Performance Measurement: Establishing Energy Impacts of Commercial Retrofit Programs

EPRI

A Pacific Northwest Study

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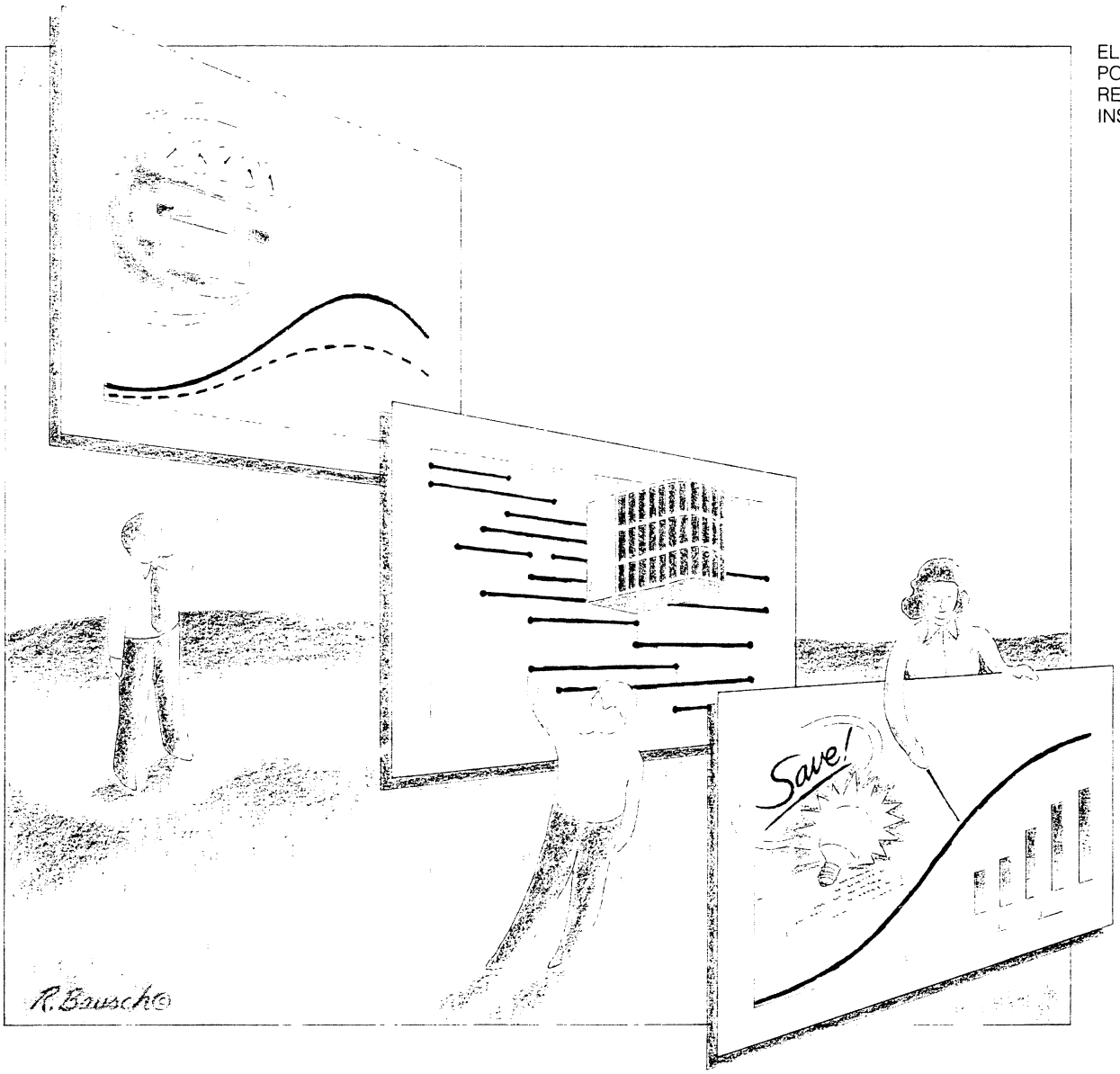

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Energy efficiency building retrofit programs can provide substantial benefits to both service providers and customers. Accurate measurement of program performance, however, is required to assess the value of these benefits. This report describes a method for determining the performance impacts of retrofits to smaller commercial buildings. The method integrates telephone surveys, statistical analysis of billing data, and on-site surveys to provide a reasonable cost approach to impact assessment.

INTEREST CATEGORIES

Market research
Marketing
Strategic market assessment
Marketing program evaluation

KEYWORDS

Marketing
Demand-side management
Conservation
Load Management
Statistical analysis

BACKGROUND A common approach to conducting performance measurements of energy efficiency retrofit programs in the existing building market is to statistically compare changes in the energy usage of "treatment" buildings against changes in energy usage of "control" buildings. This modeling process has been shown to work best for larger programs where a significant number of sites can be included in the treatment and control groups. For smaller programs, the statistical modeling results can be substantially influenced by "outliers"—sites where energy usage does not behave as predicted. In this study, outlier sites were subjected to additional data collection efforts to explain why their energy usage changed in an unexpected manner. Such efforts should increase the representative nature of performance measurements.

OBJECTIVE To estimate electricity savings from the installation of energy efficiency measures in existing commercial buildings.

APPROACH The primary approach for this study was a billing analysis of the change in electricity consumption of participants and nonparticipants in the retrofit portion of 1991–1992 Energy Smart Design Program. This program was offered to the construction market by utilities in the Pacific Northwest, including Bonneville Power Administration, Seattle City Light, and Tacoma Public Utilities. EPRI cosponsored this project with the above utilities as well as Idaho Power and Puget Power. This analysis varied from the traditional billing impact methods to include: multivariate regression analyses incorporating telephone survey data; statistically adjusted engineering (SAE) models; additional regression models incorporating findings from on-site surveys; and nonprogram factors affecting energy consumption.

RESULTS The preferred billing analysis approach involved developing preliminary savings estimates using data from focused telephone surveys and then refining the estimates in light of on-site surveys of outlier locations. Although various models were explored, the SAE model yielded the best outcome. The SAE model provided estimates of program realization rates, defined as the fraction of engineering-based energy savings realized in customer bills, controlling for changes in weather, site characteristics, and market conditions. By controlling for site-specific factors, the analysis was better able to isolate and estimate the impacts of the DSM measures installed through the program. Clearly, in programs with a limited number of participants, intensive site analysis procedures—including customized telephone surveys, on-site surveys, and follow-up surveys—should be considered in performance measurement plans.

Using this billing analysis approach, the Energy Smart Design Program savings were approximately 84% of the combined utility tracking system savings. Lighting measures accounted for the bulk of program savings.

EPRI PERSPECTIVE The commercial retrofit market has provided ongoing opportunities for utility marketing initiatives to improve energy efficiency. Performance measurement of new efficiency-related products and services will provide an important source of feedback on their value and pricing as well as the effectiveness of utility marketing initiatives. While this study was conducted for demand-side management (DSM) programs, issues related to program effectiveness remain the same. Related EPRI research includes *Performance Measurement: Establishing Energy Impacts of Commercial New Construction Programs* (TR-106924), *Performance Impacts: Evaluation Methods for the Nonresidential Sector* (TR-105845), *Impact Evaluation of Demand-Side Management Programs* (CU-7179, Vols. 1–2), and *Engineering Methods for Estimating the Impacts of Demand-Side Management Programs* (TR-100984, Vols. 1–3).

PROJECT
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A Pacific Northwest Study

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ABSTRACT

The commercial existing building market has provided ongoing opportunities for utility marketing initiatives to improve energy efficiency. In the move to a more competitive electric industry, energy-related products and services will be developed and provided by both utilities and energy service companies. Performance measurement of these products and services will continue to prove an important source of feedback on their value and pricing as well as the effectiveness of utility initiatives. The ability to provide cost-effective performance measurement techniques for commercial energy efficiency programs is particularly challenging for smaller programs. Statistical techniques that are often effective in the analysis of larger programs can lose robustness when the sample of program participants is small. EPRI and a group of member utilities collaborated on a project to develop and demonstrate a method that effectively determines the performance impacts of retrofits to smaller commercial buildings. The method integrates telephone surveys, statistical analysis of billing data, and on-site surveys to provide a reasonable cost approach to impact assessment. This report describes the demonstrated method and presents findings on the effectiveness of the method as well as the performance impacts of the program measured. Methods such as this one will provide utilities with the information they need to improve their initiatives and thereby enhance their competitive advantage.

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EXECUTIVE SUMMARY

Introduction

This report presents the results of a performance measurement study of commercial buildings in the 1991–1992 retrofit portion of the Energy Smart Design Program, offered by several utilities in the Pacific Northwest. While this is a demand-side management (DSM) project, the insight it offers into equipment retrofit practices and how a utility can influence those practices can be applied in today's utility business environment. For readers who do not have a background in DSM, a glossary of terms can be found in Appendix G.

This is one of two EPRI reports addressing energy saving impacts of commercial energy efficiency programs. The second of these reports, TR-106924, focuses on a study of the new construction market, which represents a larger portion of an overall project to develop and demonstrate alternative approaches for conducting performance measurements of commercial programs.

For a number of years, utilities have provided their customers with information and financial incentives to promote the installation of efficient technologies. In the move to a more competitive electric industry, energy-related products and services will be developed and provided by both utilities and energy service companies. Performance measurement of these products and services will continue to provide an important source of feedback on the value and effectiveness of utility initiatives.

Energy efficiency opportunities in existing buildings can offer substantial benefits to both the service providers and the host customers. However, accurate measurement of energy efficiency retrofit program performance is required to assess the value of these benefits. Moreover, in a competitive industry, an understanding of program performance and benefits will provide an important foundation for pricing energy-related products and services.

A common approach in conducting performance measurements of energy efficiency retrofit programs in the existing building market is to statistically compare changes in the energy usage of "treatment" buildings (where energy efficiency opportunities are implemented) against changes in energy usage of "control" buildings (where energy efficiency opportunities have not been

taken advantage of). The statistical modeling process has been shown to work best where a large number of sites can be included in the treatment and control groups. For smaller efforts, this approach is not as effective due to the fact that the statistical modeling results can be substantially influenced by "outliers."

Rather than dropping outliers from the analysis, this study undertook additional data collection efforts on identified outlier sites in order to explain why their energy usage changed in an unexpected manner. The additional data was incorporated into statistical models to provide improved measurement results.

Approach

The primary approach used to estimate the performance of installed DSM measures was a billing analysis of the change in electric consumption of program participants and nonparticipants. Although various models were explored, the approach that yielded the best results was a statistically adjusted engineering (SAE) model. The SAE model provided estimates of program realization rates, defined as the fraction of engineering-based energy savings realized in customer bills, controlling for changes in weather, site characteristics, and market conditions. Site characteristics and market conditions data were quantified using both telephone and on-site surveys. A preliminary survey identified sites with unexpected changes in energy use, so visits could be arranged. A key element of this analysis approach was the inclusion of on-site survey data to explicitly quantify nonprogram changes in electricity consumption. By controlling for site-specific, nonprogram factors, the analysis was better able to isolate and estimate the impacts of the DSM measures installed through the program.

This approach to performance measurement should be readily transferable to other utilities, provided they have adequate program tracking data to support engineering-based measure savings calculations. The realization rates estimated in this study are not transferable, however, because they are based on utility-specific program attributes, including energy savings calculations, program delivery, and a mix of participant business types.

Findings

Project findings address both the performance measurement methodology and the performance impacts themselves. Key findings are highlighted below.

Methodology Findings

Given the demonstration nature of this project, the methodology findings constitute an important component of the overall results. Methodology findings primarily address performance measurement for smaller programs:

- For this study, which included fewer than 200 participant sites, models using the standard telephone survey did not effectively isolate program savings from other nonprogram effects.
- Follow-up, on-site surveys of outlier sites provided important additional nonprogram information that led to substantial improvement of final analysis models. The ability to explicitly quantify nonprogram impacts in final models contributed to a 33% increase in realization rate estimates.
- A clear conclusion of this project is that for studies of this type, with a limited number of participants, more intensive site analysis procedures should be considered in performance measurement plans. These procedures could incorporate customized telephone surveys, on-site surveys, follow-up surveys, or some combination of these approaches.

Performance Impact Findings

The performance impacts themselves are of interest to the retrofit program design and implementation teams in the Pacific Northwest and elsewhere:

- Lighting measures, which accounted for the bulk of program savings, achieved a realization rate of 0.89, while the realization rate for non-lighting measures was estimated to be 0.66. This differential is not surprising, considering that lighting savings calculations are relatively straightforward when compared to savings estimates for other measures such as HVAC and refrigeration.
- Levelized regional program costs, which are comprised of fixed program costs and incentives paid, were estimated to be 28.3 mills per kWh, assuming a 3% real discount rate.
- Lighting costs were estimated to be 26.4 mills per kWh, while non-lighting costs exceeded 38.0 mills per kWh. Lighting options were clearly the most cost-effective, partly as a result of their higher realization rate.
- Program savings estimates for the 1991–1992 program years were estimated to be 44.9 GWh per year—84% of tracking system savings.

1

INTRODUCTION

Overview

This report presents the Retrofit results of a performance impact study of commercial buildings in the Pacific Northwest. This is one of two reports documenting the comprehensive impact analysis of commercial DSM programs. The second of these reports focuses on the New Construction portion of the evaluation, which represents a larger portion of the overall performance impact project. The project was co-sponsored by the Electric Power Research Institute as a case study to develop and demonstrate alternative approaches for conducting performance impact evaluations of commercial DSM programs.

The Retrofit study was designed to estimate electricity savings from the installation of DSM (demand-side management) measures in existing commercial buildings. Participating utilities included Seattle City Light (SCL), Tacoma Public Utilities (TPU), and seven additional utilities served by the Bonneville Power Administration (BPA). The evaluation covered buildings that participated in DSM programs during calendar years 1991 and 1992. The programs were implemented by participating utilities in connection with BPA through the Energy Smart Design (ESD) program.

A key aspect of the Retrofit study was the development of techniques that could be used to evaluate impacts for smaller commercial DSM programs (i.e., programs with fewer than 500 participants).

Project Background

Program

In the Pacific Northwest, many commercial DSM programs implemented by utilities are based on the BPA's ESD program, a program that has evolved over several years. In some cases, utilities have been part of the ESD program; in other cases, utilities have developed their own programs with ESD as a model. A list of ESD utilities is provided in Appendix F. Initial utility contracts for the ESD program were signed in September 1988, but most utility programs did not get underway

until 1989. The initial version of the ESD program provided design assistance only. In subsequent years, the program was expanded to include financial incentive payments to customers for the installation of program-approved energy conservation measures. The 1991 and 1992 program years evaluated in this study may be characterized as a start-up period for the incentive portion of the program.

For the program, individual utilities make resource acquisition payments to their customers in the form of custom incentives and standardized DSM measure rebates. All commercial buildings and the non-process portion of industrial plants located within the service territory of BPA customer utilities participating in the ESD program are eligible to receive program services.

As part of the ESD program, BPA offers financial support to utilities to provide program management, technical and design assistance to customers, incentive payments, and start-up and aftercare activities to ensure that the building operates as designed. In addition, BPA provides staffing assistance to utilities who lack the in-house staff to implement the program. ESD marketing is provided on a regional basis by BPA in collaboration with regional utilities.

Other activities that support DSM in the Pacific Northwest include the *Electric Ideas Clearinghouse* in Olympia, Washington, and the *Lighting Design Lab* in Seattle, Washington. BPA co-funds the *Electric Ideas Clearinghouse*, which provides free information on technologies, specific equipment, design strategies, and training opportunities through telephone and computer access. BPA and other regional utilities and organizations support the *Lighting Design Lab*. The lab focuses on lighting strategies, products, and analysis. There are demonstration areas to mock up potential workspace areas, and lighting equipment is on display.

Program Penetration

During the 1991–1992 start-up period for the ESD program, approximately 0.6 percent of the eligible buildings participated in the program. These buildings represented about 3.7 percent of the eligible floorspace. Table 1-1 presents a summary of the program penetration levels during the 1991–1992 period. The penetration estimates are based on program tracking data and commercial market data from PNNonRES, the Pacific Northwest Nonresidential/Commercial Energy Survey that was conducted by BPA from 1986–1990 to examine the region's commercial building stock.

Table 1-1
1991–1992 ESD Program Penetration

	Total Market	1991/1992 Participants	Percentage Penetration
Number of Sites	134,000	792	0.6%
Site Square Footage	1,666 million	61 million	3.7%

Performance Impact Study

Several utilities in the Pacific Northwest agreed to collaborate on a project to evaluate the impact of their commercial building DSM efforts. The performance impact study was co-sponsored by the Electric Power Research Institute (EPRI). The co-sponsoring utilities included BPA, SCL, TPU, Puget Sound Power & Light, and Idaho Power. The study was divided into two parts: a commercial new construction study (which is the primary focus of the overall evaluation) and a commercial retrofit study. Only the public utilities in the BPA service territory (including SCL and TPU) were involved in the retrofit portion of the project.

The primary objectives of the project were to:

- Develop and demonstrate alternative performance impact approaches for commercial DSM programs;
- Estimate savings from the installation of DSM measures in commercial buildings in the 1991–1992 program years; and
- Conduct a cost analysis using the energy savings estimates and program cost data provided by the utilities.

For the retrofit portion of the performance impact study, a primary objective of EPRI and the host utilities was to develop a reliable, cost-effective measurement method(s) that could be applied to commercial programs with relatively small numbers of participants.

Performance Impact Methodology

The primary approach used for this study was a billing analysis of the change in electric consumption of program participants and nonparticipants. Variations investigated in this study for estimating energy savings from the DSM measures included:

- Simple bill comparisons between program participants and nonparticipants;
- Multivariate regression analyses incorporating telephone survey data on customer-specific characteristics and non-program changes at each site;
- SAE (statistically-adjusted engineering) models, a type of regression analysis that incorporates measure savings estimates from the program tracking system; and
- Additional regression models that use findings from an on-site survey of selected sites.

The approach that yielded the best results was an SAE model that explained changes in energy use in terms of the engineering savings estimates from the installation of DSM measures, controlling for changes in weather, site characteristics, and market conditions. Site characteristics and market conditions data were quantified using both telephone and on-site survey data. By controlling for site-specific factors, the analysis was better able to isolate and estimate the

impacts of the DSM measures installed through the programs. The SAE model provided estimates of program realization rates, defined as the fraction of tracking system energy savings realized in customer bills.

A key element of this approach was the inclusion of on-site survey data to explicitly quantify non-program changes in electricity consumption. Based on the results of a preliminary analysis, sites with unexpected changes in energy use were identified and visited. Non-program factors affecting energy consumption were quantified and incorporated in the final analysis. This final step yielded significant improvements in the evaluation results.

Report Organization

The remainder of this report is organized as follows:

- Project results (including methodological results) are summarized in Section 2.
- A detailed description of the evaluation methodology and results is presented in Section 3.
- Survey instruments are presented in Appendix A.
- Telephone survey frequency tables are presented in Appendix B.
- On-site survey results are shown in Appendix C.
- The participation decision model used for the evaluation is presented in Appendix D.
- Alternative energy savings regression models are shown in Appendix E.
- A list of ESD participating utilities is contained in Appendix F.
- A glossary of selected terms is contained in Appendix G.

2

OVERVIEW OF PROJECT RESULTS

Overview

This section presents an overview of the project results. First, the performance impact methodology is presented. Next, key project findings are shown. Finally, implications of the results are discussed.

Methodology

The Retrofit performance impact study, used to estimate 1991–1992 program savings, consisted of the following steps:

- Sampling a representative group of program participants and a comparable group of nonparticipants;
- Conducting a telephone survey to collect site-specific information and identify non-program changes at the site;
- Collecting and screening billing data covering pre-retrofit and post-retrofit periods;
- Analyzing the collected data using billing analysis models to provide preliminary performance impact results and to identify outliers for follow-up on-site surveys;
- Conducting follow-up on-site surveys of selected sites with unexplained changes in energy use to verify measure installations and better quantify non-program changes in energy consumption;
- Incorporating the on-site data into the final billing analysis to improve estimates of program savings; and
- Conducting a cost analysis using the evaluated program savings and utility-supplied program cost data.

Telephone surveys were conducted for 407 sites and follow-up on-site surveys were conducted on a subset of 77 sites. Sixty sites subsequently were dropped from the analysis due to inadequate billing data and customer turnover during the study period. There were 158 program participants and 189 nonparticipants included in the final billing models.

A number of different billing analysis models were investigated during the performance impact study. Simple bill comparisons were performed, comparing changes in bills between participants and nonparticipants. The nonparticipants are included in the study to help control for non-program factors that can cause changes in energy consumption. The simple comparisons are often viewed as an inexpensive means of estimating program savings. A variety of more sophisticated econometric models was developed and compared using statistical methods. These models incorporated different program participation variables and different non-program variables (to control for non-program changes in customer bills). The analysis is described in more detail in Section 3 of this report.

In general, it was found that the econometric models performed significantly better than the simple bill comparisons. The precision levels (the accuracy of the savings estimates based on their standard errors) were much worse for the simple comparisons. In addition, the simple comparisons were very sensitive to outliers (sites with unexpected changes in energy use)—the removal of 10 influential sites (out of a total of 347 sites) caused the estimated realization rates to change from 0.02 to 0.94.

The most effective regression model used an SAE approach in which post-retrofit energy usage per square foot was modeled as a function of:

- Pre-retrofit usage per square foot;
- Tracking system measure savings estimates broken out by lighting and non-lighting savings;
- A variable developed from the on-site surveys that specifically quantified non-program changes in energy usage; and
- Other variables from the telephone survey explaining changes in energy use.

Models that incorporated information from the on-site surveys showed significant improvement over preliminary models. The on-site survey information was used to correct inaccuracies in the telephone survey and to specifically quantify, where possible, non-program changes in energy use. By better accounting for non-program factors, more precise estimates of program realization rates were developed. Table 2-1 compares preliminary to final realization rates. The lower standard errors and higher t-statistics in the final results reflect the improvements.

Table 2-1
Comparison of Preliminary and Final Realization Rates

Model	Realization Rate	Standard Error	t-statistic
Preliminary	0.63	0.076	8.3
Final	0.84	0.075	11.2

Key Findings

Project findings are grouped into three subsections:

- The preferred performance impact approach identified as part of the project;
- The results of the impact analysis; and
- The results of the cost effectiveness analysis.

These topics are discussed below.

Preferred Performance Impact Approach

The preferred billing analysis approach is to develop preliminary savings estimates using data from focused telephone surveys and then refining the estimates based on on-site surveys of outlier sites.

The approach used for this performance impact study worked reasonably well. A preferred performance impact approach was identified and recommend for future evaluations of this type, however, based on experiences conducting this and similar evaluations.

The approach used in the initial stages of this study consisted of collecting site information using a relatively inexpensive telephone survey, collecting and screening billing data for surveyed sites, and combining the survey data with the billing data to build statistical models. This approach usually works best when a fairly large sample (1,000 or more customers) is available. With a large sample, survey inaccuracies (such as incorrect dates for equipment installations) and low resolution (the inability to gain specific information about non-program changes that affect energy use) usually are compensated for by the statistical properties of a large sample. For smaller studies, such as this one, the inability to accurately quantify non-program changes can significantly impact results (for example, compare preliminary to final realization rates in Table 2-1).

A more customized approach for studies of this size is recommended, as follows:

- First, collect and conduct a preliminary analysis of customer billing data before conducting telephone surveys. Sites with inadequate billing data should be dropped from the study at this time. This step minimizes the number of surveyed sites that are subsequently dropped from the analysis, thus controlling the project budget. In addition, sites with unusual billing histories can be targeted for additional attention in the telephone surveys.
- Second, conduct customized telephone surveys using trained surveyors and information gleaned from site billing histories and the program tracking system. Customers can be questioned about unexpected changes in energy usage (or lack of expected changes), and events can be tied to specific time periods. In addition, customers may be asked questions to collect general site data. Use of customized surveys will provide more accurate, specific data than standardized surveys.
- Third, combine the billing data and survey data to build statistical billing analysis models. Variables that specifically quantify non-program changes in energy usage can be developed from data collected in Step Two and included in the models. In this step, initial program savings estimates are developed and outlier sites (sites with unexplained changes in energy use) are identified.
- Fourth (if necessary), conduct follow-up on-site surveys of selected outliers identified in Step Three. These surveys can be used to refine data collected in Step Two, especially at sites where equipment changes took place and a trained auditor can quantify impacts. The surveys also can be used to verify measure installations at sites where savings are less than expected. Incorporating the on-site data into the analysis will lead to refined billing analysis results for the performance impact.

The approach outlined above provides a more intensive analysis of each site included in the study. When study size is constrained by a limited number of program participants, this approach is likely to provide improved results over studies that rely only on standardized forms of data collection. It was found that customers often misreport or only partially report non-program factors that affect energy consumption when completing standardized survey forms. These "errors" can significantly affect the performance impact results for smaller studies, as demonstrated in Table 2-2.

Impact Analysis Results

Program savings estimates for the 1991–1992 program years were estimated to be 44.9 GWh per year—84 percent of tracking system savings.

The billing analysis methodology used for this study provides estimates of program realization rates, the fraction of engineering-based energy savings from the program tracking systems that are actually realized in the form of reduced customer bills. Separate realization rates were

estimated for lighting measures (the largest single contributor to program savings) and all other measures (including HVAC and miscellaneous measures). Realization rates are summarized in Table 2-2. Also presented are the standard errors and 90 percent statistical confidence intervals for the rates.

Table 2-2
Energy Savings Realization Rates

End Use	Realization Rate	Standard Error	90% Confidence Interval
Lighting	0.89	0.087	0.73 to 1.01
Other	0.66	0.096	0.50 to 0.82
Overall*	0.84	0.075	0.72 to 0.96

As Table 2-2 indicates, 89 percent of energy savings attributable to lighting measures and 66 percent of energy savings attributable to other measures were verified by the performance impact. Overall, 84 percent of all tracking system measure savings were realized in customer bills. It is reasonable to expect higher realization rates for lighting measures. Lighting retrofits and associated savings estimates are relatively straightforward. The savings estimates for the "other" end use (comprised mostly of HVAC and envelope measures) are more complex and thus prone to error. In addition, measures in the "other" category are more likely to experience rebound effects in which customers "take back" some of their savings in the form of increased comfort.

In addition to the differentiation of realization rates by end use, other program-related factors were investigated to determine if they had measurable affects on realization rates. These factors included: the utility implementing the program, the magnitude of the energy efficiency project (large projects vs. small projects), the size of the program savings relative to the customer's total electric bill, and the type of program delivery (customized site-based projects vs. prescriptive rebate projects). Only one of these factors contributed to a significant differentiation of realization rates—realization rates for SCL were found to be, on average, 0.24 higher than those of the other utilities. Factors contributing to this difference include SCL's added experience with retrofit programs and SCL's incorporation of past performance impact results into their tracking system savings estimates.

The realization rates shown above can be multiplied by program tracking system savings estimates to arrive at performance impact savings estimates for the program. These results are presented in Table 2-3. Savings are shown by key end use. (The miscellaneous category includes envelope, motors, refrigeration, and water heating measures.) As the table indicates, most of the overall program savings are attributable to lighting measures (comprising 82 percent of total performance impact savings for years 1991 and 1992). Non-lighting savings were equally split between HVAC and miscellaneous measures.

Table 2-3
Program Savings Estimates 1991–1992 Program Years

End Use	Number of Sites[1]	Tracking Savings (MWh)	Realization Rate	Performance Impact Results (MWh)
Lighting	660	41,418	0.89	36,862
HVAC	88	6,078	0.66	4,011
Miscellaneous	100	6,082	0.66	4,014
Total	792	53,578	0.84	44,887

[1] Totals do not reflect sum of parts due to multiple end use sites and repeat participants.

Cost Analysis Results

Levelized regional program costs were estimated to be 28.2 mills per kWh and levelized total regional costs were estimated to be 40.6 mills per kWh.

The performance impact savings estimates presented in Table 2-3 were combined with program cost data and expected measure lives to develop estimates of levelized costs per kWh saved for the programs. Levelized costs were calculated using the methodology and assumptions provided by BPA. For the analysis, the present value of all costs and savings were calculated using a three percent real discount rate. Levelized costs were then calculated from a regional program perspective (using paid incentives as the measure cost indicator) and from a total regional perspective (using total incremental measure installation costs) as follows:

$$\text{Levelized regional program costs} = \frac{PV(Incentives + Fixed\_Program\_Costs)}{PV(kWh\_Savings)}$$

$$\text{Levelized total regional costs} = \frac{PV(Incremental\_Costs + Fixed\_Program\_Costs)}{PV(kWh\_Savings)}$$

Adjustments to tracking system costs were required for the total regional cost calculation because the program tracking systems sometimes contained *total* measure costs instead of *incremental* measure costs. Based on discussions with utility staff about the program-imposed relationship between incremental costs and incentive levels, incremental costs were set to the minimum of the total measure cost, or 2.5 times the paid incentive. Fixed program costs include: utility administration costs, BPA administration costs, marketing costs, training costs, and the utility component of the performance impact costs. Costs for the *Electric Ideas Clearinghouse*, the *Lighting Design Lab*, and EPRI's contribution to the performance impact are not included in the calculations. Levelized cost results, expressed in mills per kWh, are presented in Table 2-4.

Table 2-4
Levelized Cost Estimates (Mills/kWh)

End Use	Regional Program Costs[1]	Total Regional Costs2
Lighting	26.4	37.7
HVAC	38.0	55.9
Miscellaneous	39.0	57.9
Total	28.3	40.7

[1] Cost is based on incentives paid.
[2] Cost is based on total incremental measure cost.

The levelized costs indicate that lighting retrofits proved to be the most cost-effective measure on a per-kWh basis, both from a program and total regional perspective. HVAC measures were the least cost effective. Program-wide levelized costs are significantly influenced by the lighting costs, as lighting comprised more than 80 percent of program savings. Overall, costs averaged approximately 28 mills per kWh from the regional program perspective and 41 mills per kWh from the total regional perspective. The ESD Program's target for regional program cost was 35 mills per kWh.

Implications of Results

The impact results from this performance impact study reinforce a lesson learned from many other commercial retrofit performance impact studies. It is common to find that the realization rate for lighting measures is higher than the realized rate of savings for non-lighting measures.

Developing tracking system estimates of lighting savings requires the use of a few assumptions that can often be estimated with reasonable accuracy. Developing tracking estimates for HVAC measures requires many assumptions for factors for which considerable variation exists. It stands to reason that program staff will tend to do a better job of estimating lighting impacts than non-lighting impacts.

The implication of this finding leads to an interesting conclusion regarding future programs involving the promotion of energy efficiency savings. For future programs, risk associated with realizing the savings is likely to be a more important issue. The relative higher uncertainty associated with estimating and realizing savings from HVAC measures may result in programs that just focus on at the more "reliable" lighting measures.

Beyond the difference in realized savings by end use, the results from this performance impact study did not provide any clear direction for program design. The realization rates tended to be the same across different sizes of customers and different program options. A previous study of

commercial retrofit program impacts in the Northwest region found higher realization rates for larger buildings and when a more "customized" program delivery method was used. The results did not support this finding.

The fact that SCL's participants were found to have higher realization rates that other areas may provide some insights into better program design. SCL staff have been offering retrofit programs much longer than the other utilities in the study and this experience may be a source of higher realized savings. SCL staff also reports that they have tried to incorporate the results from previous evaluations into their tracking system estimates. With regard to program design, SCL had a minimum watt reduction requirement that was not used by the other utilities.

3

DETAILED METHODOLOGY AND RESULTS

Overview

The primary objectives of the retrofit performance impact study were to estimate energy savings from installing DSM measures and to demonstrate effective performance impact techniques. The performance impact study covered existing commercial buildings that participated in the programs during 1991 and 1992. Buildings that underwent major renovations were excluded from the Retrofit study (and were included in a separate new construction performance impact study).

A diagram depicting the design of the retrofit performance impact project is presented in Figure 3-1. The primary components of the study included:

- Sample design to select representative participant and comparable nonparticipant sites for the study;
- Telephone surveying to collect site-specific data on factors affecting energy usage for use in the billing analysis models;
- Billing data collection from the utilities involved in the study;
- Preliminary participation and billing analyses to produce initial performance impact results and to identify outlier sites for subsequent on-site surveys;
- On-site surveys of selected customers to quantify non-program factors causing changes in energy use;
- Final participation and billing analyses using the on-site survey data; and
- Cost analyses based on the performance impact energy savings results.

Telephone surveys were conducted on 192 participants and 215 nonparticipants to collect site-specific building and behavioral information. Data from the telephone survey then were combined with program tracking data and billing data for inclusion in preliminary billing analysis models. Based on the preliminary analysis, outlier sites (sites with unexpected changes in energy consumption) were targeted for follow-up on-site surveys. On-site surveys then were performed

on 77 sites to verify DSM measure installations and to quantify non-program factors causing changes in energy use. Final billing analysis models were developed using information from the on-site surveys, and the results of these models were used to calculate program energy savings. Performance impact estimates then were combined with program tracking information on program costs and expected measure lives to develop estimates of levelized costs per kWh saved for the programs.

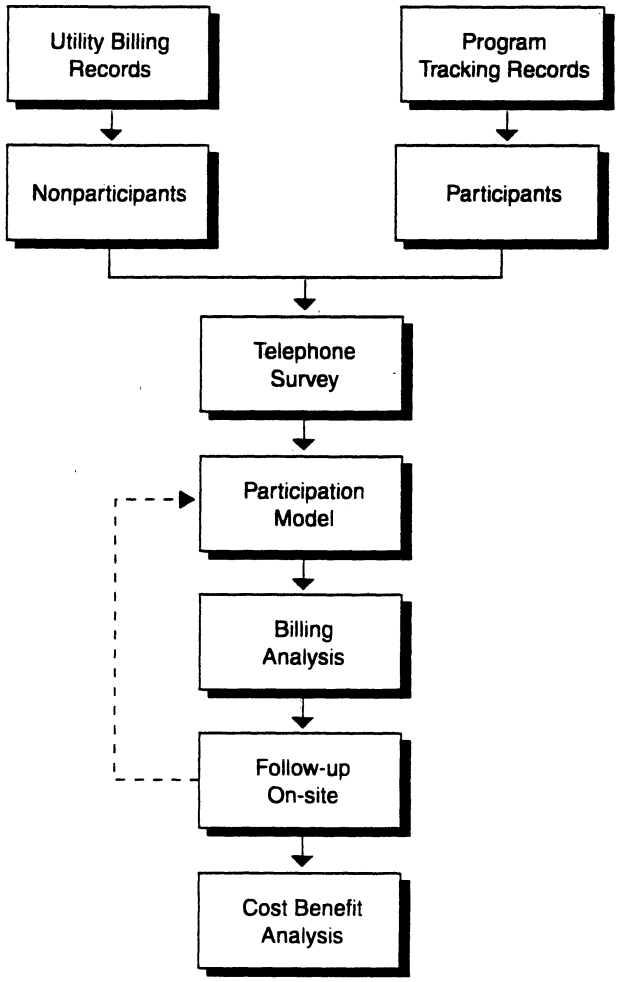

Figure 3-1
Retrofit Program Performance Impact Study Design

The performance impact methodology and results are discussed in the remainder of this section. Topics include:

- Sample design;
- Telephone survey;

- On-site survey results;
- Temperature adjustment and annualization of billing data;
- Simple bill comparisons;
- Econometric models;
- Energy savings results;
- Cost analysis;
- SCL results; and
- A brief comparison to other Northwest performance impact study results.

Sample Design

The goal of the sample design was to provide a diverse sample of program participants and a sample of comparable nonparticipants for use in the billing analysis. Initial targets of 200 participants and 200 nonparticipants were set for the number of sites to be included in the study.

Participants

Sample frames for the program participants were taken from the utility tracking systems. A stratified random sample design was used for the participant sample. This approach ensured that a representative sample of participants were selected for the study. Strata consisted of program year (1991 and 1992), measure types at the site (lighting-only, lighting/other, and other measures), and geographical area. Participant population counts and the selected sample are presented in Table 3-1. Sample attrition, the difference between the expected sample and the sites in final models, is discussed below in the subsection, "Sample Attrition."

Table 3-1
Participant Population and Sample

Program Year	Measure Type	Population	Expected Sample	Surveyed Sites	Sites in Final Models
1991	Lighting Only	133	80	56	46
	Lighting & Other	11	7	5	5
	Other Only	22	13	8	7
	Subtotal	166	100	69	58
1992	Lighting Only	478	40	68	58
	Lighting & Other	39	20	19	15
	Other Only	109	40	36	27
	Subtotal	626	100	123	100
	Total	792	200	192	158

Nonparticipants

Sample frames for the nonparticipants varied by utility. For SCL, the billing system was used. For TPU, a Metroscan[1] dataset matched to the billing system was used. The Metroscan data provided year of construction to distinguish between existing and new construction sites. For the other BPA utilities, the sample frame came from two sources. For Snohomish County PUD, Metroscan data were used; for other BPA utilities, the PNNonRES[2] Phase 1 database was used. The nonparticipant sample was designed to match the participant sample as closely as possible, based on business type, customer size, and geographical area.

Table 3-2 presents a tabulation of participant and nonparticipant sites included in the final models segmented by business type and customer size category. The small/large distinction is based on the median customer size (in pre-retrofit kWh) for each business type. As the table indicates, the participants and nonparticipants are matched reasonably well by business type. Participants tended to be somewhat larger customers, however, especially in the office, retail, and "other" categories.

Table 3-2
Tabulation of Participant and Nonparticipant Sites in Final Models

	Nonparticipants			Participants		
Business Type	**Small**	**Large**	**Total**	**Small**	**Large**	**Total**
Office	31	21	52	20	30	50
Retail	16	10	26	8	13	21
School	5	6	11	5	4	9
Manufacturing	6	6	12	5	5	10
Lodging	11	12	23	11	10	21
Other	42	23	65	15	32	47
Total	111	78	189	64	94	158

[1] Metroscan data consist of computerized records of county assessors' data and include for each site the business type, building's square footage, and year the building was built.

[2] PNNonRES, the Pacific Northwest Nonresidential/Commercial Energy Survey, was conducted by BPA from 1986–1990 to examine the region's commercial building stock. In Phase 1 of this project, a list of nonresidential buildings was developed to be used as a sampling frame for the survey. The list included site square footage and business type for all buildings in sampled ZIP areas.

Sample Attrition

As noted above, sample sizes of 200 participants and 200 nonparticipants were targeted for the study. The final number of sites included in the study were 158 participants and 189 nonparticipants. Sample attrition is presented in Table 3-3. For nonparticipants, the primary reason for the loss of sites was customers who completed surveys but would not sign billing data release forms as required by their utility. For participants, a number of customer billing records could not be located. The largest cause of participant attrition was inadequate billing data, primarily due to insufficient pre-retrofit data. Five sites with adequate billing data were dropped from the final models because of near-complete tenant changes during the study period. A final nonparticipant site was dropped because it was identified as a participant in the new construction program (it was an existing building that received an extensive remodel).

Table 3-3
Sample Attrition

	Nonparticipants	Participants	Total
Complete Surveys	215	192	407
Some Billing Data	191	184	375
Adequate Billing Data	190	163	353
In "Final" Models	189	158	347

Telephone Surveys

Telephone surveys were conducted to collect site-specific information on program participants and nonparticipants. Collected data were used to identify non-program factors affecting energy consumption that could confound the estimates of program energy savings. Because the study methodology consisted of explaining the change in energy consumption for selected sites, the information gathered in the telephone surveys included:

- Major equipment and operation behavior;
- Events that caused consumption to change, such as changes in building operations and equipment additions/removals; and
- Customer characteristics associated with the likelihood to change energy consumption including participating in the program.

Copies of the participant and nonparticipant telephone survey instruments are provided in Appendix A, and complete tabulation of survey results is presented in Appendix B.

Table 3-4 presents key survey statistics for participants and nonparticipants. The variables presented in this table often contribute to changes in energy consumption and to the customers' decision to participate in DSM programs. As the table indicates, the participants and nonparticipants were fairly similar, especially with respect to business and equipment changes. The survey reflects that participant sites tended to be larger sites than nonparticipant sites (as discussed in the previous subsection). Major equipment holdings are very similar except for air conditioning, where participants have a somewhat higher saturation. Participants tended to have higher instances of tenant turnover and remodeling than nonparticipants, and more nonparticipants appeared to experience tougher business conditions. Participants also tended to have longer operating hours than nonparticipants. Equipment changes appeared similar for participants and nonparticipants.

Table 3-4
Summary of Telephone Survey Results

	Participants	Nonparticipants
Site/Business Characteristics		
% owner-occupied sites	72%	71%
% single business sites	70%	79%
% sites: energy manager	41%	30%
Average number of employees	116	94
Average floorspace (sq. ft.)	62,082	47,033
Average weekly operation hours	89	78
Equipment Saturations		
Electric heating	49%	48%
Air conditioning	70%	60%
Refrigeration	22%	20%
Electric water heating	57%	58%
Business Changes		
% sites with tenant changes	7%	3%
% remodeled sites	21%	12%
% sites: increased floorspace	8%	5%
% sites: increased employees/occupants	15%	12%
% sites: decreased employees/occupants	4%	9%
% sites: increased hours	6%	6%
% sites: decreased hours	0%	1%
% sites: improved business conditions	39%	37%
% sites: worsened business conditions	7%	15%

Table 3-4 (Continued)
Summary of Telephone Survey Results

	Participants	Nonparticipants
Equipment Changes		
% sites: added equipment	40%	42%
% sites: removed equipment	11%	11%
% sites: discontinued energy using activities	3%	6%
% sites: other non-program conservation	14%	17%

On-site Surveys

On-site surveys were a key component of the final billing analysis. Information from the on-site surveys was incorporated into the billing analysis to control for non-program factors, significantly improving modeling results. A preliminary billing analysis was used to identify outliers that were then targeted for on-site surveys. Outliers consisted of customers with unexpected changes in consumption or the lack of expected changes in consumption (participants whose bills were expected to decline). The on-site surveys primarily were used to:

- Refine data collected in the telephone surveys, and
- Explicitly quantify non-program changes that altered electricity consumption and potentially masked program energy savings.

The on-site surveys also were used to verify measure installation data obtained from the program tracking system at sites where energy savings were less than expected. Although a detailed verification of measure installations was not conducted at each site, it was found that program measures generally were still in place.

The surveys allowed for higher quality information than the telephone surveys as the surveyor and customer were able to discuss specific issues in detail. The surveyor had access to billing histories and information from the telephone survey and program tracking system so that unusual events could be identified and explained. An on-site survey instrument used as a general guide while conducting the surveys is provided in Appendix A and site-specific results are provided in Appendix C.

Summary results of the on-site surveys are tabulated in Table 3-5.

Table 3-5
On-Site Survey Summary

Sites visited	77
Factor influencing electricity usage	# Sites[1]
Total change in occupants	5
Equipment increases	21
Equipment decreases	3
Additional measures installed	8
Fewer measures installed	0
Operations increase	36
Operations decrease	4
Unusual occurrences	2
No explanation	17
kWh impacts calculated	48

[1] Sites do not sum to total due to multiple factor sites.

Key findings from the on-site surveys included:

- The identification of five sites with major changes in occupants; these sites were dropped from the study.
- The identification of operations increases and equipment additions at a large number of participants sites. These increases tended to offset measure savings.
- The ability to calculate non-program kWh impacts associated with operations or equipment changes for 48 sites. These impacts were explicitly included in the final billing models.

The non-program impacts were quantified on a site-by-site basis and the methodology employed depended on the availability of site data. In some cases, the energy using characteristics of added equipment (kW input, wattage, horsepower, tons of cooling, etc.) and the operating profiles were collected and used in engineering equations to develop load changes. In other cases, site energy managers were able to provide estimates of the impact of specific site changes. Finally, in several sites with square footage additions, typical Northwest EUIs (energy use indices in kWh per square foot) for the given building type and end use were used to develop impact estimates.

Note: information provided in the following three subsections is somewhat technical in nature. The technical detail can be skipped over without significant loss of continuity.

Annualization and Temperature: Adjustment of Billing Data

Annualization and temperature-adjustment of the billing data is typically performed to ensure that the comparisons of electricity use between years and between participant and nonparticipant groups span the same number of days and the same weather conditions. In addition, temperature adjustment normalizes annual electricity consumption using long-run, average temperatures. Only customers with temperature-sensitive end uses were considered for temperature adjustment. Other customers' bills were simply normalized to a 365-day year. Table 3-6 shows the distribution of temperature-sensitive end uses for participants and nonparticipants.

Table 3-6
Distribution of Temperature-sensitive End Uses

End Use Category	# of Sites	Percentage
Participants		
No electric heating or AC	36	22.8
Electric heating only	15	9.5
AC only	50	31.6
Electric heating and AC	57	36.1
Participant totals	158	100.0
Nonparticipants		
No electric heating or AC	53	28.0
Electric heating only	20	10.6
AC only	47	24.9
Electric heating and AC	69	36.5
Nonparticipant totals	189	100.0

For the analysis, each customer's billing history is divided into a pre-retrofit and a post-retrofit period of approximately one year each. A customer-specific black-out period encompassing the months when the measures were installed was excluded from the analysis. Temperature-adjusted annual consumption was estimated for each customer in the pre- and post-retrofit periods by estimating two individual multiple linear regression models, one model for the pre-retrofit period and one for the post-retrofit period. In the specified models, average daily heating degree and cooling degree days for each billing period are used to explain variations in kWh consumption for each billing period. The functional form of the time-series model is:

$$KWH_1 = \alpha_1 + \alpha_2(HDD_t^{60}) + \alpha_3(CDD_t^{60}) + \varepsilon$$

where:

KWH_t = average daily electricity consumption in period t

HDD_t^{60} = average daily heating degree days calculated at a reference temperature of 60°F in period t

CDD_t^{60} = average daily cooling degree days calculated at a reference temperature of 60°F in period t

ε_t = a random error term with a mean of zero and a constant variance

In this model, α_1 is the regression intercept, α_2 is an estimate of how a marginal change in heating degree days affects electricity consumption, and α_3 is an estimate of how a marginal change in cooling degree days affects electricity consumption.

Annual temperature-adjusted consumption is estimated using long-run heating degree and cooling degree days. The formula for calculating pre-retrofit annualized weather-adjusted consumption is:

$$PRE\_KWH = [\alpha_1 + \alpha_2(LRHDD^{60}) + \alpha_3(LRCDD^{60})] \times 365$$

and similarly for the post-retrofit period:

$$POS\_KWH = [\alpha_1 + \alpha_2(LRHDD^{60}) + \alpha_3(LRCDD^{60})] \times 365$$

Mean-adjusted pre- and post-retrofit consumption for participants and nonparticipants is shown in Table 3-7 on a use-per-site and use-per-square-foot basis. The influence of the largest sites is reduced when calculations are made on a per-square-foot basis. The results show that temperature adjustment had only minor affects on average consumption, especially when viewed on a use-per-square-foot basis.

Table 3-7
Mean Annual Consumption Estimates

	Weather-adjusted kWh	Non-weather-adjusted kWh	Weather-adjusted kWh/sqft	Non-weather-adjusted kWh/sqft
Participants (n=158)				
Pre-Retrofit	2,140,279	2,164,881	22.93	22.96
Post-Retrofit	2,137,734	2,136,759	21.57	21.49
Nonparticipants (n=189)				
Pre-Retrofit	952,307	952,246	20.63	20.52
Post-Retrofit	951,632	955,803	21.02	21.02

Simple Bill Comparisons

Simple bill comparisons were conducted as an interim step in the billing analysis to assess their effectiveness as a savings measurement tool. Simple bill comparisons are often used in performance impact studies of DSM programs because they are relatively inexpensive. The only data required for the comparisons are utility billing data and information about when the program measures were installed. In addition, weather data that is often readily available at the utility can be used to adjust the billing data prior to the comparisons.

A nonparticipant control group is used in the analysis to control for non-program factors that have changed over time and may have influenced energy use. For example, if businesses in general are expanding, the control group can control for the energy-inducing impacts of this expansion. Also, to the extent that the propensity for natural conservation can be assumed to be the same for participants and nonparticipants, the comparisons also control for naturally-occurring conservation. The major drawback to simple bill comparisons is that they assume that the factors that affect energy use will affect participants and nonparticipants equally. To the extent that the control group is not representative of participants, energy savings estimates will be flawed. This is usually more of a concern in the heterogeneous commercial sector than in the more homogeneous residential sector.

For this analysis, savings estimates from the bill comparisons were calculated using annualized weather-adjusted consumption. First, changes in energy use were calculated for participants and nonparticipants. Next, changes in energy use for participants were compared to nonparticipants to develop an estimate of program-related savings.

The following equations were used to calculate the savings and precision estimates:

- Average savings per participant:

$$\overline{S_p} = \overline{\Delta kWh_P} - \overline{\Delta kWh_{NP}}$$

- Standard error of the savings estimate:

$$SE_{\bar{S}} = \sqrt{\frac{\sigma^2 \Delta kWh_P}{n_P} + \frac{\sigma^2 \Delta kWh_{NP}}{n_{NP}}}$$

- t-statistic of the savings estimate:

$$t - statistic = \frac{\overline{S_P}}{SE_{\bar{S}}}$$

where:

$\overline{\Delta kWh_P}$ = mean change in energy use for participants

$\overline{\Delta kWh_{NP}}$ = mean change in energy use for nonparticipants

$\sigma^2 \Delta kWh_P$ = variance of the change in energy use for participants

$\sigma^2 \Delta kWh_{NP}$ = variance of the change in energy use for nonparticipants

n_P = the number of participants in the analysis

n_{NP} = the number of nonparticipants in the analysis

Results of the bill comparisons are presented in Table 3-8. Results are shown for four different bill comparison calculations:

- Calculation 1: Uses all observations, with the mean change in energy usage per site compared for participants and nonparticipants.
- Calculation 2: Same as Calculation 1, but with 10 participant outliers removed—these customers were large customers with small expected savings or customers with very large changes in bills.
- Calculation 3: Uses all observations, with the mean-use-per-square-foot compared for participants and nonparticipants.
- Calculation 4: Same as Calculation 3, but with 10 participant outliers removed.

The bill comparison results highlight several factors:

1. The bill comparisons were very sensitive to outliers—the removal of 10 influential sites caused the estimated realization rate to change from 0.02 to 0.94.
2. The estimates had relatively low statistical precision levels—the most significant t-statistic obtained was –5.0, which is much lower than those obtained using the econometric models (discussed later).
3. The comparisons made on a use-per-square-foot basis provided the best statistical results—the influence of large sites was dampened, resulting in a more robust comparison (with outliers removed, the realization rates only change moderately, from 0.59 to 0.72).

As noted above, one primary advantage usually cited for simple bill comparison analysis is that it can be conducted without collecting additional site-specific data, thus lowering performance impact study costs. The results obtained in this performance impact study, however, demonstrate that the comparisons made using only billing data (Comparisons 1 and 2) were inferior to the comparisons that used site-specific data collected through a survey (i.e., the square footage data used in Comparison 3).

Table 3-8
Simple Bill Comparisons—Annualized Temperature-adjusted Consumption

	Participants	Nonparticipants	Difference	t-Statistic
All observations n=	**158**	**189**		
Pre kWh	2,140,279	952,307		
Post kWh	2,137,734	951,632		
Delta kWh	–2,545	–674	–1,871	–0.03
Tracking savings			–83,346	
Realization rate			0.02	
Outliers removed n=	**148**	**189**		
Pre kWh	1,400,259	952,307		
Post kWh	1,322,222	951,632		
Delta kWh	–78,037	–675	–77,362	–2.6
Tracking savings			–82,384	
Realization rate			0.94	
All obs.: use per sqft n=	**158**	**189**		
Pre kWh	22.93	20.63		
Post kWh	21.57	21.02		
Delta kWh	–1.36	0.39	–1.74	–3.9
Tracking savings			–2.94	
Realization rate			0.59	
Outliers removed: use/sqft n=	**148**	**189**		
Pre kWh	22.43	20.63		
Post kWh	20.68	21.02		
Delta kWh	–1.75	0.39	–2.14	–5.0
Tracking savings			–2.97	
Realization rate			0.72	

The bill comparison results in Table 3-8 also show that changes in bills for participants tend to decline by a lesser amount than predicted by the tracking system. The relationship between participant bill changes and expected savings (from the tracking system) is shown graphically in Figure 3-2. The slanting line in the figure indicates points where bill declines equal expected savings. Points below the line indicate bill declines that are greater than expected savings, and points above the line indicate bill declines that are less than expected savings. As shown in the figure, the majority of the points are above the slanting line, indicating that most bill declines

were less than expected savings. This result is generally attributable to two key sources: 1) other factors influencing energy use, and 2) realized savings that are less than expected savings. The use of nonparticipants and statistical models is necessary to control for the other factors to obtain accurate estimates of realized savings.

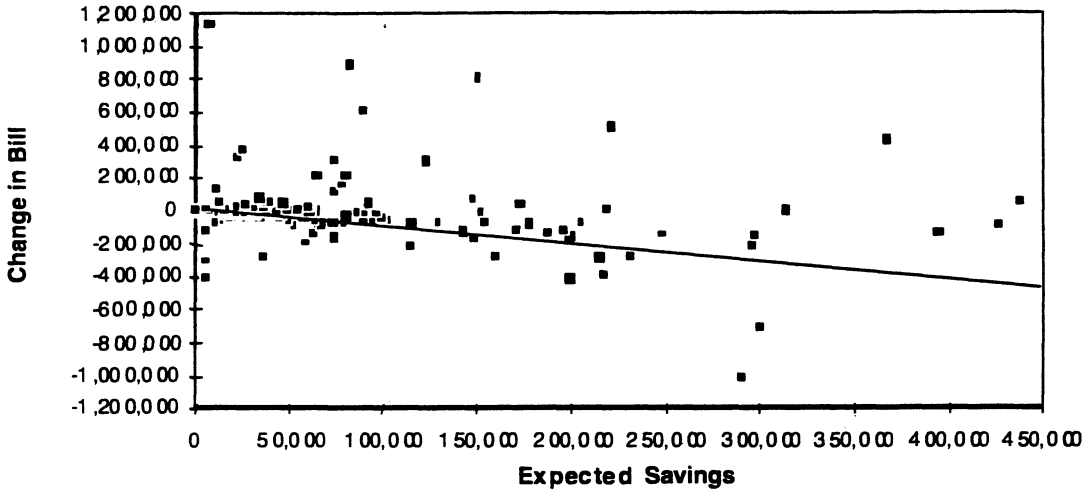

Figure 3-2
Bill Changes vs. Expected Savings (kWh/Year)

Econometric Models

Econometric models provide more flexibility in analyzing program energy savings than do simple bill comparisons. These models incorporate more data into the analysis, including site-specific survey data and program tracking system data. Model variables can be developed to control for non-program factors that cause changes in energy usage and thus confound the estimates of program energy savings. The additional ability to control for non-program factors is important when selection of a well-matched nonparticipant control group is not possible. This is especially true in the heterogeneous commercial sector where no two buildings are exactly alike.

In estimating program-related savings for this study, customer data for the Retrofit Programs were combined for the development of two econometric models:

- A participation decision model, and
- An energy savings model.

The participation model is used to quantify the influential factors in the choice to participate in the programs. The results of the participation model are incorporated into the energy savings model to correct any biases that might result from customers' self-selecting themselves into the programs.

The energy savings model is used to quantify the energy savings attributable to the programs. This model is a multiple linear regression model in which post-retrofit energy use is explained as a function of pre-retrofit energy use, tracking system measure savings estimates, and other key variables explaining changes in energy use (such as changes in floorspace and operating hours). The energy savings model is also referred to as a statistically-adjusted engineering (SAE) model because engineering-based measure savings variables from the program tracking system are used as explanatory variables in the model. In addition, energy savings models that use binary variables as indicators of program participation (that equal 1 for participants and 0 for nonparticipants) were estimated and compared to the results of the SAE models.

Participation Model

A binary discrete choice logit model was specified to implement the participation model. This model is presented and discussed more fully in Appendix D.

The model results indicate that sites with remodels, sites with floorspace increases, and sites in which energy expenditures are an important portion of the total expenditures are more likely to participate in the programs. Multi-tenant sites and sites with declines in business activity were less likely to participate. Another significant distinction between program participants and nonparticipants was that nonparticipants required larger expected bill reductions to induce their participation. Model results also indicate that perceived program inconveniences are a significant deterrent to participation.

Using results of the participation model, a selectivity correction variable was calculated from the estimated probability of participation. The variable was included in the energy savings model to help correct self-selection bias. The rationale for this approach is to view self-selection bias as an omitted variables problem. Self-selection bias will be minimized in the energy savings equation through incorporation of all the variables that characterize program participation (via the self-selection term). Subsequent energy savings modeling indicated that self-selection bias was not a significant factor for the programs under study.

Energy Savings Model

The energy model regression analysis uses a cross-sectional change-in-consumption model specification. Each customer's billing history is divided into three periods: a pre-retrofit period, a blackout period, and a post-retrofit period. The blackout period is chosen to be sufficiently large to ensure that the measure installation occurs within this period. Then pre- and post-retrofit billing data (viewed on an annual basis) are compared as part of the billing analysis. By using this approach, timing of events is not as critical as with models that use monthly time-series data. Customers are usually able to recall the general timing of major facility events but are often unable to pinpoint the exact month of an occurrence.

For the regression models, annual post-retrofit electric consumption per square foot of building is explained as a function of annual pre-retrofit consumption per square foot, a variable or variables identifying program participation, and "other" variables that explain changes in energy consumption. For the analysis, program participation was modeled two different ways.

The first equation, referred to as an SAE model, uses expected energy savings per square foot as the program participation variable. It has the following functional form:

$$kWh/SF_{i,\,Post} = \alpha + \beta_0 \times kWh/SF_{i,\,Pre} + \beta_1 \times Eng/SF_i + \beta_j \times X_{if} + \varepsilon_i$$

where:

$kWh/SF_{i,Post}$	= post-retrofit period consumption for customer *i*
$kWh/SF_{i,Pre}$	= pre-retrofit period consumption for customer *i*
Eng/SF_i	= the engineering-based estimate of rebate program savings from the program tracking system
X_{ij}	= a vector of *j* other explanatory variables explaining changes in consumption
α, β's	= estimated parameters
ε_i	= random error term

The second type of model uses a binary participation variable and a similar functional form:

$$kWh/SF_{i,\,Post} = \alpha + \beta_0 \times kWh/SF_{i,\,Pre} + \beta_1 \times Part_i + \beta_j \times X_{if} + \varepsilon_i$$

The Eng/SF_i variable in the first equation is replaced by *Part*, a binary variable that takes on the value of "1" for program participants and the value of "0" for nonparticipants.

The parameter of interest in these equations is β_1, the coefficient for the program variable. For the first equation that incorporates the tracking system savings estimate, this parameter represents the estimated realization rate, the fraction of tracking system savings realized in customer bills. In the second equation that uses a binary participation variable, the associated parameter represents the estimate of average savings per square foot attributable to the program. This estimate of savings per square foot then can be compared to the estimated savings per square foot calculated using tracking system savings data.

In addition to the program participation variables, "other" explanatory variables were developed from survey data to explain non-program changes in energy consumption. A number of variables were investigated in the modeling process. Variables were included in final specifications based on their statistical significance and the reasonableness of their parameter estimate. Key "other" variables included the presence of an energy manager, increases in building floorspace, additions

of equipment, installation of non-program conservation measures, and site-specific changes in energy use determined during the on-site surveys.

A number of model variations was developed as part of the performance impact study to test the sensitivity of the results to different specifications and to demonstrate the impact of including data from the on-site follow-up surveys. In addition to the inclusion of on-site data, variations explored in the analysis included use of temperature-adjusted and non-temperature-adjusted billing data and the specification of the program participation variable (use of SAE variables and binary program indicator variables). The following models are discussed further below:

Model 1: This model was developed during the preliminary analysis; it does not contain information obtained from the on-site follow-up surveys. Billing data is temperature adjusted, and an SAE model specification is used (i.e., the program tracking system estimates of energy savings are used to explain consumption changes).

Model 2: This model is similar to Model 1, but it includes information from the on-site follow-up surveys to refine variables initially obtained from the telephone survey.

Model 3: This model is similar to Model 2, but it also includes a variable developed from the on-site surveys that explicitly quantifies non-program changes in electricity consumption.

Model 4: This model is similar to Model 3, but it does not use temperature-adjusted billing data. Instead, temperature impacts are incorporated directly into the model using heating and cooling degree day variables.

Model 5: This model is similar to Model 3, but uses binary variables to identify program participation instead of the tracking system savings variables.

Model 6: This model is similar to Model 4, but uses binary participation variables.

Model 7: This model is similar to Model 3, but participants with expected savings of less than two percent of their pre-retrofit bill were excluded from the regression. This model was included to test the sensitivity of results to sites where program savings are so small that they could easily be lost in the general "noise" associated with typical non-program bill variations.

The key modeling results are summarized in Table 3-9, and the preferred model is presented in Table 3-10. (Results for each of the individual models are presented in Appendix E.) The first column in Table 3-9 indicates the model number, as identified above. The second column identifies the type of program participation variable(s) used—either SAE for models using tracking system savings estimates or (0/1) for models using binary participation variables. The third column of the table indicates whether the billing data was temperature-adjusted beforehand. The next four columns present the estimated realization rates and their associated t-statistics (the parameter estimate divided by its standard error). The final column in the table presents the adjusted R^2 for the models. Note that for the models using an SAE specification, two realization rates were estimated: one for lighting measures and one for all other measures. In addition, an

incremental realization rate was estimated for SCL. This rate is added to the lighting and non-lighting realization rates to determine the SCL realization rates. The overall realization rate is a combination of the three parameters, based on their energy savings contribution to total program savings.

Table 3-9
Summary of Modeling Results

			Realization Rates (t-statistics in parentheses)				
Model	**Participation Variable**	**Adjustment of Billing Data**	**Lighting**	**Other**	**SCL Adder**	**OVERALL**	**Adjusted R^2**
Preliminary Results Model, n=332							
1	SAE	Temperature	0.43	0.29	0.45	0.63	0.9932
		Adjusted	(5.5)	(2.4)	(3.4)	(8.3)	
Model Excluding On-site kWh-change Variable, n=347							
2	SAE	Temperature	0.75	0.38	0.22	0.78	0.9715
		Adjusted	(9.4)	(3.2)	(1.5)	(9.0)	
Models Including On-site kWh-change Variable, n=347							
3	SAE	Temperature	0.76	0.54	0.24	0.84	0.9789
		Adjusted	(11.2)	(5.3)	(1.9)	(11.2)	
4	SAE	Not Temp	0.77	0.75	0.05	0.79	0.9714
		Adjusted	(9.7)	(6.3)	(0.3)	(9.0)	
5	0/1	Temperature				0.84	0.9721
		Adjusted				(6.7)	
6	0/1	Not Temp				0.90	0.9642
		Adjusted				(6.2)	
Model Excluding Participants with Savings of Less Than 2%, n=325							
7	SAE	Temperature	0.77	0.54	0.24	0.84	0.9782
		Adjusted	(11.1)	(5.3)	(1.9)	(11.0)	

Primary findings include the following:

- Model 3 provided the best overall results. The R^2 statistic is higher than the other comparable models and the t-statistics for the realization rates are the highest. This model used an SAE specification, temperature-adjusted billing data, and an on-site non-program impact variable.
- The updating of model variables using on-site data has generally improved model performance and increased realization rates (Model 1 vs. Model 2); the lower R^2 in Model 2 results because there is now less total variation in kWh/sqft that was previously attributable to

erroneous floorspace estimates (the root mean square error of the model declined from 6.5 to 3.3 where erroneous floorspace estimates were adjusted based on on-site data).

- The inclusion of the on-site variable that explicitly quantifies non-program impacts considerably improves the model fit and the fit of the program variables (Model 2 vs. Model 3). The on-site variable has a coefficient near 1.0 (0.94) with a high t-statistic (11.8), indicating that the non-program impact estimates from the survey were fairly accurate and fit the billing data well.
- The models that use SAE program impact variables have better fits than the models that use the binary (0/1) program variables—both t-statistics and R^2 are higher for the SAE models (Models 3 and 4 vs. Models 5 and 6).
- The models that use temperature-adjusted billing data have better statistical fits than the models that do not—the two-step modeling approach that uses customer-specific temperature-adjustments appears to better explain variations in bills (Models 3 and 5 vs. Models 4 and 6).
- Realization rates are generally highest for the models using the binary program variables and the unadjusted billing data. Differences between the highest realization rates and the lowest realization rates are not statistically significant, however.
- Models that exclude the low percentage-savings sites are not much different than the models that include all sites (Models 7 vs. Models 3). This is not surprising as the low percentage savings sites generally have little influence on the estimated realization rates. For these sites, savings per square foot are usually small and thus these sites exert little leverage on the analysis.

A review of Model 3 in Table 3-10 indicates the following: pre-retrofit energy usage was a very significant variable and had a parameter estimate near 1.0; the Mills Ratio variable, included to correct for possible self-selection bias, was not significant; all three program savings variables were significant at the 90 percent confidence level; the on-site change variable was very significant and had a parameter estimate near 1.0; the presence of an energy manager tended to exert downward pressure on bills (by 0.41 kWh/sqft on average); floor space increases and equipment additions tended to increase bills (as one would expect); and non-program conservation activities tended to reduce bills by 0.9 kWh/sqft on average.

Table 3-10
Model 3: Preferred Model, Temperature-adjusted SAE with On-site Variable, Dependent Variable: Post retrofit kWh/sqft: Temperature Adjustment

Independent Variable	Parameter Estimate	Standard Error	t-statistic	Probability
Intercept	0.15	0.36	0.4	0.6720
Pre retrofit kWh/sqft	0.99	0.01	122.3	0.0001
Mills ratio	–0.19	0.22	–0.8	0.4076
Lighting kWh savings/sqft	–0.77	0.07	–11.2	0.0001
Other kWh savings/sqft	–0.54	0.10	–5.4	0.0001
SCL kWh savings/sqft	–0.24	0.12	–1.9	0.0561
On-site change: kWh/sqft	0.94	0.08	11.8	0.0001
Energy manager present	–0.41	0.32	–1.3	0.2065
Floorspace increase	1.07	0.61	1.8	0.0804
Added equipment	0.67	0.32	2.1	0.0341
Did other conservation	–0.90	0.54	–1.7	0.0979

n	347
Dependent mean	21.3
Root mean square error	2.8
Adjusted R^2	0.9789

Energy Savings Results

Using results from Model 3 in the previous section, program savings estimates were calculated by multiplying realization rates by the initial energy savings estimates from the program tracking systems. Realization rates, incorporating the SCL adder (discussed above), are summarized in Table 3-11. Realization rates reflect the fraction of tracking system savings that are realized in customer bills. Program savings by end use and program year are presented in Table 3-12. (The miscellaneous category includes envelope, motors, refrigeration, and water heating measures.)

Table 3-11
Energy Savings Realization Rates

End Use	Realization Rate[1]	Standard Error	90% Confidence Interval
Lighting	0.89	0.087	0.73 to 1.01
Other	0.66	0.096	0.50 to 0.82
Overall	0.84	0.075	0.72 to 0.96

[1] Lighting and Other realization rates include the SCL adder discussed in the previous section.

Table 3-12
Program Savings Estimates

Program Year	End Use	Number of Sites[1]	Tracking Savings (MWh)	Realization Rate	Performance Impact Savings (MWh)
1991	Lighting	144	13,111	0.89	11,669
	HVAC	15	693	0.66	457
	Miscellaneous	21	691	0.66	456
	Subtotal	170	14,495	0.87	12,582
1992	Lighting	517	28,307	0.89	25,193
	HVAC	74	5,385	0.66	3,554
	Miscellaneous	79	5,391	0.66	3,558
	Subtotal	626	39,083	0.83	32,305
Totals	Lighting	660	41,418	0.89	36,862
	HVAC	88	6,078	0.66	4,011
	Miscellaneous	100	6,082	0.66	4,014
	Total	792	53,578	0.84	44,887

[1] Totals do not reflect sum of parts due to multiple end use sites and repeat participants.

As Table 3-12 indicates, most of the overall program savings are attributable to lighting measures (comprising 82 percent of total performance impact savings for years 1991 and 1992). Non-lighting savings were split equally between HVAC and miscellaneous measures. In addition, 72 percent of all savings were achieved in the 1992 program year—lighting savings more than doubled and non-lighting savings increased by almost 800 percent.

Using billing data and square footage data collected during the performance impact study, estimates of average savings per square foot and average percentage savings were calculated. These estimates are presented in Table 3-13. On average, program savings were about 2.4 kWh per square foot of and about 19 percent of pre-retrofit annual bills.

Table 3-13
Average[1] Savings Estimates—Performance Impact Sites

End Use	Average Savings per Square Foot (kWh/year)	Percentage Savings
Lighting	1.69	7.4%
HVAC	0.36	1.6%
Miscellaneous	0.33	1.4%
Total	2.38	10.4%

[1] Averages reflect simple averages across all participant sites and are not weighted by customer size. Averages will not necessarily equal total program savings divided by total square feet or total program savings divided by total pre-retrofit kWh usage.

Cost Analysis

Using the results of the performance impact and program tracking data on measure costs, incentives, and expected measure lives, levelized costs of conserved energy were developed for the program (on a mills-per-kWh basis). This cost analysis used the methodology and assumptions provided by BPA (BPA 1993).

For the analysis, the present value of all costs and savings were calculated using a three percent real discount rate. Present-value costs were then divided by present-value kWh savings. Levelized costs were calculated from a regional program perspective (using paid incentives as the measure cost indicator) and from a total regional perspective (using total incremental measure costs), as follows:

$$\text{Levelized regional program costs} = \frac{PV(Incentives + Fixed\_Program\_Costs)}{PV(kWh\_Savings)}$$

$$\text{Levelized total regional costs} = \frac{PV(Incremental\_Costs + Fixed\_Program\_Costs)}{PV(kWh\_Savings)}$$

Adjustments to tracking system costs were required for the total regional cost calculation because the program tracking systems sometimes contained *total* measure costs instead of *incremental* measure costs. Based on discussions with utility staff about the program-imposed relationship between incremental costs and incentive levels, incremental costs were set to the minimum of the total measure cost or 2.5 times the paid incentive.

Fixed program costs include: utility administration costs, BPA administration costs, marketing costs, and training costs. Costs for the program performance impact study, the *Electric Ideas Clearinghouse,* and the *Lighting Design Lab* are not included in the calculations. All included costs are assumed to be financed at BPA's treasury borrowing rate of 8.35 percent for 20 years (which incorporates an assumed inflation rate of four percent). Table 3-14 presents tracking system data that are incorporated into the cost analysis.

Table 3-14
Cost Analysis Data

Number of sites	792
Tracking MWh savings	53,578
Performance impact MWh savings	44,887
Incentive paid ($1,000s)	7,348
Incremental measure costs ($1,000s)	13,315
Utility fixed program costs ($1,000s)	2,373
BPA fixed program costs ($1,000s)	3,941
Average measure lives (Years)	14.8[1]

[1] End-use-specific measure lives averaged 14.7 years for lighting, 16.2 years for HVAC, and 14.1 years for other measures.

Levelized costs were developed separately for lighting measures, HVAC measures, and all other measures (including envelope, refrigeration, motor, and miscellaneous measures). Results are expressed in mills per kWh. Table 3-15 presents levelized costs before and after application of the performance impact realization rates. Costs are disaggregated by cost element in Table 3-16.

Table 3-15
Levelized Costs: Mills per kWh

	Tracking System Results		Performance Impact Results	
End Use	Regional Program Costs[1]	Total Regional Costs[2]	Regional Program Costs[1]	Total Regional Costs[2]
Lighting	23.7	33.9	26.4	37.7
HVAC	27.4	40.3	38.0	55.9
Other	23.8	35.4	39.0	57.9
Total	24.2	34.8	28.3	40.7

[1] Cost is based on incentives paid.
[2] Cost is based on total incremental measure cost.

Table 3-16
Levelized Cost Disaggregation: Mills per kWh

Cost Element	Regional Program Costs[1]	Total Regional Costs[2]
Measure cost per kWh saved	15.2	27.6
Utility fixed program cost	4.9	4.9
BPA fixed program cost	8.2	8.2
Total	28.3	40.7

[1] Cost is based on incentives paid.
[2] Cost is based on total incremental measure cost.

Based on tracking system kWh savings estimates, all end uses showed somewhat similar cost effectiveness results, with lighting achieving the lowest levelized costs, followed closely by the "other" end uses. Incorporation of the performance impact kWh savings estimates cause results to shift somewhat, however. First, levelized costs increased because the realization rates were less than 1.0. Second, the performance impact levelized costs indicate that lighting retrofits had significantly lower costs, both from a regional program and total regional perspective. HVAC measures were the least cost effective. Program-wide levelized costs are significantly influenced by the lighting costs, as lighting comprised more than 80 percent of program savings.

Overall, costs averaged approximately 28 mills per kWh from the regional program perspective (meeting BPA's cost target of 35 mills per kWh) and 41 mills per kWh from the total regional perspective. As Table 3-16 indicates, measure-specific cost is the largest cost component, followed by BPA fixed program cost, and utility program cost.

Results for SCL

Based on a review of the retrofit programs, there was reason to believe that realization rates for SCL might be higher than for the other participating utilities. Three primary factors could contribute to this result:

- SCL has more experience with the retrofit program (having implemented their program earlier than the other utilities) and had extensive commercial retrofit experience in BPA's Commercial Incentive Pilot Program (CIPP);
- SCL sets minimum wattage reduction requirements for retrofits receiving rebates; and
- SCL has incorporated other performance impact findings into their tracking system savings estimates.

Based on this information, an incremental realization rate was estimated for SCL in the econometric billing analysis (see the subsection, "Econometric Models"). This "SCL adder" was estimated to be 0.24 and was statistically significant at the 90 percent confidence level. Using this adder, separate realization rates and savings estimates were developed for SCL. These results are presented below. Table 3-17 shows the SCL realization rates, Table 3-18 presents 1991–1992 program savings, and Table 3-19 shows levelized costs using performance impact savings estimates.

Table 3-17
SCL: Energy Savings Realization Rates

End Use	Realization Rate	Standard Error	90% Confidence Interval
Lighting	1.00	0.133	0.78 to 1.22
Other	0.78	0.125	0.57 to 0.99
Overall	0.95	0.122	0.75 to 1.15

Table 3-18
SCL: Program Savings Estimates

End Use	Number of Sites[1]	Tracking Savings (MWh)	Realization Rate	Performance Impact Savings (MWh)
Lighting	239	21,718	1.00	21,718
HVAC	30	4,409	0.78	3,439
Miscellaneous	21	1,854	0.78	1,446
Total	281	27,981	0.95	26,603

[1] Total does not reflect sum of end uses due to multiple end use sites.

Table 3-19
SCL: Levelized Costs—Mills per kWh

	Tracking System Results		Performance Impact Results	
End Use	Regional Program Costs[1]	Total Regional Costs[2]	Regional Program Costs[1]	Total Regional Costs[2]
Lighting	21.7	30.6	21.7	30.6
HVAC	27.1	41.4	34.7	53.1
Other	29.2	50.7	37.5	65.0
Total	22.9	33.2	24.0	34.9

[1] Cost is based on incentives paid.
[2] Cost is based on total incremental measure cost.

Comparison to Other Northwest Commercial Performance Impact Studies

In the past five years, several performance impact studies have been conducted on the Commercial Incentives Pilot Program (CIPP), which was initiated by BPA in 1986 to demonstrate the feasibility of commercial energy conservation in existing buildings. Under this program, eligible customers were offered financial incentives to install conservation measures. Energy savings results from this current study appear comparable to the performance impact results for the CIPP, even though different performance impact techniques were used in the various studies.

In a study for SCL (Coates, 1994), 124 sites that participated in the CIPP during 1987, 1988, and 1989 averaged savings of 2.2 kWh/sqft, quite similar to this study's finding of 2.4 kWh/sqft. Another study of 16 SCL participants in program years 1987 through 1989 (SBW Consulting et al., 1993) showed that 69 percent of initially predicted savings were realized in the performance

impact study. A study for TPU (Perich-Anderson et al., 1991) on CIPP participants prior to 1989 showed that approximately 69 percent of pre-retrofit savings estimates were realized in customer bills (after excluding outliers). The realization rates of 69 percent found in these two studies are fairly similar to the 84 percent realization rate estimated in this performance impact project. Finally, in a study for BPA (Cambridge Systematics et al., 1990) of CIPP participants through November 1989, program savings were estimated to be approximately 20 percent of customers' pre-retrofit bills, higher than the average per-site savings estimate of 10 percent determined for this study. The lower percentage savings results in this study are most probably due to the inclusion of a few large sites that implemented relatively small projects.

References

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Perich-Anderson, J. and Lerman, D., *Commercial Incentives Pilot Program: Lessons from Three Program Years*, Tacoma Public Utilities, April 1991.

SBW Consulting, Inc., Linda Dethman and Associates, BRACO Energy Services, and Reiter Northwest, *Energy Savings for Outlier Buildings in Commercial Retrofit Programs*, Seattle City Light, May 1993.

A

SURVEY INSTRUMENTS

This appendix contains the telephone and on-site survey instruments used to collect site-specific data for the retrofit evaluation.

The telephone survey was conducting via a CATI (computer-assisted telephone interview) system, and the following survey instruments were adhered to strictly. For the on-site survey, a trained auditor interviewed customers while focusing on site-specific events that caused changes in energy consumption.

The on-site survey instrument was only used as a general guide and a mechanism for recording responses. It was not intended to be a thorough, stand-alone instrument.

The survey instruments are shown in the following order:

- Participant telephone survey questionnaire
- Nonparticipant telephone survey questionnaire
- On-site survey instrument

Participant

Telephone Survey

Questionnaire

Final Questionnaires

Participant Survey

Q10

Hello, my name is _____ from Northwest Research Group, and I'm calling on behalf of

[PRESS ANY KEY TO CONTINUE.]

Q15

May I speak with [CONTACT NAME]
or with someone in your office who is familiar with the operation of your building, particularly as it pertains to your energy use?

1 YES, SPEAK WITH CONTACT PERSON
2 NO, OTHER PERSON FAMILIAR WITH OPERATIONS
[IF PERSON IS DIFFERENT FROM LISTED CONTACT PERSON, UPDATE CONTACT NAME.]

Q20

Are you the best person to speak with regarding your firm's participation in 's [UTILITY NAME]
program to promote energy efficiency by offering incentives for the installation of energy efficiency equipment?

1 YES
2 NO [PROBE FOR PERSON WHO WOULD KNOW ABOUT THE PROGRAM AND ASK TO SPEAK WITH THAT PERSON. IF NOT AVAILABLE, SET UP A CALLBACK. USE CONTROL-END KEYS.]

Q30

[UTILITY NAME]
has begun a research project to study electricity use in commercial buildings.
[UTILITY NAME]
currently works with commercial customers to increase the energy efficiency of buildings. This research project will provide information that will help improve the services provided to commercial customers.

[PRESS ANY KEY TO CONTINUE.]

Q31

Our records indicate that over the past few years, your building has participated in a utility program that pays out incentives to encourage the use of energy efficient equipment. On behalf of [UTILITY NAME] we would like to thank you for your participation.

[PRESS ANY KEY TO CONTINUE.]

Q32

To study the long-term impact of this program, we would like to ask you a number of questions about your energy use. Your responses will be held in strictest confidence.

[PRESS ANY KEY TO CONTINUE.]

Q40
Do you recall participating in [UTILITY NAME]'s energy efficiency incentive program in 1991 or in 1992?

1 YES
2 NO, [PROBE TO SEE IF THERE IS SOMEONE ELSE AT THE BUSINESS WHO IS MORE FAMILIAR WITH THE PROGRAM.
3 NO, PARTICIPATED IN ANOTHER PERIOD.

Q50 IF (KEY = 1)SKIP TO Q65
In this survey, I am interested in energy use at the location where the energy-saving measure(s) for the energy efficiency program were installed. According to our records , the service address is:
[SERVICE ADDRESS]
is this correct?

1 YES
2 NO

Q60
What is the correct address?

Q65 IF (KEY = 2)SKIPTO Q68
Has the function of this building changed significantly since 1990? For example, has it changed from a warehouse to an office or from a retail store to a restaurant?

1 YES
2 NO

Q67 IF (KEY = 1) OR IF (KEY = 90 SKIPTO THANK1)
What was that change?

1 SPECIFY
9 DK / REF

Q68
This survey asks questions about changes in energy use for the past few years at that location.

This series of questions will be used to verify our records on the energy efficiency measures installed at your site.

[PRESS ANY KEY TO CONTINUE.]

Q69
Our records indicate that you have installed the following energy efficiency measure(s) as part of your local utility's energy efficiency program. Please confirm all measures you recall being installed.

[PRESS ANY KEY TO CONTINUE.]

Q70
[ENERGY EFFICIENCY MEASURE]
[IF NECESSARY: Our records indicate that you have installed the following energy efficiency measure(s) as part of your local utility's energy efficiency program. Can you please confirm Whether or not you recall its being installed.]

1 YES
2 NO, NOT INSTALLED
3 NO, OTHER MEASURES
9 DK/REF

Q72
[ENERGY EFFICIENCY MEASURE]
[IF NECESSARY: Our records indicate that you have installed the following energy efficiency measure(s) as part of your local utility's energy efficiency program. Can you please confirm Whether or not you recall its being installed.]

1 YES
2 NO, NOT INSTALLED
3 NO, OTHER MEASURES
9 DK/REF

Q74
[ENERGY EFFICIENCY MEASURE]
[IF NECESSARY: Our records indicate that you have installed the following energy efficiency measure(s) as part of your local utility's energy efficiency program. Can you please confirm Whether or not you recall its being installed.]

1 YES
2 NO, NOT INSTALLED
3 NO, OTHER MEASURES
9 DK/REF

Q76
[ENERGY EFFICIENCY MEASURE]
[IF NECESSARY: Our records indicate that you have installed the following energy efficiency measure(s) as part of your local utility's energy efficiency program. Can you please confirm Whether or not you recall its being installed.]

1 YES
2 NO, NOT INSTALLED
3 NO, OTHER MEASURES
9 DK/REF

Q78
[ENERGY EFFICIENCY MEASURE]
[IF NECESSARY: Our records indicate that you have installed the following energy efficiency measure(s) as part of your local utility's energy efficiency program. Can you please confirm Whether or not you recall its being installed.]

1 YES
2 NO, NOT INSTALLED
3 NO, OTHER MEASURES
9 DK/REF

Q80
Did you install any additional energy efficiency measures as part of your utility's program that we didn't list above?

1 YES [SPECIFY_____]
2 NO
9 DK/REF

Q82 IF (KEY = 1) OR IF (KEY = 9) SKIPTO Q89
Our records indicate that you began the installation of the energy efficiency measures in approximately [START DATE] and completed the installations in approximately [END DATE]

Are these dates generally correct or can you provide a better start and complete dates?

1 YES, GENERALLY CORRECT
2 NO, CAN PROVIDE BETTER START AND COMPLETE DATES
9 DK / REF

Q83
Approximately when did you begin installing the energy efficiency measure(s) discussed above?

ENTER MONTH AND YEAR
01/99 DK/REF

Q84
Approximately when did you complete installing the energy efficiency measure(s) discussed above?

ENTER MONTH AND YEAR
01/99 DK/REF

Q89
The following series of questions cover the general function and operations at your business site.

[PRESS ANY KEY TO CONTINUE.]

Q90
How would you classify the business site?

[PROBE FOR MOST SIGNIFICANT ONE, IF 50/50 HAVE THE RESPONDENT CHOOSE ONE.]

1 RETAIL SALES (eg., DEPARTMENT STORE, NON-FOOD)
2 FOOD/GROCERY MARKET
3 FOOD SERVICE (RESTAURANT / BAR)
4 OFFICE
5 LODGING/HOTELS/MOTELS/NURSING HOMES
6 SCHOOL
7 WAREHOUSE
8 MEDICAL
9 RESIDENCE - APARTMENT BUILDING/CONDOMINIUM COMPLEX
10 OTHER; (SPECIFY)
99 DK/REF

Q100
Do you or the company you represent own or lease this facility?

1 OWN
2 LEASE
9 DK/REF

Q110
Is there a single business or multiple businesses at this site?

1 SINGLE BUSINESS
2 MULTIPLE BUSINESSES
9 DK/REF

Q120 (IF KEY = 2) SKIPTO Q140
Are you an occupant at this site or do you manage the facility for other businesses or both?

1 OCCUPANT AT THIS SITE
2 MANAGE THE FACILITY FOR OTHER BUSINESSES
3 OCCUPANT AND MANAGE FACILITY FOR OTHER BUSINESSES
4 OTHER
9 DK/REF

Q130
When did your business move into this location?

ENTER MONTH AND YEAR
01/99 DK/REF

Q140 (IF KEY > 1) SKIPTO Q170
Has there been a significant change in tenants since January 1990

1 YES
2 NO
3 NOT APPLICABLE
9 DK/REF

Q150
When was the first change?

ENTER MONTH AND YEAR
01/99 DK/REF

Q155
Approximately what percent of your building's occupants changed at this time?

ENTER PERCENTAGE
999 DK/REF

Q160
When was the next change?
[IF NECESSARY: in tenants since January 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF
01/97 NO NEXT CHANGE

Q165
Approximately what percent of your building's occupants changed at this time?

ENTER PERCENTAGE
999 DK/ REF

Q170 (IF KEY > 1) SKIPTO Q190
Has this facility been significantly remodeled since January 1990?

1 YES
2 NO
9 DK/REF

Q175
When did this remodel take place?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q180
Did you install your program-related energy efficiency measures at the time of the remodel?

1 YES
2 NO
9 DK/REF

Q190
What is the approximate floor space at this site (in square feet)?

ENTER NUMBER OF SQUARE FEET
999999 DK/REF

Q200 (IF KEY > 1) SKIPTO Q230
Since January 1990, has the amount of floor space occupied at this site changed significantly?

1	YES
2	NO
9	DK / REF

Q210
Did it increase or decrease?

1	INCREASED
2	DECREASED
9	DK/REF

Q220
What was the approximate floor space in 1990?

	ENTER NUMBER OF SQUARE FEET
999999	DK/REF

Q230
Approximately how many hours does your business operate each week? (Hours of operation include periods when someone is generally in the building -- excluding security guards and janitors.)

	ENTER NUMBER OF HOURS PER WEEK
999	DK/REF

Q240 (IF KEY > 1) SKIPTO Q270
Since January 1990, have there been any significant changes in the hours of operation at this site?

1	YES
2	NO
9	DK / REF

Q250
Did they increase or decrease?

1	INCREASED
2	DECREASED
9	DK/REF

Q260
What were the approximate weekly hours of operation in 1990?

	ENTER NUMBER OF HOURS PER WEEK
999	DK/REF

Q270
What is the approximate number of employees and/or occupants at this site?

	ENTER NUMBER OF EMPLOYEES / OCCUPANTS
99998	99998 OR MORE
99999	DK/REF

Q280 (IF KEY > 1) SKIPTO Q310
Have the number of employees and/or occupants at this site changed significantly since January 1990?

1	YES
2	NO
9	DK / REF

Q290
Was this an increase or decrease?

1	INCREASE
2	DECREASE
9	DK/REF

Q300
Approximately how many total employees/occupants were at this site in 1990?

	ENTER NUMBER OF EMPLOYEES / OCCUPANTS
99999	DK/REF

Q310 (IF KEY > 1) SKIPTO Q330
Have there been any temporary business shutdowns at this site since January 1990?

(IF NECESSARY): By temporary business shutdown we mean a shutdown that is not part of your normal business operations.

1	YES
2	NO
9	DK/ REF

Q320
Approximately when was this shutdown?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

	ENTER MONTH AND YEAR
01/99	DK/REF

Q330
How well did the business or other activity at this facility do in the last year compared to 1990 and 1991, would you say it did Much better, Somewhat better, about the same, Somewhat worse or Much worse

1	MUCH BETTER
2	SOMEWHAT BETTER
3	ABOUT THE SAME
4	SOMEWHAT WORSE
5	MUCH WORSE
7	NOT APPLICABLE
9	DK/REF

Q340 (IF KEY > 1) SKIPTO Q360
The next series of questions relate to energy efficiency improvements and changes in equipment other than those made as part of the utility program.

Other than through participation in your local electric utility's energy efficiency program, has your facility been involved in any other energy efficiency improvements since January 1990?

(IF NECESSARY): Examples include installing insulation, installing more efficient equipment, making improvements to the building, installing an energy management system, installing lighting controls, etc.)

1	YES
2	NO
9	DK/REF

Q349
Please specify what energy efficiency improvements have been made.

Q350
Approximately when were they made.
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER YEAR AND MONTH
01/99 DK/REF

Q351
Please specify any other energy efficiency improvements which have been made since January 1990.

[PRESS ENTER IF NO OTHER ENERGY EFFICIENCY IMPROVEMENTS HAVE BEEN MADE]

Q352
Approximately when were they made.
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER YEAR AND MONTH
01/99 DK/REF

Q353
Please specify any other energy efficiency improvements which have been made since January 1990.

[PRESS ENTER IF NO OTHER ENERGY EFFICIENCY IMPROVEMENTS HAVE BEEN MADE]

Q354
Approximately when were they made.
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER YEAR AND MONTH
01/99 DK/REF

Q355
Were these improvements made on your own, or through some conservation program other than the one provided by your local electric utility?

1 Improvements made on our own
2 Improvement were part of another program
(Specify_____)
3 Some improvements on our own, some as part of another program
9 DK/REF

Q360 (IF KEY > 1) SKIPTO Q380
Has your facility participated in any additional energy efficiency programs other than those discussed thus far?

1 YES
2 NO
9 DK / REF

Q370
What was the name of the program?

Q380 (IF KEY > 1) SKIPTO Q440
Does your facility have a space heating system?

1 YES
2 NO
9 DK / REF

Q390
What is the primary space heating fuel at your facility?

1 ELECTRICITY
2 NATURAL GAS
3 OTHER
9 DK / REF

Q400 (IF KEY > 1) SKIPTO Q440
Have you installed or made any significant changes to your primary heating system since January 1990?

1 YES
2 NO
9 DK / REF

Q410 (IF KEY > 1) SKIPTO Q412
Did you replace an old heating system?
[IF NECESSARY: since January 1990?.]

1 YES
2 NO
9 DK/REF

Q411
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q412 (IF KEY > 1) SKIPTO Q414
Did you add an additional heating system?
[IF NECESSARY: since January 1990?.]

1 YES
2 NO
9 DK/REF

Q413
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q414 (IF KEY > 1) SKIPTO Q415
Did you change heating fuels?
[IF NECESSARY: since January 1990?.]

1 YES
2 NO
9 DK/REF

Q416
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q420
What was the prior heating fuel?

1 ELECTRICITY
2 NATURAL GAS
3 OTHER
9 DK/REF

Q425
Did you make any other changes not previously mentioned?
[PROMPT IF NECESSARY: To your primary heating system since January 1990.]

1 YES [SPECIFY_____]
2 NO
9 DK/REF

Q430
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR

Q440 (IF KEY > 1) SKIPTO Q480
Does this facility have a space cooling (air conditioning) system?

1 YES
2 NO
9 DK / REF

Q450 (IF KEY > 1) SKIPTO Q480
Have you installed or made any significant changes to your primary cooling system since January 1990?

1 YES
2 NO
9 DK / REF

Q460 (IF KEY > 1) SKIPTO Q462
Did you replace an old cooling system?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK/REF

Q461
When was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q462 (IF KEY > 1) SKIPTO Q464
Did you add an additional cooling system?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK/REF

Q463
When was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q464 (IF KEY = 2) SKIPTO Q480
Did you make any other changes?
[PROMPT IF NECESSARY: To your primary cooling system since January 1990.]

1 YES [SPECIFY_____]
2 NO
9 DK/REF

Q470
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF]

Q480 (IF KEY > 1) SKIPTO Q520
Does this facility have a refrigeration system?

1 YES
2 NO
9 DK/REF

Q490 (IF KEY > 1) SKIPTO Q520
Have you installed or made any significant changes to your refrigeration system since January 1990?

1 YES
2 NO
9 DK / REF

Q500 (IF KEY = 1) SKIPTO Q510
Did you replace an old refrigeration system?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK/REF

Q501 (IF KEY = 1) SKIPTO Q510
Did you add an additional refrigeration system?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK / REF

Q502 (IF KEY = 2) SKIPTO Q520
Did you make any other changes?
[PROMPT IF NECESSARY: To your refrigeration system since January 1990.]

1 YES [SPECIFY_____]
2 NO
9 DK/REF

Q510
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q520 (IF KEY > 1) SKIPTO Q550
Have there been any significant changes to your lighting system since January 1990?

1 YES
2 NO
9 DK / REF

Q530
Did you replace a old lighting system?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK / REF

Q531
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q532 (IF KEY > 1) SKIPTO Q534
Did you add an additional lighting system?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK/REF

Q533
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q534 (IF KEY = 2) SKIPTO Q550
Did you make any other changes?
[PROMPT IF NECESSARY: To your lighting system since January 1990.]

1 YES [SPECIFY_____]
2 NO
9 DK/REF

Q540
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q550 (IF KEY > 1) SKIPTO Q610
Does this facility have a water heating system?

1 YES
2 NO
9 DK/REF

Q560
What is the primary water heating fuel at your facility?

1 ELECTRICITY
2 NATURAL GAS
3 OTHER
9 DK/REF

Q570 (IF KEY > 1) SKIPTO Q610
Have you installed or made any significant changes to your primary water heating system since January 1990?

1 YES
2 NO
9 DK/REF

Q580 (IF KEY > 1) SKIPTO Q582
Did you replace an old water heating system?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK/REF

Q581
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q582 (IF KEY > 1) SKIPTO Q584
Did you add an additional water heating system?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK / REF

Q583
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q584 (IF KEY > 1) SKIPTO Q585
Did you change water heating fuels?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK / REF

Q586 (IF KEY > 1) SKIPTO Q610
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q590
What was the prior water heating fuel?

1 ELECTRICITY
2 NATURAL GAS
3 OTHER
9 DK/REF

Q585
Did you make any other changes?
[PROMPT IF NECESSARY: To your primary water heating system since January 1990.]

1 YES [SPECIFY_____]
2 NO

Q600
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q610
Have you removed any old energy using equipment since January 1990?

1 YES [SPECIFY_____]
2 NO
9 DK/REF

Q620
Since January 1990, have you discontinued certain activities that use energy?

1 YES [SPECIFY_____]
2 NO
9 DK / REF

Q630
Have you added any new energy using equipment, such as office equipment, or activities not already discussed since January 1990?

1 YES [SPECIFY_____]
2 NO
9 DK / REF

Q640
Can you think of any additional factors not already discussed that have significantly changed your energy consumption since January 1990?

1 YES [SPECIFY_____]
2 NO
9 DK/REF

Q650 (IF KEY > 1) SKIPTO Q660
We have a few more general questions that relate to the management of your company's energy usage.

Does this facility have someone who is specifically responsible for managing the energy use of the facility?
[PROBE: FOR THE PERSON SPECIFICALLY RESPONSIBLE.]

1 YES
2 NO
9 DK / REF

Q655 (IF KEY > 1) SKIPTO Q660
How long has this position been a normal part of your company?

1 UNDER 2 YEARS
2 2 - 5 YEARS
3 5 - 10 YEARS
4 OVER 10 YEARS
9 DK/REF

Q660
On a scale of 1 to 5, where 1 is not at all important and 5 is very important, how important are this facility's energy expenditures compared to other operating expenses at this facility?

1 NOT AT ALL IMPORTANT
2
3
4
5 VERY IMPORTANT
9 DK/REF

Q670 (IF KEY > 1) SKIPTO Q690

When you decided to participate in your local electric utility's energy efficiency program, what percentage of savings did you expect to receive from the measures installed, in terms of your facilities energy bill?

1 0 - 5%
2 6 - 10%
3 11 - 15%
4 16 - 25%
5 OVER 25%
9 DK/REF

Q680

As far as you know, were these expectations exceeded, generally met or not met?

1 EXCEEDED
2 GENERALLY MET
3 NOT MET
9 DK/REF

Q690

If your facility were to spend $1000 on energy saving devices, approximately what reduction to your annual energy bill would be required?

1 $200 OR LESS
2 $200 - $500
3 $500 - $1000
4 $1000 - $1500
5 $1500 - $2000
6 $2000 OR MORE
9 DK/REF

Q700

When you first considered the possibility of participating in the program, how much time and effort did you think it would take on your part, Less than 10 hours, 10 to 20 hours, 20 to 30 hours, 30 to 40 hours, 40 to 50 hours or Over 50 hours ?

1 LESS THAN 10 HOURS
2 10 TO 20 HOURS
3 20 TO 30 HOURS
4 30 TO 40 HOURS
5 40 TO 50 HOURS
6 OVER 50 HOURS
9 DK/REF

Q710

Did you think that arranging your schedule to do the paperwork for the program and to satisfy any other program requirements would pose no difficulty, minor difficulty or major inconvenience?

1 NO DIFFICULTY
2 MINOR DIFFICULTY
3 MAJOR INCONVENIENCE
9 DK/REF

Q719

Please rate the importance of the following factors in influencing your decision to participate in the Energy Efficiency Program, where 1 means not important and 5 means very important.

[PRESS ANY KEY TO CONTINUE.]

Q720
Expected reduction in bill?

[PROMPT AS NECESSARY: On a scale of 1 to 5, where 1 means not important and 5 means very important, how important was this factor in influencing your decision to participate in the Energy Efficiency Program.]

1	NOT IMPORTANT
2	
3	
4	
5	VERY IMPORTANT
9	DK/REF

Q730
Potential changes in comfort?

[PROMPT AS NECESSARY: On a scale of 1 to 5, where 1 means not important and 5 means very important, how important was this factor in influencing your decision to participate in the Energy Efficiency Program.]

1	NOT IMPORTANT
2	
3	
4	
5	VERY IMPORTANT
9	DK/REF

Q740
Simply to be as energy efficient as possible?

[PROMPT AS NECESSARY: On a scale of 1 to 5, where 1 means not important and 5 means very important, how important was this factor in influencing your decision to participate in the Energy Efficiency Program.]

1	NOT IMPORTANT
2	
3	
4	
5	VERY IMPORTANT
9	DK/REF

Q750
Easy to make improvements because other construction / remodeling undertaken at same time ?

[PROMPT AS NECESSARY: On a scale of 1 to 5, where 1 means not important and 5 means very important, how important was this factor in influencing your decision to participate in the Energy Efficiency Program.]

1	NOT IMPORTANT
2	
3	
4	
5	VERY IMPORTANT
9	DK/REF

Q760
Corporate image?

[PROMPT AS NECESSARY: On a scale of 1 to 5, where 1 means not important and 5 means very important, how important was this factor in influencing your decision to participate in the Energy Efficiency Program.]

1 NOT IMPORTANT
2
3
4
5 VERY IMPORTANT
9 DK/REF

Q770
Concern for the environment?

[PROMPT AS NECESSARY: On a scale of 1 to 5, where 1 means not important and 5 means very important, how important was this factor in influencing your decision to participate in the Energy Efficiency Program.]

1 NOT IMPORTANT
2
3
4
5 VERY IMPORTANT
9 DK/REF

THANK1
Thank you for your time. That's all the questions we have for you.

[PRESS ANY KEY TO END INTERVIEW.]

This concludes the survey. Thank you for your cooperation.

[PRESS ANY KEY TO CONTINUE.]

Nonparticipant

Telephone Survey

Questionnaire

Non-Participant Survey

Q10
Hello, my name is _____ from Northwest Research Group,
a local market research firm.
[PRESS ANY KEY TO CONTINUE.]

Q11
Today we are calling on behalf of (LOCAL ELECTRIC UTILITY).

[PRESS ANY KEY TO CONTINUE]

Q20
Are you the best person to speak to regarding your firm's energy use?

1 YES
2 NO [PROBE FOR PERSON WHO WOULD KNOW ABOUT THE BUILDING'S ENERGY USE AND ASK TO SPEAK WITH THAT PERSON. IF NOT AVAILABLE, SET UP A CALLBACK. USE CONTROL-END KEYS.]

Q30
[UTILITY NAME]
has begun a research project to study electricity use in commercial buildings.
[UTILITY NAME]
currently works with commercial customers to increase the energy efficiency of buildings. This research project will provide information that will help improve the services provided to commercial customers.

To study energy usage patterns, we would like to ask you a number of questions about your business's energy use. Your responses will be held in strictest confidence.

[PRESS ANY KEY TO CONTINUE.]

Q35 IF (KEY = 1) SKIPTO Q50
According to our records, the business at this address is:
Is this correct?

1 YES
2 NO

Q40 IF (KEY = 2) SKIPTO THANK1
Is only the name of the business different or changed, or has the type of business changed?

1 NAME CHANGE ONLY [ENTER THE NEW NAME]
2 DIFFERENT BUSINESS [TERMINATE.]

Q50 IF (KEY = 1)SKIPTO Q65
According to our records , the service address is:
[ADDRESS]
is this correct?

1 YES
2 NO

Q60
What is the correct address

Q65 IF (KEY = 1) SKIPTO THANK2
Has your building/site changed its function since 1990? For example, has it changed from a warehouse to an office or from a retail store to a restaurant?

1 YES [TERMINATE.]
2 NO

Q70 IF (KEY = 2)SKIPTO Q89
IF (KEY = 9)SKIPTO Q89
Are you aware of your local electric utility's program that provides cash incentives for installing energy-saving measures such as energy-efficient lighting and ceiling insulation?

1 YES
2 NO
9 DK/REF

Q75 IF (Q75 > 1) SKIPTO Q89
Has your firm ever participated in this program?

1 YES
2 NO
9 DK / REF

Q80
Approximately when did you participate?
[NOTE: WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q85
What energy efficient measures did you install?

Q89
The following series of questions cover the general function and operations at your business site.

[PRESS ANY KEY TO CONTINUE.]

Q90
How would you classify the business site?

[PROBE FOR MOST SIGNIFICANT ONE, IF 50/50 HAVE THE RESPONDENT CHOOSE ONE.]

1 RETAIL SALES (eg., DEPARTMENT STORE, NON-FOOD)
2 FOOD/GROCERY MARKET
3 FOOD SERVICE (RESTAURANT / BAR)
4 OFFICE
5 LODGING/HOTELS/MOTELS/NURSING HOMES
6 SCHOOL
7 WAREHOUSE
8 MEDICAL
9 RESIDENCE - APARTMENT BUILDING/CONDOMINIUM COMPLEX
10 OTHER; (SPECIFY)
99 DK/REF

Q100
Do you or the company you represent own or lease this facility?

1 OWN
2 LEASE
9 DK/REF

Q110
Is there a single business or multiple businesses at this site?

1 SINGLE BUSINESS
2 MULTIPLE BUSINESSES
9 DK/REF

Q120 IF (KEY = 2)SKIPTO Q140
Are you an occupant at this site or do you manage the facility for other businesses or both?

1 OCCUPANT AT THIS SITE
2 MANAGE THE FACILITY FOR OTHER BUSINESSES
3 OCCUPANT AND MANAGE FACILITY FOR OTHER BUSINESSES
9 DK/REF

Q130
When did your business move into this location?

ENTER MONTH AND YEAR
01/99 DK/REF

Q140 IF (KEY > 1)SKIPTO Q170
Has there been a significant change in tenants since January 1990

1 YES
2 NO
3 NOT APPLICABLE
9 DK/REF

Q150
When was the first change?
[IF NECESSARY: in tenants since January 1990.]
[NOTE: WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]

ENTER MONTH AND YEAR
01/99 DK/REF

Q155
Approximately what percent of your building's occupants changed at this time?

ENTER PERCENTAGE
999 DK/REF

Q160
When was the next change?

ENTER MONTH AND YEAR
01/99 DK/REF
01/97 NO NEXT CHANGE (SKIP TO Q170)

Q165
Approximately what percent of your building's occupants changed at this time?

ENTER PERCENTAGE
999 DK/ REF

Q170 IF (KEY > 1)SKIPTO Q190
Has this facility been significantly remodeled since January 1990?

1 YES
2 NO
9 DK/REF

Q175
When did this remodel take place?
[NOTE: WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q190
What is the approximate floor space at this site (in square feet)?

ENTER NUMBER OF SQUARE FEET
999999 DK/REF

Q200 IF (KEY > 1)SKIPTO Q230
Since January 1990, has the amount of floor space occupied at this site changed significantly?

1 YES
2 NO
9 DK / REF

Q210
Did it increase or decrease?

1 INCREASED
2 DECREASED
9 DK/REF

Q220
What was the approximate floor space in 1990?

ENTER NUMBER OF SQUARE FEET
999999 DK/REF

Q230
Approximately how many hours does your business operate each week? (Hours of operation include periods when someone is generally in the building -- excluding security guards and janitors.)

ENTER NUMBER OF HOURS PER WEEK
999 DK/REF

Q240 IF (KEY > 1)SKIPTO Q270
Since January 1990, have there been any significant changes in the hours of operation at this site?

1 YES
2 NO
9 DK / REF

Q250
Did they increase or decrease?

1 INCREASED
2 DECREASED
9 DK/REF

Q260
What were the approximate weekly hours of operation in 1990?

ENTER NUMBER OF HOURS PER WEEK
999 DK/REF

Q270
What is the approximate number of employees and/or occupants at this site?

ENTER NUMBER OF EMPLOYEES / OCCUPANTS
99998 99998 OR MORE
99999 DK/REF

Q280 IF (KEY > 1)SKIPTO Q310

Have the number of employees and/or occupants at this site changed significantly since January 1990?

1 YES
2 NO
9 DK / REF

Q290

Was this an increase or decrease?

1 INCREASE
2 DECREASE
9 DK/REF

Q300

Approximately how many total employees/occupants were at this site in 1990?

ENTER NUMBER OF EMPLOYEES / OCCUPANTS
99999 DK/REF

Q310 IF (KEY > 1)SKIPTO Q330

Have there been any temporary business shutdowns at this site since January 1990?
(IF NECESSARY): By temporary business shutdown we mean a shutdown that is not part of your normal business operations.

1 YES
2 NO
9 DK/ REF

Q320

Approximately when was this shutdown?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q330

How well did the business or other activity at this facility do in the last year compared to 1990 and 1991, would you say it did Much better, Somewhat better, about the same, Somewhat worse or Much worse

1 MUCH BETTER
2 SOMEWHAT BETTER
3 ABOUT THE SAME
4 SOMEWHAT WORSE
5 MUCH WORSE
7 NOT APPLICABLE
9 DK/REF

Q340 IF (KEY > 1)SKIPTO Q360

The next series of questions relate to energy efficiency improvements and changes in equipment.

Has your facility been involved in any other energy efficiency improvements since January 1990?

(IF NECESSARY): Examples include installing insulation, installing more efficient equipment, making improvements to the building, installing an energy management system, installing lighting controls, etc.)

1 YES
2 NO
9 DK/REF

Q349
Please specify what energy efficiency improvements have been made.

Q350
Approximately when were they made.
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER YEAR AND MONTH
01/99 DK/REF

Q351
Please specify any other energy efficiency improvements which have been made since January of 1992
[PRESS ENTER IF NO OTHER ENERGY EFFICIENCY IMPROVEMENTS HAVE BEEN MADE

Q352
Approximately when were they made.
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER YEAR AND MONTH
01/99 DK/REF

Q353
Please specify any other energy efficiency improvements which have been made since January of 1992
[PRESS ENTER IF NO OTHER ENERGY EFFICIENCY IMPROVEMENTS HAVE BEEN MADE

Q354
Approximately when were they made.
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER YEAR AND MONTH
01/99 DK/REF

Q355
Were these improvements made on your own, or through some conservation program other than the one provided by your local electric utility?

1 Improvements made on our own
2 Improvement were part of another program (Specify_____)
3 Some improvements on our own, some as part of another program
4 other
9 DK/REF

Q360 IF (KEY > 1)SKIPTO Q380
Has your facility participated in any additional energy efficiency programs other than those discussed thus far?

1 YES
2 NO
9 DK / REF

Q370
What was the name of the program?

Q380 IF (KEY > 1)SKIPTO Q440
Does your facility have a space heating system?

1 YES
2 NO
9 DK / REF

Q390
What is the primary space heating fuel at your facility?

1 ELECTRICITY
2 NATURAL GAS
3 OTHER
9 DK / REF

Q400 IF (KEY > 1)SKIPTO Q440
Have you installed or made any significant changes to your primary heating system since January 1990?

1 YES
2 NO
9 DK / REF

Q410 IF (KEY > 1)SKIPTO Q412

Did you replace an old heating system?
[IF NECESSARY: since January 1990?.]
1 YES
2 NO
9 DK/REF

Q411
What was the approximate date of the change?
[NOTE: WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q412 IF (KEY > 1)SKIPTO Q414

Did you add an additional heating system?
[IF NECESSARY: since January 1990?.]

1 YES
2 NO
9 DK/REF

Q413
What was the approximate date of the change?
[NOTE: WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q414 IF (KEY > 1)SKIPTO Q415

Did you change heating fuels?
[IF NECESSARY: since January 1990?.]

1 YES
2 NO
9 DK/REF

Q416
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q420
What was the prior heating fuel?

1 ELECTRICITY
2 NATURAL GAS
3 OTHER
9 DK/REF

Q415
Did you make any other changes not previously mentioned?
[PROMPT IF NECESSARY: To your primary heating system since January 1990.]

1 YES [SPECIFY_____]
2 NO
3 DK/REF

Q430
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q440 IF (KEY > 1)SKIPTO Q480
Does this facility have a space cooling (air conditioning) system?

1 YES
2 NO
9 DK / REF

Q450 IF (KEY > 1) SKIPTO Q480
Have you installed or made any significant changes to your primary cooling system since January 1990?

1 YES
2 NO
9 DK / REF

Q460 IF (KEY > 1)SKIPTO Q462
Did you replace an old cooling system?
[IF NECESSARY: since January 1990?.]
1 YES
2 NO
9 DK/REF

Q461
When was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q462 IF (KEY > 1)SKIPTO Q464
Did you add an additional cooling system?
[IF NECESSARY: since January 1990?.]

1 YES
2 NO
9 DK/REF

Q463
When was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q464 IF (KEY = 2)SKIPTO Q480
Did you make any other changes?
[PROMPT IF NECESSARY: To your primary cooling system since January 1990.]

1 YES [SPECIFY_____]
2 NO
3 DK/REF

Q470
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q480 IF (KEY > 1)SKIPTO Q520
Does this facility have a refrigeration system?
1 YES
2 NO
9 DK/REF

Q490 IF (KEY > 1)SKIPTO Q520
Have you installed or made any significant changes to your refrigeration system since January 1990?
1 YES
2 NO
9 DK / REF

Q500 IF (KEY = 1)SKIPTO Q510
Did you replace an old refrigeration system?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK/REF

Q501 IF (KEY = 1)SKIPTO Q510
Did you add an additional refrigeration system?
[IF NECESSARY: since January 1990?.]

1 YES
2 NO
9 DK / REF

Q502 IF (KEY = 2)SKIPTO Q520
Did you make any other changes?
[PROMPT IF NECESSARY: To your refrigeration system since January 1990.]

1 YES [SPECIFY_____]
2 NO
3 DK/REF

Q510
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q520 IF (KEY > 1)SKIPTO Q550
Have there been any significant changes to your lighting system since January 1990?

1 YES
2 NO
9 DK / REF

Q530 IF (KEY > 1)SKIPTO Q532
Did you replace a old lighting system?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK / REF

Q531
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q532 IF (KEY > 1)SKIPTO Q534
Did you add an additional lighting system?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK/REF

Q533
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q534 IF (KEY = 2)SKIPTO Q550
Did you make any other changes?
[PROMPT IF NECESSARY: To your lighting system since January 1990.]

1 YES [SPECIFY_____]
2 NO

Q540
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q550 IF (KEY > 1)SKIPTO Q610
Does this facility have a water heating system?

1 YES
2 NO
9 DK/REF

Q560
What is the primary water heating fuel at your facility?

1 ELECTRICITY
2 NATURAL GAS
3 OTHER
9 DK/REF

Q570 IF (KEY > 1)SKIPTO Q610
Have you installed or made any significant changes to your primary water heating system since January 1990?

1 YES
2 NO
9 DK/REF

Q580 IF (KEY > 1) SKIPTO Q582
Did you replace an old water heating system?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK/REF

Q581
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q582 IF (KEY > 1)SKIPTO Q584
Did you add an additional water heating system?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK / REF

Q583
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q584 IF (KEY > 1)SKIPTO Q585
Did you change water heating fuels?
[IF NECESSARY: since January 1990?]

1 YES
2 NO
9 DK / REF

Q586
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q590
What was the prior water heating fuel?

1 ELECTRICITY
2 NATURAL GAS
3 OTHER
9 DK/REF

Q585 IF (KEY = 2)SKIPTO Q610
Did you make any other changes?
[PROMPT IF NECESSARY: To your primary water heating system since January 1990.]

1 YES [SPECIFY_____]
2 NO

Q600
What was the approximate date of the change?
[NOTE : WILL ONLY ACCEPT A DATE FROM JANUARY 1990.]
ENTER MONTH AND YEAR
01/99 DK/REF

Q610
Have you removed any old energy using equipment since January 1990?

1 YES [SPECIFY_____]
2 NO
9 DK/REF

Q620
Since January 1990, have you discontinued certain activities that use energy?

1 YES [SPECIFY_____]
2 NO
9 DK / REF

Q630
Have you added any new energy using equipment, such as office equipment, or activities not already discussed since January 1990?

1 YES [SPECIFY_____]
2 NO
9 DK / REF

Q640
Can you think of any additional factors not already discussed that have significantly changed your energy consumption since January 1990?

1 YES [SPECIFY_____]
2 NO
9 DK/REF

Q650 IF (KEY > 1)SKIPTO Q660
We have a few more general questions that relate to the management of your company's energy usage.

Does this facility have someone who is specifically responsible for managing the energy use of the facility?
[PROBE : FOR PERSON SPECIFICALLY RESPONSIBLE.]
1 YES
2 NO
9 DK / REF

Q655 IF (KEY = 9)SKIPTO Q660
How long has this position been a normal part of your company?

1 UNDER 2 YEARS
2 2 - 5 YEARS
3 5 - 10 YEARS
4 OVER 10 YEARS
9 DK/REF

Q660
On a scale of 1 to 5, where 1 is not at all important and 5 is very important, how important are this facility's energy expenditures compared to other operating expenses at this facility?

1 NOT AT ALL IMPORTANT
2 NOT IMPORTANT
3 NEITHER
4 IMPORTANT
5 VERY IMPORTANT
9 DK/REF

Q670 IF (KEY = 9)SKIPTO Q690
If you were to participate in your local electric utility's energy efficiency program, what percentage of savings did you expect to receive from the measures installed, in terms of your facilities energy bill?

1 0 - 5%
2 6 - 10%
3 11 - 15%
4 16 - 25%
5 OVER 25%
9 DK/REF

Q690

If your facility were to spend $1000 on energy saving devices, approximately what reduction to your annual energy bill would be required?

1 $200 OR LESS
2 $200 - $500
3 $500 - $1000
4 $1000 - $1500
5 $1500 - $2000
6 $2000 OR MORE
9 DK/REF

Q700

If you were to participate in a utility-sponsored energy efficiency program, how much time and effort do you think it would take on your part, Less than 10 hours, 10 to 20 hours, 20 to 30 hours, 30 to 40 hours, 40 to 50 hours or Over 50 hours ?

1 LESS THAN 10 HOURS
2 10 TO 20 HOURS
3 20 TO 30 HOURS
4 30 TO 40 HOURS
5 40 TO 50 HOURS
6 OVER 50 HOURS
9 DK/REF

Q710

Do you think that arranging your schedule to do the paperwork for the program and to satisfy any other program requirements would pose no difficulty, minor difficulty or major inconvenience?

1 NO DIFFICULTY
2 MINOR DIFFICULTY
3 MAJOR INCONVENIENCE
9 DK/REF

Q719

Please rate the importance of the following factors in influencing your decision to participate in the Energy Efficiency Program, where 1 means not important and 5 means very important.

[PRESS ANY KEY TO CONTINUE.]

Q720

Expected reduction in bill?
[PROMPT AS NECESSARY: On a scale of 1 to 5, where 1 means not important and 5 means very important, how important was this factor in influencing your decision to participate in the Energy Efficiency Program.]

1 NOT IMPORTANT
2
3
4
5 VERY IMPORTANT
9 DK/REF

Q730

Potential changes in comfort?
[PROMPT AS NECESSARY: On a scale of 1 to 5, where 1 means not important and 5 means very important, how important was this factor in influencing your decision to participate in the Energy Efficiency Program.]

1 NOT IMPORTANT
2
3
4
5 VERY IMPORTANT
9 DK/REF

Q740
Simply to be as energy efficient as possible?
[PROMPT AS NECESSARY: On a scale of 1 to 5, where 1 means not important and 5 means very important, how important was this factor in influencing your decision to participate in the Energy Efficiency Program.]

1 NOT IMPORTANT
2
3
4
5 VERY IMPORTANT
9 DK/REF

Q750
Easy to make improvements because other construction / remodeling undertaken at same time ?
[PROMPT AS NECESSARY: On a scale of 1 to 5, where 1 means not important and 5 means very important, how important was this factor in influencing your decision to participate in the Energy Efficiency Program.]

1 NOT IMPORTANT
2
3
4
5 VERY IMPORTANT
9 DK/REF

Q760
Corporate image?
[PROMPT AS NECESSARY: On a scale of 1 to 5, where 1 means not important and 5 means very important, how important was this factor in influencing your decision to participate in the Energy Efficiency Program.]

1 NOT IMPORTANT
2
3
4
5 VERY IMPORTANT
9 DK/REF

Q770
Concern for the environment?
[PROMPT AS NECESSARY: On a scale of 1 to 5, where 1 means not important and 5 means very important, how important was this factor in influencing your decision to participate in the Energy Efficiency Program.]

1 NOT IMPORTANT
2
3
4
5 VERY IMPORTANT
9 DK/REF

THANK1
Thank you for your time. That's all the questions we have for you.
[PRESS ANY KEY TO END INTERVIEW.]

THANK2
This concludes the survey. Thank you for your cooperation.
[PRESS ANY KEY TO CONTINUE.]

On-site Survey Instrument

North West Commercial Evaluation Project
Verification Survey

**** Confidential: All data on this form is confidential and may only be used for NWCEP Studies.****

General Information

ID Number: [ ][ ][ ][ ][ ][ ]

Business Name [ ] Phone: [ ][ ][ ] - [ ][ ][ ] - [ ][ ][ ][ ]

Name of Contact: [ ] Phone: [ ][ ][ ] - [ ][ ][ ] - [ ][ ][ ][ ]

Address [ ]

City: [ ] Postal Code [ ][ ][ ] - [ ][ ][ ]

Scheduling

Scheduler: [ ][ ] Date scheduled: [ ][ ] [ ][ ] [ ][ ]

Auditor: [ ] Survey Date: [ ][ ] [ ][ ] [ ][ ]

Directions / Notes:

Building Information

Total Sq. Footage of Building (s) [ ]

# of Buildings [ ]

Avg. age of buildings [ ]

Primary Building Type Code [ ]

% Total of Sq. Ft. [ ]

Secondary Building Type Code [ ]

% Total of Sq. Ft. [ ]

Tertiary Building Type Code [ ]

% Total of Sq. Ft. [ ]

Occupancy Schedule

Describe Occupancy Schedule

(hrs./day, days/wk, variability, % occupied, etc.)

Meter Numbers

Number of Electrical Meters [ ]

Number of Gas Meters [ ]

		E/G			E/G
Meter 1:	[ ]	[ ]	Meter 5:	[ ]	[ ]
Meter 2:	[ ]	[ ]	Meter 6:	[ ]	[ ]
Meter 3:	[ ]	[ ]	Meter 7:	[ ]	[ ]
Meter 4:	[ ]	[ ]	Meter 8:	[ ]	[ ]

Building Type Codes				
01- Transportation	05- Grocery	09- Large Offices (>5 stories)	13- College & University	17- Agriculture
02- Communication	06- Shopping Centers	10- Housing Common Areas (<5stories)	14- Lodging	18- Industrial
03- Misc Commercial	07- Retail and Store Front	11- Housing Common Areas (>5stories)	15- Restaurants	19- Other-Describe
04- Warehouse/Wholesale	08- Small Offices(<5 stories)	12- Schools	16- Hospitals	20- Exterior only

NOTES :

Measures

	Measure	Installation Start Date mnt	Installation Start Date yr	Installation End Date mnt	Installation End Date yr	Does it match Tracking Records? (Y/N)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Changes

Note: Respond to change questions in reference to time period defined on previous page

	Condition	Date From	Date To	Square Footage	Event #
Expansion or Reduction of Space	#1				
	#2				

	Condition	Date From	Date To	Sq. Ft. Affected	Event #
Remodel Changes	#1				
	#2				

	Condition	Date From	Date To	Sq. Ft. Occupied	Event #
Occupied Space Changes	#1				
	#2				
	#3				

	Condition	Date From	Date To	Percent of Current Level	Event #
Operation (hrs.) Changes	#1				
	#2				

	Condition	Date From	Date To	Percent of Current Level	Event #
Production Changes	#1				
	#2				

	Condition	Date From	Date To	Equipment Type	Event #
Equipment Changes	#1				
	#2				

	Condition	Date From	Date To	Describe	Event #
Other Changes	#1				
	#2				

Event 1

Time period *month* ☐ *yr.* ☐ *thru* *month* ☐ *yr.* ☐

Describe -

Calculations :

Estimated Annual kWh Impact

Event 2

Time period *month* ☐ *yr.* ☐ *thru* *month* ☐ *yr.* ☐

Describe -

Calculations :

Estimated Annual kWh Impact

Event 3

Time period *month* [ ] *yr.* [ ] *thru* *month* [ ] *yr.* [ ]

Describe - _____

Calculations :

Estimated Annual kWh Impact _____

Event 4

Time period *month* [ ] *yr.* [ ] *thru* *month* [ ] *yr.* [ ]

Describe - _____

Calculations :

Estimated Annual kWh Impact _____

Other

DHW

Inventory Item	*Check if applicable*	*Fuel Code*	*If Electric Have there been any changes? (Y/N)*	*Describe changes*
D1	☐	☐	☐	

Estimated Annual kWh Impact _____

REFRIGERATION

Inventory Item	*Check if applicable*	*Fuel Code*	*If Electric Have there been any changes? (Y/N)*	*Describe changes*
R1	☐	☐	☐	

Estimated Annual kWh Impact _____

COOKING

Inventory Item	*Check if applicable*	*Fuel Code*	*If Electric Have there been any changes? (Y/N)*	*Describe changes*
C1	☐	☐	☐	

Estimated Annual kWh Impact _____

POOL\SPA

Inventory Item	*Check if applicable*	*Fuel Code*	*If Electric Have there been any changes? (Y/N)*	*Describe changes*
P1	☐	☐	☐	

Estimated Annual kWh Impact _____

INSULATION

Inventory Item	*Check if applicable*	*Fuel Code*	*If Electric Have there been any changes? (Y/N)*	*Describe changes*
P1	☐	☐	☐	

Estimated Annual kWh Impact

BUILDING SHELL

Inventory Item	*Check if applicable*	*Fuel Code*	*If Electric Have there been any changes? (Y/N)*	*Describe changes*
P1	☐	☐	☐	

Estimated Annual kWh Impact

MISC

Inventory Item	*Check if applicable*	*Fuel Code*	*If Electric Have there been any changes? (Y/N)*	*Describe changes*
P1	☐	☐	☐	

Estimated Annual kWh Impact

Misc. Motors/ Pumps

Inventory		*Size*			
Item	*Quantity*	*H.P.*	*or*	*kW*	.
MP1					

Previous Motor/ Pump							
		Previous Size				*Change in Consumption*	
Item	*Quantity*	*H.P.*	*or*	*kW*	.	*Increase %*	*Decrease %*
CMP1							
Date change implemented	/	*to*	/				

Inventory		*Size*			
Item	*Quantity*	*H.P.*	*or*	*kW*	.
MP3					

Previous Motor/ Pump							
		Previous Size				*Change in Consumption*	
Item	*Quantity*	*H.P.*	*or*	*kW*	.	*Increase %*	*Decrease %*
CMP3							
Date change implemented	/	*to*	/				

Inventory		*Size*			
Item	*Quantity*	*H.P.*	*or*	*kW*	.
MP2					

Previous Motor/ Pump							
		Previous Size				*Change in Consumption*	
Item	*Quantity*	*H.P.*	*or*	*kW*	.	*Increase %*	*Decrease %*
CMP2							
Date change implemented	/	*to*	/				

Inventory		*Size*			
Item	*Quantity*	*H.P.*	*or*	*kW*	.
MP4					

Previous Motor/ Pump							
		Previous Size				*Change in Consumption*	
Item	*Quantity*	*H.P.*	*or*	*kW*	.	*Increase %*	*Decrease %*
CMP4							
Date change implemented	/	*to*	/				

NOTES :

Heating System

Inventory Item	System Type Code	Fuel Code	Quantity	Mbtuh Input or kW	Sq. Footage Served
H1				.	

Previous Heating System

Item	Previous System Type Code	Fuel Code	Previous Quantity	Mbtuh Input or kW	Change in Consumption Increase %	Change in Consumption Decrease %
CH1				.		

Date change implemented ___/___ to ___/___

Inventory Item	System Type Code	Fuel Code	Quantity	Mbtuh Input or kW	Sq. Footage Served
H2				.	

Previous Heating System

Item	Previous System Type Code	Fuel Code	Previous Quantity	Mbtuh Input or kW	Change in Consumption Increase %	Change in Consumption Decrease %
CH2				.		

Date change implemented ___/___ to ___/___

Inventory Item	System Type Code	Fuel Code	Quantity	Mbtuh Input or kW	Sq. Footage Served
H3				.	

Previous Heating System

Item	Previous System Type Code	Fuel Code	Previous Quantity	Mbtuh Input or kW	Change in Consumption Increase %	Change in Consumption Decrease %
CH3				.		

Date change implemented ___/___ to ___/___

Inventory Item	System Type Code	Fuel Code	Quantity	Mbtuh Input or kW	Sq. Footage Served
H4				.	

Previous Heating System

Item	Previous System Type Code	Fuel Code	Previous Quantity	Mbtuh Input or kW	Change in Consumption Increase %	Change in Consumption Decrease %
CH4				.		

Date change implemented ___/___ to ___/___

Heating System

Inventory Item	System Type Code	Fuel Code	Quantity	Mbtuh Input or kW	Sq. Footage Served
H5				.	

Previous Heating System

Item	Previous System Type Code	Fuel Code	Previous Quantity	Mbtuh Input or kW	Change in Consumption Increase %	Change in Consumption Decrease %
CH5				.		

Date change implemented ___/___ to ___/___

Inventory Item	System Type Code	Fuel Code	Quantity	Mbtuh Input or kW	Sq. Footage Served
H6				.	

Previous Heating System

Item	Previous System Type Code	Fuel Code	Previous Quantity	Mbtuh Input or kW	Change in Consumption Increase %	Change in Consumption Decrease %
CH6				.		

Date change implemented ___/___ to ___/___

Inventory Item	System Type Code	Fuel Code	Quantity	Mbtuh Input or kW	Sq. Footage Served
H7				.	

Previous Heating System

Item	Previous System Type Code	Fuel Code	Previous Quantity	Mbtuh Input or kW	Change in Consumption Increase %	Change in Consumption Decrease %
CH7				.		

Date change implemented ___/___ to ___/___

Inventory Item	System Type Code	Fuel Code	Quantity	Mbtuh Input or kW	Sq. Footage Served
H8				.	

Previous Heating System

Item	Previous System Type Code	Fuel Code	Previous Quantity	Mbtuh Input or kW	Change in Consumption Increase %	Change in Consumption Decrease %
CH8				.		

Date change implemented ___/___ to ___/___

Air Conditioning

Inventory

Item	*Sq. Footage Served*	*System Type Code*	*Condenser Type Code*	*Quantity*	*Tons*
AC5					

Previous Air Conditioning

Item	*Previous System Type Code*	*Previous Condenser Type Code*	*Previous Quantity*	*Tons*	*Change in Consumption Increase %*	*Decrease %*
CAC5						

Date change implemented ___/___ *to* ___/___

Inventory

Item	*Sq. Footage Served*	*System Type Code*	*Condenser Type Code*	*Quantity*	*Tons*
AC6					

Previous Air Conditioning

Item	*Previous System Type Code*	*Previous Condenser Type Code*	*Previous Quantity*	*Tons*	*Change in Consumption Increase %*	*Decrease %*
CAC6						

Date change implemented ___/___ *to* ___/___

Inventory

Item	*Sq. Footage Served*	*System Type Code*	*Condenser Type Code*	*Quantity*	*Tons*
AC7					

Previous Air Conditioning

Item	*Previous System Type Code*	*Previous Condenser Type Code*	*Previous Quantity*	*Tons*	*Change in Consumption Increase %*	*Decrease %*
CAC7						

Date change implemented ___/___ *to* ___/___

Inventory

Item	*Sq. Footage Served*	*System Type Code*	*Condenser Type Code*	*Quantity*	*Tons*
AC8					

Previous Air Conditioning

Item	*Previous System Type Code*	*Previous Condenser Type Code*	*Previous Quantity*	*Tons*	*Change in Consumption Increase %*	*Decrease %*
CAC8						

Date change implemented ___/___ *to* ___/___

Heating Codes		
01- Steam Boiler	05- Unit Heater	09- Heat Pump, water-cooled
02- Hot-Water Boiler	06- Baseboard	10- Heat Pump, ground source
03- Warm-Air Furnace	07- Radiant Heater	11- Other
04- Duct Heater	08- Heat Pump, air-cooled	

Fuel Codes	
E- Electric	L- LPG
G- Natural Gas	S- Steam
O- Fuel Oil	

NOTES :

A\C System Type Codes		
01- Centrifugal Chiller	05- Packaged DX	09- Evaporative Cooler
02- Screw Chiller	06- Split DX	10- Thermal Storage
03- Reciprocating Chiller	07- Heat Pump	11- Other
04- Absorption Chiller	08- Window or Wall Unit	

Condenser Type Codes
01- Air-Cooled
02- Cooling Tower-Air Source
03- Cooling Tower-Water Source

NOTES :

Air Conditioning

Inventory

Item	*Sq. Footage Served*	*System Type Code*	*Condenser Type Code*	*Quantity*	*Tons*
AC1					

Previous Air Conditioning

Item	*Previous System Type Code*	*Previous Condenser Type Code*	*Previous Quantity*	*Tons*	*Change in Consumption Increase %*	*Decrease %*
CAC1						

Date change implemented ___/___ *to* ___/___

Inventory

Item	*Sq. Footage Served*	*System Type Code*	*Condenser Type Code*	*Quantity*	*Tons*
AC2					

Previous Air Conditioning

Item	*Previous System Type Code*	*Previous Condenser Type Code*	*Previous Quantity*	*Tons*	*Change in Consumption Increase %*	*Decrease %*
CAC2						

Date change implemented ___/___ *to* ___/___

Inventory

Item	*Sq. Footage Served*	*System Type Code*	*Condenser Type Code*	*Quantity*	*Tons*
AC3					

Previous Air Conditioning

Item	*Previous System Type Code*	*Previous Condenser Type Code*	*Previous Quantity*	*Tons*	*Change in Consumption Increase %*	*Decrease %*
CAC3						

Date change implemented ___/___ *to* ___/___

Inventory

Item	*Sq. Footage Served*	*System Type Code*	*Condenser Type Code*	*Quantity*	*Tons*
AC4					

Previous Air Conditioning

Item	*Previous System Type Code*	*Previous Condenser Type Code*	*Previous Quantity*	*Tons*	*Change in Consumption Increase %*	*Decrease %*
CAC4						

Date change implemented ___/___ *to* ___/___

Area Codes						
01- Office	05- Fast Food	09- School	13- Assembly	17- Warehouse	21- Warehouse	25- Tavern\Nightclub\Other
02- Retail	06- Restaurant	10- College	14- Commons	18- Service	22- Service	26- Retirement\Nursing Home
03- Grocery	07- Kitchen	11- Hospital	15- Laundry	19- Industrial	23- Storage	27- Parking Garage
04- Convenience Store	08- Hotel\ Motel	12- Other Medical	16- Religious	20- Exterior only	24- Computer Cnt.	28- Other-Describe

Control Codes			
01- Switch(s)	03- Occ. / Motion Sensor	05- Photo Cell	07- Twist Timer
02- Timeclock	04- Manual Dimmer	06- EMS	08- Other (describe)

Lighting

Inventory Item	Rebate Measure	Area	Fixture Code	Fixture Count	Control Type
L1					

Location Description

Operating Schedule 1	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Operating Schedule 2	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Previous Lighting

Item	Measure Code	Previous Fixture Code	Previous Fixture Count	Previous Control
CL1				

Date change implemented / to /

Operating Schedule 1 [ ] Same

	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Operating Schedule 2 [ ] Same

	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Inventory Item	Rebate Measure	Area	Fixture Code	Fixture Count	Control Type
L2					

Location Description

Operating Schedule 1	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Operating Schedule 2	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Previous Lighting

Item	Measure Code	Previous Fixture Code	Previous Fixture Count	Previous Control
CL2				

Date change implemented / to /

Operating Schedule 1 [ ] Same

	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Operating Schedule 2 [ ] Same

	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Inventory Item	Rebate Measure	Area	Fixture Code	Fixture Count	Control Type
L3					

Location Description

Operating Schedule 1	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Operating Schedule 2	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Previous Lighting

Item	Measure Code	Previous Fixture Code	Previous Fixture Count	Previous Control
CL3				

Date change implemented / to /

Operating Schedule 1 [ ] Same

	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Operating Schedule 2 [ ] Same

	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Inventory Item	Rebate Measure	Area	Fixture Code	Fixture Count	Control Type
L4					

Location Description

Operating Schedule 1	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Operating Schedule 2	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Previous Lighting

Item	Measure Code	Previous Fixture Code	Previous Fixture Count	Previous Control
CL4				

Date change implemented / to /

Operating Schedule 1 [ ] Same

	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Operating Schedule 2 [ ] Same

	Hours/ Day	# of Days	Months
Weekday			
Weekend			

Lighting

Inventory Item	Rebate Measure	Area	Fixture Code	Fixture Count	Control Type	Operating Schedule 1 Hours/Day	Operating Schedule 1 # of Days	Operating Schedule 1 Months	Operating Schedule 2 Hours/Day	Operating Schedule 2 # of Days	Operating Schedule 2 Months
L5						Weekday					
						Weekend					

Location Description

Previous Lighting Item	Measure Code	Previous Fixture Code	Previous Fixture Count	Previous Control	Operating Schedule 1 [ ] Same Hours/Day	# of Days	Months	Operating Schedule 2 [ ] Same Hours/Day	# of Days	Months
CL5					Weekday					
					Weekend					

Date change implemented / to /

Inventory Item	Rebate Measure	Area	Fixture Code	Fixture Count	Control Type	Operating Schedule 1 Hours/Day	Operating Schedule 1 # of Days	Operating Schedule 1 Months	Operating Schedule 2 Hours/Day	Operating Schedule 2 # of Days	Operating Schedule 2 Months
L6						Weekday					
						Weekend					

Location Description

Previous Lighting Item	Measure Code	Previous Fixture Code	Previous Fixture Count	Previous Control	Operating Schedule 1 [ ] Same Hours/Day	# of Days	Months	Operating Schedule 2 [ ] Same Hours/Day	# of Days	Months
CL6					Weekday					
					Weekend					

Date change implemented / to /

Inventory Item	Rebate Measure	Area	Fixture Code	Fixture Count	Control Type	Operating Schedule 1 Hours/Day	Operating Schedule 1 # of Days	Operating Schedule 1 Months	Operating Schedule 2 Hours/Day	Operating Schedule 2 # of Days	Operating Schedule 2 Months
L7						Weekday					
						Weekend					

Location Description

Previous Lighting Item	Measure Code	Previous Fixture Code	Previous Fixture Count	Previous Control	Operating Schedule 1 [ ] Same Hours/Day	# of Days	Months	Operating Schedule 2 [ ] Same Hours/Day	# of Days	Months
CL7					Weekday					
					Weekend					

Date change implemented / to /

Inventory Item	Rebate Measure	Area	Fixture Code	Fixture Count	Control Type	Operating Schedule 1 Hours/Day	Operating Schedule 1 # of Days	Operating Schedule 1 Months	Operating Schedule 2 Hours/Day	Operating Schedule 2 # of Days	Operating Schedule 2 Months
L8						Weekday					
						Weekend					

Location Description

Previous Lighting Item	Measure Code	Previous Fixture Code	Previous Fixture Count	Previous Control	Operating Schedule 1 [ ] Same Hours/Day	# of Days	Months	Operating Schedule 2 [ ] Same Hours/Day	# of Days	Months
CL8					Weekday					
					Weekend					

Date change implemented / to /

Lighting

Inventory Item	Rebate Measure	Area	Fixture Code	Fixture Count	Control Type	Operating Schedule 1 Hours/Day	Operating Schedule 1 # of Days	Operating Schedule 1 Months	Operating Schedule 2 Hours/Day	Operating Schedule 2 # of Days	Operating Schedule 2 Months
L9						Weekday					
						Weekend					

Location Description

Previous Lighting Item	Measure Code	Previous Fixture Code	Previous Fixture Count	Previous Control	Operating Schedule 1 [ ] Same Hours/Day	# of Days	Months	Operating Schedule 2 [ ] Same Hours/Day	# of Days	Months
CL9					Weekday					
					Weekend					

Date change implemented / to /

Inventory Item	Rebate Measure	Area	Fixture Code	Fixture Count	Control Type	Operating Schedule 1 Hours/Day	Operating Schedule 1 # of Days	Operating Schedule 1 Months	Operating Schedule 2 Hours/Day	Operating Schedule 2 # of Days	Operating Schedule 2 Months
L10						Weekday					
						Weekend					

Location Description

Previous Lighting Item	Measure Code	Previous Fixture Code	Previous Fixture Count	Previous Control	Operating Schedule 1 [ ] Same Hours/Day	# of Days	Months	Operating Schedule 2 [ ] Same Hours/Day	# of Days	Months
CL10					Weekday					
					Weekend					

Date change implemented / to /

Inventory Item	Rebate Measure	Area	Fixture Code	Fixture Count	Control Type	Operating Schedule 1 Hours/Day	Operating Schedule 1 # of Days	Operating Schedule 1 Months	Operating Schedule 2 Hours/Day	Operating Schedule 2 # of Days	Operating Schedule 2 Months
L11						Weekday					
						Weekend					

Location Description

Previous Lighting Item	Measure Code	Previous Fixture Code	Previous Fixture Count	Previous Control	Operating Schedule 1 [ ] Same Hours/Day	# of Days	Months	Operating Schedule 2 [ ] Same Hours/Day	# of Days	Months
CL11					Weekday					
					Weekend					

Date change implemented / to /

Inventory Item	Rebate Measure	Area	Fixture Code	Fixture Count	Control Type	Operating Schedule 1 Hours/Day	Operating Schedule 1 # of Days	Operating Schedule 1 Months	Operating Schedule 2 Hours/Day	Operating Schedule 2 # of Days	Operating Schedule 2 Months
L12						Weekday					
						Weekend					

Location Description

Previous Lighting Item	Measure Code	Previous Fixture Code	Previous Fixture Count	Previous Control	Operating Schedule 1 [ ] Same Hours/Day	# of Days	Months	Operating Schedule 2 [ ] Same Hours/Day	# of Days	Months
CL12					Weekday					
					Weekend					

Date change implemented / to /

B

TELEPHONE SURVEY FREQUENCY TABLES

This appendix presents frequency tables for the retrofit evaluation telephone survey. Participant and nonparticipant results are presented together to facilitate comparisons.

CORRECT BUSINESS NAME?

TABLE OF Q35 BY PTYPE

Q35	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	192	0	192
	47.17	0.00	47.17
YES	0	189	189
	0.00	46.44	46.44
NO	0	26	26
	0.00	6.39	6.39
Total	192	215	407
	47.17	52.83	100.00

CORRECT SERVICE ADDRESS?

TABLE OF Q50 BY PTYPE

Q50	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	187	180	367
	45.95	44.23	90.17
NO	5	35	40
	1.23	8.60	9.83
Total	192	215	407
	47.17	52.83	100.00

AWARE OF UTILITY PROGRAM?

TABLE OF Q70_N BY PTYPE

Q70_N	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	192	0	192
	47.17	0.00	47.17
YES	0	114	114
	0.00	28.01	28.01
NO	0	100	100
	0.00	24.57	24.57
UNKNOWN	0	1	1
	0.00	0.25	0.25
Total	192	215	407
	47.17	52.83	100.00

ENERGY EFFICIENCY MEASURE 1 INSTALLED?

TABLE OF Q70_P BY PTYPE

Q70_P	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	0 0.00	215 52.83	215 52.83
YES	186 45.70	0 0.00	186 45.70
NOT INSTALLED	5 1.23	0 0.00	5 1.23
UNKNOWN	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

ENERGY EFFICIENCY MEASURE 2 INSTALLED?

TABLE OF Q72 BY PTYPE

Q72	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	119 29.24	215 52.83	334 82.06
YES	70 17.20	0 0.00	70 17.20
NOT INSTALLED	2 0.49	0 0.00	2 0.49
UNKNOWN	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

ENERGY EFFICIENCY MEASURE 3 INSTALLED?

TABLE OF Q74 BY PTYPE

Q74	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	176 43.24	215 52.83	391 96.07
YES	16 3.93	0 0.00	16 3.93
Total	192 47.17	215 52.83	407 100.00

EVER PARTICIPATE IN UTILITY PROGRAM?

TABLE OF Q75 BY PTYPE

Q75	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	192	101	293
	47.17	24.82	71.99
YES	0	35	35
	0.00	8.60	8.60
NO	0	76	76
	0.00	18.67	18.67
UNKNOWN	0	3	3
	0.00	0.74	0.74
Total	192	215	407
	47.17	52.83	100.00

ENERGY EFFICIENCY MEASURE 4 INSTALLED?

TABLE OF Q76 BY PTYPE

Q76	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	187	215	402
	45.95	52.83	98.77
YES	4	0	4
	0.98	0.00	0.98
NOT INSTALLED	1	0	1
	0.25	0.00	0.25
Total	192	215	407
	47.17	52.83	100.00

ANY ADDITIONAL MEASURES INSTALLED?

TABLE OF Q80_P BY PTYPE

Q80_P	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	0	215	215
	0.00	52.83	52.83
YES	56	0	56
	13.76	0.00	13.76
NO	134	0	134
	32.92	0.00	32.92
UNKNOWN	2	0	2
	0.49	0.00	0.49
Total	192	215	407
	47.17	52.83	100.00

MO/YR OF PARTICIPATION?

TABLE OF Q80_N BY PTYPE

Q80_N / Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	192 47.17	180 44.23	372 91.40
<=JUN90	0 0.00	4 0.98	4 0.98
JAN91-JUN91	0 0.00	3 0.74	3 0.74
JUL91-DEC91	0 0.00	1 0.25	1 0.25
JAN92-JUN92	0 0.00	5 1.23	5 1.23
JAN93-JUN93	0 0.00	5 1.23	5 1.23
JUL93-DEC93	0 0.00	3 0.74	3 0.74
>=JAN94	0 0.00	9 2.21	9 2.21
UNKNOWN	0 0.00	5 1.23	5 1.23
Total	192 47.17	215 52.83	407 100.00

ADDITIONAL MEASURES.

TABLE OF Q80_1 BY PTYPE

Q80_1 / Frequency / Percent	PTYPE PART	NON-PART	Total
NOT APPLICABLE	136 33.42	215 52.83	351 86.24
FLUOR LIGHT/ELB	10 2.46	0 0.00	10 2.46
LIGHT CONTROLS	8 1.97	0 0.00	8 1.97
LIGHT EFFICIENCY	7 1.72	0 0.00	7 1.72
WEATHERSTRIPPING	5 1.23	0 0.00	5 1.23
HVAC IMPROVEMNTS	13 3.19	0 0.00	13 3.19
REFR IMPROVEMNTS	2 0.49	0 0.00	2 0.49
DHW IMPROVEMNTS	4 0.98	0 0.00	4 0.98
PROGRAM THERMOST	1 0.25	0 0.00	1 0.25
EMS	1 0.25	0 0.00	1 0.25
LIGHTING/INSULTN	1 0.25	0 0.00	1 0.25
LIGHTING/REFRIG	1 0.25	0 0.00	1 0.25
LITECTL/EMS/HVAC	1 0.25	0 0.00	1 0.25
OTHER	2 0.49	0 0.00	2 0.49
Total	192 47.17	215 52.83	407 100.00

CORRECT INSTALLATION START DATE?

TABLE OF Q82 BY PTYPE

Q82	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	0 0.00	215 52.83	215 52.83
YES	168 41.28	0 0.00	168 41.28
NO	21 5.16	0 0.00	21 5.16
UNKNOWN	3 0.74	0 0.00	3 0.74
Total	192 47.17	215 52.83	407 100.00

MO/YR INSTALLATION BEGAN?

TABLE OF Q83 BY PTYPE

Q83	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	171 42.01	215 52.83	386 94.84
JAN91-JUN91	5 1.23	0 0.00	5 1.23
JUL91-DEC91	1 0.25	0 0.00	1 0.25
JAN92-JUN92	8 1.97	0 0.00	8 1.97
JUL92-DEC92	6 1.47	0 0.00	6 1.47
JAN93-JUN93	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

MO/YR INSTALLATION COMPLETE?

TABLE OF Q84 BY PTYPE

Q84	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	171 42.01	215 52.83	386 94.84
JAN91-JUN91	2 0.49	0 0.00	2 0.49
JUL91-DEC91	3 0.74	0 0.00	3 0.74
JAN92-JUN92	2 0.49	0 0.00	2 0.49
JUL92-DEC92	8 1.97	0 0.00	8 1.97
JAN93-JUN93	2 0.49	0 0.00	2 0.49
JUL93-DEC93	2 0.49	0 0.00	2 0.49
>=JAN94	1 0.25	0 0.00	1 0.25
UNKNOWN	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

ENERGY EFFICIENCY MEASURE 1 INSTALLED?

TABLE OF Q85_1 BY PTYPE

Q85_1	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	192 47.17	184 45.21	376 92.38
FLUOR LIGHT/ELB	0 0.00	7 1.72	7 1.72
LIGHT CONTROLS	0 0.00	1 0.25	1 0.25
LIGHT EFFICIENCY	0 0.00	12 2.95	12 2.95
WEATHERSTRIPPING	0 0.00	2 0.49	2 0.49
HVAC IMPROVEMNTS	0 0.00	3 0.74	3 0.74
EMS	0 0.00	1 0.25	1 0.25
EE MOTORS	0 0.00	1 0.25	1 0.25
LIGHTING/INSULTN	0 0.00	2 0.49	2 0.49
OTHER	0 0.00	2 0.49	2 0.49
Total	192 47.17	215 52.83	407 100.00

ENERGY EFFICIENCY MEASURE 2 INSTALLED?

TABLE OF Q85_2 BY PTYPE

Q85_2	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	192 47.17	210 51.60	402 98.77
FLUOR LIGHT/ELB	0 0.00	1 0.25	1 0.25
LIGHT EFFICIENCY	0 0.00	2 0.49	2 0.49
WEATHERSTRIPPING	0 0.00	1 0.25	1 0.25
HVAC IMPROVEMNTS	0 0.00	1 0.25	1 0.25
Total	192 47.17	215 52.83	407 100.00

ENERGY EFFICIENCY MEASURE 3 INSTALLED?

TABLE OF Q85_3 BY PTYPE

Q85_3	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	192 47.17	214 52.58	406 99.75
LIGHT EFFICIENCY	0 0.00	1 0.25	1 0.25
Total	192 47.17	215 52.83	407 100.00

ENERGY EFFICIENCY MEASURE 4 INSTALLED?

TABLE OF Q85_4 BY PTYPE

Q85_4	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	192 47.17	214 52.58	406 99.75
DHW IMPROVEMNTS	0 0.00	1 0.25	1 0.25
Total	192 47.17	215 52.83	407 100.00

BUILDING TYPE?

TABLE OF Q90 BY PTYPE

Q90	PTYPE		
Frequency Percent	PART	NON-PART	Total
RETAIL	26 6.39	29 7.13	55 13.51
GROCERY	12 2.95	4 0.98	16 3.93
RESTAURANT	3 0.74	10 2.46	13 3.19
OFFICE	56 13.76	54 13.27	110 27.03
HOTEL/NURSG HOME	10 2.46	21 5.16	31 7.62
SCHOOL	14 3.44	15 3.69	29 7.13
WAREHOUSE	14 3.44	15 3.69	29 7.13
MEDICAL	7 1.72	11 2.70	18 4.42
RESIDENTIAL APT	15 3.69	6 1.47	21 5.16
OTHER	11 2.70	19 4.67	30 7.37
BANK	3 0.74	3 0.74	6 1.47
MANUFACTURING	10 2.46	12 2.95	22 5.41
CHURCH	11 2.70	15 3.69	26 6.39
UNKNOWN	0 0.00	1 0.25	1 0.25
Total	192 47.17	215 52.83	407 100.00

OWN OR LEASE?

TABLE OF Q100 BY PTYPE

Q100	PTYPE		
Frequency / Percent	PART	NON-PART	Total
OWN	138	153	291
	33.91	37.59	71.50
LEASE	44	60	104
	10.81	14.74	25.55
UNKNOWN	10	2	12
	2.46	0.49	2.95
Total	192	215	407
	47.17	52.83	100.00

SINGLE OR MULTIPLE BUSINESSES AT SITE?

TABLE OF Q110 BY PTYPE

Q110	PTYPE		
Frequency / Percent	PART	NON-PART	Total
SINGLE	135	169	304
	33.17	41.52	74.69
MULTIPLE	54	45	99
	13.27	11.06	24.32
UNKNOWN	3	1	4
	0.74	0.25	0.98
Total	192	215	407
	47.17	52.83	100.00

OCCUPY OR MANAGE OR BOTH?

TABLE OF Q120 BY PTYPE

Q120	PTYPE		
Frequency / Percent	PART	NON-PART	Total
OCCUPY ONLY	98	150	248
	24.08	36.86	60.93
MANAGE ONLY	35	31	66
	8.60	7.62	16.22
OCCUPY & MANAGE	47	30	77
	11.55	7.37	18.92
UNKNOWN	12	4	16
	2.95	0.98	3.93
Total	192	215	407
	47.17	52.83	100.00

MO/YR TENANCY BEGAN?

TABLE OF Q130 BY PTYPE

Q130 / Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	35	31	66
	8.60	7.62	16.22
PRE-1950	12	27	39
	2.95	6.63	9.58
1950-1959	8	24	32
	1.97	5.90	7.86
1960-1969	20	20	40
	4.91	4.91	9.83
1970-1979	29	37	66
	7.13	9.09	16.22
1980-1989	59	51	110
	14.50	12.53	27.03
1990-PRESENT	19	9	28
	4.67	2.21	6.88
UNKNOWN	10	16	26
	2.46	3.93	6.39
Total	192	215	407
	47.17	52.83	100.00

CHANGE IN TENANTS SINCE 1/90?

TABLE OF Q140 BY PTYPE

Q140 / Frequency / Percent	PART	NON-PART	Total
YES	13	7	20
	3.19	1.72	4.91
NO	138	171	309
	33.91	42.01	75.92
NOT APPLICABLE	38	34	72
	9.34	8.35	17.69
UNKNOWN	3	3	6
	0.74	0.74	1.47
Total	192	215	407
	47.17	52.83	100.00

MO/YR OF FIRST CHANGE?

TABLE OF Q150 BY PTYPE

Q150 / Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	179 43.98	208 51.11	387 95.09
<=JUN90	1 0.25	0 0.00	1 0.25
JUL90-DEC90	0 0.00	2 0.49	2 0.49
JAN91-JUN91	3 0.74	0 0.00	3 0.74
JUL91-DEC91	1 0.25	1 0.25	2 0.49
JAN92-JUN92	1 0.25	1 0.25	2 0.49
JUL92-DEC92	1 0.25	0 0.00	1 0.25
JAN93-JUN93	1 0.25	1 0.25	2 0.49
JUL93-DEC93	2 0.49	2 0.49	4 0.98
UNKNOWN	3 0.74	0 0.00	3 0.74
Total	192 47.17	215 52.83	407 100.00

% DELTA OCCUPANCY FOR FIRST CHANGE?

TABLE OF Q155 BY PTYPE

Q155 / Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	179 43.98	208 51.11	387 95.09
0% - 25%	5 1.23	2 0.49	7 1.72
26% - 50%	4 0.98	0 0.00	4 0.98
51% - 75%	1 0.25	1 0.25	2 0.49
76% - 100%	3 0.74	3 0.74	6 1.47
UNKNOWN	0 0.00	1 0.25	1 0.25
Total	192 47.17	215 52.83	407 100.00

MO/YR OF SECOND CHANGE?

TABLE OF Q160 BY PTYPE

Q160 / Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	179 43.98	208 51.11	387 95.09
JUL91-DEC91	1 0.25	1 0.25	2 0.49
JAN92-JUN92	1 0.25	0 0.00	1 0.25
JAN93-JUN93	1 0.25	0 0.00	1 0.25
JUL93-DEC93	1 0.25	0 0.00	1 0.25
>=JAN94	0 0.00	1 0.25	1 0.25
NO 2ND CHANGE	7 1.72	5 1.23	12 2.95
UNKNOWN	2 0.49	0 0.00	2 0.49
Total	192 47.17	215 52.83	407 100.00

% DELTA OCCUPANCY FOR SECOND CHANGE?

TABLE OF Q165 BY PTYPE

Q165 / Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	186 45.70	213 52.33	399 98.03
0% - 25%	3 0.74	2 0.49	5 1.23
26% - 50%	1 0.25	0 0.00	1 0.25
76% - 100%	1 0.25	0 0.00	1 0.25
UNKNOWN	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

REMODEL SINCE 1/90?

TABLE OF Q170 BY PTYPE

Q170	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	41 10.07	25 6.14	66 16.22
NO	151 37.10	189 46.44	340 83.54
UNKNOWN	0 0.00	1 0.25	1 0.25
Total	192 47.17	215 52.83	407 100.00

MO/YR OF REMODEL?

TABLE OF Q175 BY PTYPE

Q175	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	151 37.10	190 46.68	341 83.78
<=JUN90	6 1.47	1 0.25	7 1.72
JAN91-JUN91	9 2.21	6 1.47	15 3.69
JUL91-DEC91	5 1.23	0 0.00	5 1.23
JAN92-JUN92	6 1.47	4 0.98	10 2.46
JUL92-DEC92	2 0.49	1 0.25	3 0.74
JAN93-JUN93	7 1.72	6 1.47	13 3.19
JUL93-DEC93	4 0.98	2 0.49	6 1.47
>=JAN94	2 0.49	3 0.74	5 1.23
UNKNOWN	0 0.00	2 0.49	2 0.49
Total	192 47.17	215 52.83	407 100.00

PROGRAM MEASURES INSTALLED FOR REMODEL?

TABLE OF Q180 BY PTYPE

Q180	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	151	215	366
	37.10	52.83	89.93
YES	27	0	27
	6.63	0.00	6.63
NO	13	0	13
	3.19	0.00	3.19
UNKNOWN	1	0	1
	0.25	0.00	0.25
Total	192	215	407
	47.17	52.83	100.00

FLOORSPACE?

TABLE OF Q190 BY PTYPE

Q190	PTYPE		
Frequency / Percent	PART	NON-PART	Total
0 - 10,000	54	77	131
	13.27	18.92	32.19
10,001 - 25,000	34	30	64
	8.35	7.37	15.72
25,001 - 50,000	25	11	36
	6.14	2.70	8.85
50,001 - 75,000	13	4	17
	3.19	0.98	4.18
75,001 -100,000	12	2	14
	2.95	0.49	3.44
100,001-150,000	6	3	9
	1.47	0.74	2.21
150,001-200,000	4	4	8
	0.98	0.98	1.97
201,000+	10	11	21
	2.46	2.70	5.16
UNKNOWN	34	73	107
	8.35	17.94	26.29
Total	192	215	407
	47.17	52.83	100.00

FLOORSPACE CHANGED SINCE 1/90?

TABLE OF Q200 BY PTYPE

Q200	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	15	10	25
	3.69	2.46	6.14
NO	177	205	382
	43.49	50.37	93.86
Total	192	215	407
	47.17	52.83	100.00

FLOORSPACE INCREASE OR DECREASE?

TABLE OF Q210 BY PTYPE

Q210	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	177	205	382
	43.49	50.37	93.86
INCREASE	15	10	25
	3.69	2.46	6.14
Total	192	215	407
	47.17	52.83	100.00

FLOORSPACE IN 1/90?

TABLE OF Q220 BY PTYPE

Q220	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	177	205	382
	43.49	50.37	93.86
0 - 10,000	4	1	5
	0.98	0.25	1.23
10,001 - 25,000	1	3	4
	0.25	0.74	0.98
25,001 - 50,000	4	0	4
	0.98	0.00	0.98
75,001 -100,000	1	0	1
	0.25	0.00	0.25
150,001-200,000	1	0	1
	0.25	0.00	0.25
201,000+	1	0	1
	0.25	0.00	0.25
UNKNOWN	3	6	9
	0.74	1.47	2.21
Total	192	215	407
	47.17	52.83	100.00

BUSINESS WEEKLY HOURS OF OPERATION?

TABLE OF Q230 BY PTYPE

Q230	PTYPE		
Frequency Percent	PART	NON-PART	Total
0-25	2 0.49	5 1.23	7 1.72
26-50	57 14.00	75 18.43	132 32.43
51-75	44 10.81	60 14.74	104 25.55
76-100	28 6.88	22 5.41	50 12.29
100-125	9 2.21	5 1.23	14 3.44
126-150	5 1.23	1 0.25	6 1.47
150-200	42 10.32	40 9.83	82 20.15
UNKNOWN	5 1.23	7 1.72	12 2.95
Total	192 47.17	215 52.83	407 100.00

CHANGE IN HOP SINCE 1/90?

TABLE OF Q240 BY PTYPE

Q240	PTYPE		
Frequency Percent	PART	NON-PART	Total
YES	11 2.70	16 3.93	27 6.63
NO	181 44.47	197 48.40	378 92.87
UNKNOWN	0 0.00	2 0.49	2 0.49
Total	192 47.17	215 52.83	407 100.00

HOP INCREASE OR DECREASE?

TABLE OF Q250 BY PTYPE

Q250	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	181 44.47	199 48.89	380 93.37
INCREASE	11 2.70	13 3.19	24 5.90
DECREASE	0 0.00	3 0.74	3 0.74
Total	192 47.17	215 52.83	407 100.00

WEEKLY HOP IN 1990?

TABLE OF Q260 BY PTYPE

Q260	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	181 44.47	199 48.89	380 93.37
0-25	0 0.00	1 0.25	1 0.25
26-50	3 0.74	7 1.72	10 2.46
51-75	3 0.74	2 0.49	5 1.23
76-100	1 0.25	2 0.49	3 0.74
100-125	2 0.49	0 0.00	2 0.49
126-150	1 0.25	1 0.25	2 0.49
UNKNOWN	1 0.25	3 0.74	4 0.98
Total	192 47.17	215 52.83	407 100.00

NUMBER OF OCCUPANTS?

TABLE OF Q270 BY PTYPE

Q270	PTYPE		
Frequency / Percent	PART	NON-PART	Total
0-50	105	163	268
	25.80	40.05	65.85
51-100	30	14	44
	7.37	3.44	10.81
101-200	18	8	26
	4.42	1.97	6.39
201-300	12	8	20
	2.95	1.97	4.91
301-400	4	2	6
	0.98	0.49	1.47
401-500	1	4	5
	0.25	0.98	1.23
501-750	1	6	7
	0.25	1.47	1.72
751-1000	4	2	6
	0.98	0.49	1.47
1001-2000	3	2	5
	0.74	0.49	1.23
UNKNOWN	14	6	20
	3.44	1.47	4.91
Total	192	215	407
	47.17	52.83	100.00

CHANGE IN OCCUPANCY SINCE 1/90?

TABLE OF Q280 BY PTYPE

Q280	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	38	46	84
	9.34	11.30	20.64
NO	149	165	314
	36.61	40.54	77.15
UNKNOWN	5	4	9
	1.23	0.98	2.21
Total	192	215	407
	47.17	52.83	100.00

OCCUPANCY INCREASE OR DECREASE?

TABLE OF Q290 BY PTYPE

Q290	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	154 37.84	169 41.52	323 79.36
INCREASE	29 7.13	26 6.39	55 13.51
DECREASE	8 1.97	20 4.91	28 6.88
UNKNOWN	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

TOTAL OCCUPANTS IN 1990?

TABLE OF Q300 BY PTYPE

Q300	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	154 37.84	169 41.52	323 79.36
0-50	22 5.41	33 8.11	55 13.51
51-100	4 0.98	4 0.98	8 1.97
101-200	5 1.23	3 0.74	8 1.97
201-300	0 0.00	2 0.49	2 0.49
301-400	0 0.00	1 0.25	1 0.25
501-750	1 0.25	1 0.25	2 0.49
UNKNOWN	6 1.47	2 0.49	8 1.97
Total	192 47.17	215 52.83	407 100.00

ANY TEMPORARY BUSINESS SHUTDOWNS?

TABLE OF Q310 BY PTYPE

Q310	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	14	7	21
	3.44	1.72	5.16
NO	178	205	383
	43.73	50.37	94.10
UNKNOWN	0	3	3
	0.00	0.74	0.74
Total	192	215	407
	47.17	52.83	100.00

MO/YR OF SHUTDOWN?

TABLE OF Q320 BY PTYPE

Q320	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	178	208	386
	43.73	51.11	94.84
JUL90-DEC90	1	0	1
	0.25	0.00	0.25
JAN91-JUN91	2	0	2
	0.49	0.00	0.49
JUL91-DEC91	0	1	1
	0.00	0.25	0.25
JAN92-JUN92	0	1	1
	0.00	0.25	0.25
JUL92-DEC92	2	0	2
	0.49	0.00	0.49
JAN93-JUN93	2	4	6
	0.49	0.98	1.47
JUL93-DEC93	3	0	3
	0.74	0.00	0.74
>=JAN94	1	0	1
	0.25	0.00	0.25
UNKNOWN	3	1	4
	0.74	0.25	0.98
Total	192	215	407
	47.17	52.83	100.00

COMPARE SUCCESS BETWEEN 90 AND 93?

TABLE OF Q330 BY PTYPE

Q330	PTYPE		
Frequency / Percent	PART	NON-PART	Total
MUCH BETTER	22 5.41	19 4.67	41 10.07
SOMEWHAT BETTER	52 12.78	60 14.74	112 27.52
ABOUT SAME	70 17.20	86 21.13	156 38.33
SOMEWHAT WORSE	13 3.19	18 4.42	31 7.62
MUCH WORSE	0 0.00	14 3.44	14 3.44
NOT APPLICABLE	17 4.18	6 1.47	23 5.65
UNKNOWN	18 4.42	12 2.95	30 7.37
Total	192 47.17	215 52.83	407 100.00

FIRST SET IMPROVEMENTS OUTSIDE PROGRAM?

TABLE OF Q340 BY PTYPE

Q340	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	40 9.83	52 12.78	92 22.60
NO	150 36.86	158 38.82	308 75.68
UNKNOWN	2 0.49	5 1.23	7 1.72
Total	192 47.17	215 52.83	407 100.00

OTHER IMPROVEMENTS?

TABLE OF Q349_1 BY PTYPE

Q349_1 / Frequency / Percent	PTYPE PART	NON-PART	Total
NOT APPLICABLE	152 37.35	163 40.05	315 77.40
FLUOR LIGHT/ELB	2 0.49	5 1.23	7 1.72
LIGHT CONTROLS	2 0.49	1 0.25	3 0.74
LIGHT EFFICIENCY	4 0.98	8 1.97	12 2.95
WEATHERSTRIPPING	6 1.47	4 0.98	10 2.46
HVAC IMPROVEMNTS	3 0.74	20 4.91	23 5.65
REFR IMPROVEMNTS	0 0.00	1 0.25	1 0.25
DHW IMPROVEMNTS	1 0.25	3 0.74	4 0.98
PROGRAM THERMOST	2 0.49	0 0.00	2 0.49
EMS	2 0.49	1 0.25	3 0.74
EE MOTORS	2 0.49	0 0.00	2 0.49
EE POOL HTR/PUMP	2 0.49	2 0.49	4 0.98
HTNG-ELEC TO GAS	3 0.74	0 0.00	3 0.74
EE OFFICE EQUIP	2 0.49	0 0.00	2 0.49
EE DHW DEVICES	2 0.49	3 0.74	5 1.23
OTHER	5 1.23	4 0.98	9 2.21
UNKNOWN	2 0.49	0 0.00	2 0.49
Total	192 47.17	215 52.83	407 100.00

OTHER IMPROVEMENTS?

TABLE OF Q349_2 BY PTYPE

Q349_2	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	181 44.47	204 50.12	385 94.59
FLUOR LIGHT/ELB	3 0.74	1 0.25	4 0.98
LIGHT EFFICIENCY	0 0.00	1 0.25	1 0.25
WEATHERSTRIPPING	1 0.25	1 0.25	2 0.49
HVAC IMPROVEMNTS	2 0.49	2 0.49	4 0.98
DHW IMPROVEMNTS	0 0.00	1 0.25	1 0.25
PROGRAM THERMOST	0 0.00	1 0.25	1 0.25
EE OFFICE EQUIP	1 0.25	0 0.00	1 0.25
EE DHW DEVICES	2 0.49	0 0.00	2 0.49
OTHER	2 0.49	4 0.98	6 1.47
Total	192 47.17	215 52.83	407 100.00

OTHER IMPROVEMENTS?

TABLE OF Q349_3 BY PTYPE

Q349_3	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	189 46.44	213 52.33	402 98.77
LIGHT EFFICIENCY	0 0.00	1 0.25	1 0.25
WEATHERSTRIPPING	2 0.49	1 0.25	3 0.74
HTNG-ELEC TO GAS	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

MO/YR OF FIRST SERIES OF IMPROVEMENTS?

TABLE OF Q350 BY PTYPE

Q350 / Frequency / Percent	PTYPE: PART	PTYPE: NON-PART	Total
NOT APPLICABLE	152 37.35	163 40.05	315 77.40
<=JUN90	3 0.74	7 1.72	10 2.46
JUL90-DEC90	0 0.00	2 0.49	2 0.49
JAN91-JUN91	5 1.23	10 2.46	15 3.69
JUL91-DEC91	1 0.25	3 0.74	4 0.98
JAN92-JUN92	3 0.74	7 1.72	10 2.46
JUL92-DEC92	5 1.23	5 1.23	10 2.46
JAN93-JUN93	5 1.23	4 0.98	9 2.21
JUL93-DEC93	9 2.21	4 0.98	13 3.19
>=JAN94	2 0.49	7 1.72	9 2.21
UNKNOWN	7 1.72	3 0.74	10 2.46
Total	192 47.17	215 52.83	407 100.00

SECOND SET IMPROVEMENTS OUTSIDE PROGRAM?

TABLE OF Q351 BY PTYPE

Q351	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	183 44.96	206 50.61	389 95.58
FLUOR LIGHT/ELB	0 0.00	1 0.25	1 0.25
WEATHERSTRIPPING	2 0.49	1 0.25	3 0.74
HVAC IMPROVEMNTS	3 0.74	1 0.25	4 0.98
DHW IMPROVEMNTS	0 0.00	1 0.25	1 0.25
PROGRAM THERMOST	1 0.25	2 0.49	3 0.74
EMS	1 0.25	0 0.00	1 0.25
EE MOTORS	0 0.00	1 0.25	1 0.25
OTHER	2 0.49	2 0.49	4 0.98
Total	192 47.17	215 52.83	407 100.00

MO/YR OF SECOND SERIES OF IMPROVEMENTS?

TABLE OF Q352 BY PTYPE

Q352	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	183 44.96	205 50.37	388 95.33
<=JUN90	1 0.25	2 0.49	3 0.74
JUL90-DEC90	1 0.25	0 0.00	1 0.25
JAN91-JUN91	2 0.49	1 0.25	3 0.74
JAN92-JUN92	1 0.25	0 0.00	1 0.25
JUL92-DEC92	2 0.49	2 0.49	4 0.98
JAN93-JUN93	1 0.25	4 0.98	5 1.23
>=JAN94	1 0.25	0 0.00	1 0.25
UNKNOWN	0 0.00	1 0.25	1 0.25
Total	192 47.17	215 52.83	407 100.00

THIRD SET IMPROVEMENTS OUTSIDE PROGRAM?

TABLE OF Q353 BY PTYPE

Q353	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	191 46.93	215 52.83	406 99.75
OTHER	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

MO/YR OF THIRD SERIES OF IMPROVEMENTS?

TABLE OF Q354 BY PTYPE

Q354	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	191 46.93	215 52.83	406 99.75
JUL91-DEC91	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

SELF-INITIATED OR UTILITY OR BOTH?

TABLE OF Q355 BY PTYPE

Q355	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	152 37.35	163 40.05	315 77.40
SELF-INITIATED	30 7.37	45 11.06	75 18.43
UTILITY-SPONSOR	3 0.74	4 0.98	7 1.72
BOTH	1 0.25	1 0.25	2 0.49
UNKNOWN	6 1.47	2 0.49	8 1.97
Total	192 47.17	215 52.83	407 100.00

PARTICIPATION IN ANY OTHER PROGRAMS?

TABLE OF Q360 BY PTYPE

Q360	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	6	3	9
	1.47	0.74	2.21
NO	186	207	393
	45.70	50.86	96.56
UNKNOWN	0	5	5
	0.00	1.23	1.23
Total	192	215	407
	47.17	52.83	100.00

OTHER PROGRAM NAME?

TABLE OF Q370 BY PTYPE

Q370	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	186	212	398
	45.70	52.09	97.79
SEE COMMENT LOG	6	3	9
	1.47	0.74	2.21
Total	192	215	407
	47.17	52.83	100.00

HEATING SYSTEM IN FACILITY?

TABLE OF Q380 BY PTYPE

Q380	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	168	194	362
	41.28	47.67	88.94
NO	24	21	45
	5.90	5.16	11.06
Total	192	215	407
	47.17	52.83	100.00

PRIMARY HEATING FUEL?

TABLE OF Q390 BY PTYPE

Q390	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	24	21	45
	5.90	5.16	11.06
ELECTRIC	92	98	190
	22.60	24.08	46.68
NATURAL GAS	59	71	130
	14.50	17.44	31.94
OTHER	6	10	16
	1.47	2.46	3.93
STEAM	6	8	14
	1.47	1.97	3.44
ELECTRIC & GAS	2	5	7
	0.49	1.23	1.72
UNKNOWN	3	2	5
	0.74	0.49	1.23
Total	192	215	407
	47.17	52.83	100.00

CHANGE IN HEATING SYSTEM SINCE 1/90?

TABLE OF Q400 BY PTYPE

Q400	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	24	21	45
	5.90	5.16	11.06
YES	38	25	63
	9.34	6.14	15.48
NO	129	165	294
	31.70	40.54	72.24
UNKNOWN	1	4	5
	0.25	0.98	1.23
Total	192	215	407
	47.17	52.83	100.00

OLD HEATING SYSTEM REPLACED?

TABLE OF Q410 BY PTYPE

Q410	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	154 37.84	190 46.68	344 84.52
YES	18 4.42	13 3.19	31 7.62
NO	20 4.91	11 2.70	31 7.62
UNKNOWN	0 0.00	1 0.25	1 0.25
Total	192 47.17	215 52.83	407 100.00

MO/YR OF HEATING SYSTEM CHANGE?

TABLE OF Q411 BY PTYPE

Q411	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	174 42.75	202 49.63	376 92.38
JAN91-JUN91	1 0.25	1 0.25	2 0.49
JUL91-DEC91	2 0.49	0 0.00	2 0.49
JAN92-JUN92	3 0.74	4 0.98	7 1.72
JUL92-DEC92	1 0.25	5 1.23	6 1.47
JAN93-JUN93	4 0.98	2 0.49	6 1.47
JUL93-DEC93	3 0.74	0 0.00	3 0.74
>=JAN94	2 0.49	1 0.25	3 0.74
UNKNOWN	2 0.49	0 0.00	2 0.49
Total	192 47.17	215 52.83	407 100.00

ANOTHER HEATING SYSTEM ADDED?

TABLE OF Q412 BY PTYPE

Q412	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	154	190	344
	37.84	46.68	84.52
YES	12	8	20
	2.95	1.97	4.91
NO	26	16	42
	6.39	3.93	10.32
UNKNOWN	0	1	1
	0.00	0.25	0.25
Total	192	215	407
	47.17	52.83	100.00

MO/YR OF HEATING SYSTEM ADDITION?

TABLE OF Q413 BY PTYPE

Q413	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	180	207	387
	44.23	50.86	95.09
<=JUN90	2	0	2
	0.49	0.00	0.49
JAN91-JUN91	1	0	1
	0.25	0.00	0.25
JUL91-DEC91	1	0	1
	0.25	0.00	0.25
JAN92-JUN92	3	3	6
	0.74	0.74	1.47
JUL92-DEC92	1	0	1
	0.25	0.00	0.25
JAN93-JUN93	1	2	3
	0.25	0.49	0.74
JUL93-DEC93	3	1	4
	0.74	0.25	0.98
UNKNOWN	0	2	2
	0.00	0.49	0.49
Total	192	215	407
	47.17	52.83	100.00

CHANGE IN HEATING FUEL?

TABLE OF Q414 BY PTYPE

Q414	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	154 37.84	190 46.68	344 84.52
YES	7 1.72	5 1.23	12 2.95
NO	29 7.13	19 4.67	48 11.79
UNKNOWN	2 0.49	1 0.25	3 0.74
Total	192 47.17	215 52.83	407 100.00

MO/YR OF HEATING FUEL CHANGE?

TABLE OF Q416 BY PTYPE

Q416	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	185 45.45	210 51.60	395 97.05
JAN91-JUN91	0 0.00	1 0.25	1 0.25
JUL91-DEC91	1 0.25	0 0.00	1 0.25
JAN92-JUN92	0 0.00	1 0.25	1 0.25
JUL92-DEC92	0 0.00	1 0.25	1 0.25
JAN93-JUN93	2 0.49	0 0.00	2 0.49
JUL93-DEC93	2 0.49	0 0.00	2 0.49
>=JAN94	0 0.00	2 0.49	2 0.49
UNKNOWN	2 0.49	0 0.00	2 0.49
Total	192 47.17	215 52.83	407 100.00

PRIOR HEATING FUEL?

TABLE OF Q420 BY PTYPE

Q420	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	185	210	395
	45.45	51.60	97.05
ELECTRIC	3	1	4
	0.74	0.25	0.98
NATURAL GAS	1	1	2
	0.25	0.25	0.49
OTHER	2	3	5
	0.49	0.74	1.23
PROPANE	1	0	1
	0.25	0.00	0.25
Total	192	215	407
	47.17	52.83	100.00

OTHER HEATING CHANGES?

TABLE OF Q425 BY PTYPE

Q425	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	154	190	344
	37.84	46.68	84.52
YES	10	4	14
	2.46	0.98	3.44
NO	27	21	48
	6.63	5.16	11.79
UNKNOWN	1	0	1
	0.25	0.00	0.25
Total	192	215	407
	47.17	52.83	100.00

MO/YR OF OTHER HEATING SYSTEM CHANGES?

TABLE OF Q430 BY PTYPE

Q430	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	182	211	393
	44.72	51.84	96.56
JUL90-DEC90	0	1	1
	0.00	0.25	0.25
JAN91-JUN91	2	0	2
	0.49	0.00	0.49
JUL91-DEC91	1	0	1
	0.25	0.00	0.25
JAN92-JUN92	2	0	2
	0.49	0.00	0.49
JUL92-DEC92	1	1	2
	0.25	0.25	0.49
JAN93-JUN93	2	1	3
	0.49	0.25	0.74
JUL93-DEC93	2	0	2
	0.49	0.00	0.49
>=JAN94	0	1	1
	0.00	0.25	0.25
Total	192	215	407
	47.17	52.83	100.00

COOLING SYSTEM IN FACILITY?

TABLE OF Q440 BY PTYPE

Q440	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	135	128	263
	33.17	31.45	64.62
NO	57	87	144
	14.00	21.38	35.38
Total	192	215	407
	47.17	52.83	100.00

CHANGE IN COOLING SYSTEM SINCE 1/90?

TABLE OF Q450 BY PTYPE

Q450	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	57 14.00	87 21.38	144 35.38
YES	27 6.63	18 4.42	45 11.06
NO	108 26.54	108 26.54	216 53.07
UNKNOWN	0 0.00	2 0.49	2 0.49
Total	192 47.17	215 52.83	407 100.00

OLD COOLING SYSTEM REPLACED?

TABLE OF Q460 BY PTYPE

Q460	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	165 40.54	197 48.40	362 88.94
YES	13 3.19	8 1.97	21 5.16
NO	13 3.19	10 2.46	23 5.65
UNKNOWN	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

MO/YR OF COOLING SYSTEM CHANGE?

TABLE OF Q461 BY PTYPE

Q461	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	179 43.98	207 50.86	386 94.84
JAN91-JUN91	1 0.25	2 0.49	3 0.74
JUL91-DEC91	1 0.25	0 0.00	1 0.25
JAN92-JUN92	2 0.49	0 0.00	2 0.49
JUL92-DEC92	1 0.25	3 0.74	4 0.98
JAN93-JUN93	5 1.23	1 0.25	6 1.47
JUL93-DEC93	2 0.49	0 0.00	2 0.49
>=JAN94	0 0.00	1 0.25	1 0.25
UNKNOWN	1 0.25	1 0.25	2 0.49
Total	192 47.17	215 52.83	407 100.00

ANOTHER COOLING SYSTEM ADDED?

TABLE OF Q462 BY PTYPE

Q462	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	165 40.54	197 48.40	362 88.94
YES	9 2.21	9 2.21	18 4.42
NO	17 4.18	9 2.21	26 6.39
UNKNOWN	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

MO/YR OF COOLING SYSTEM ADDITION?

TABLE OF Q463 BY PTYPE

Q463	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	183 44.96	206 50.61	389 95.58
<=JUN90	1 0.25	1 0.25	2 0.49
JUL90-DEC90	2 0.49	0 0.00	2 0.49
JAN91-JUN91	1 0.25	3 0.74	4 0.98
JAN92-JUN92	4 0.98	1 0.25	5 1.23
JAN93-JUN93	0 0.00	4 0.98	4 0.98
JUL93-DEC93	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

OTHER COOLING CHANGES?

TABLE OF Q464 BY PTYPE

Q464	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	165 40.54	197 48.40	362 88.94
YES	7 1.72	5 1.23	12 2.95
NO	19 4.67	13 3.19	32 7.86
UNKNOWN	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

MO/YR OF OTHER COOLING SYSTEM CHANGES?

TABLE OF Q470 BY PTYPE

Q470	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	185	210	395
	45.45	51.60	97.05
JAN91-JUN91	2	3	5
	0.49	0.74	1.23
JUL91-DEC91	1	0	1
	0.25	0.00	0.25
JAN92-JUN92	1	0	1
	0.25	0.00	0.25
JAN93-JUN93	2	1	3
	0.49	0.25	0.74
>=JAN94	0	1	1
	0.00	0.25	0.25
UNKNOWN	1	0	1
	0.25	0.00	0.25
Total	192	215	407
	47.17	52.83	100.00

REFRIGERATION SYSTEM IN FACILITY?

TABLE OF Q480 BY PTYPE

Q480	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	43	44	87
	10.57	10.81	21.38
NO	149	168	317
	36.61	41.28	77.89
UNKNOWN	0	3	3
	0.00	0.74	0.74
Total	192	215	407
	47.17	52.83	100.00

CHANGE IN FRIDGE SYSTEM SINCE 1/90?

TABLE OF Q490 BY PTYPE

Q490	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	149	171	320
	36.61	42.01	78.62
YES	16	11	27
	3.93	2.70	6.63
NO	27	33	60
	6.63	8.11	14.74
Total	192	215	407
	47.17	52.83	100.00

OLD REFRIGERATION SYSTEM REPLACED?

TABLE OF Q500 BY PTYPE

Q500	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	176	204	380
	43.24	50.12	93.37
YES	6	4	10
	1.47	0.98	2.46
NO	10	6	16
	2.46	1.47	3.93
UNKNOWN	0	1	1
	0.00	0.25	0.25
Total	192	215	407
	47.17	52.83	100.00

ANOTHER REFRIGERATION SYSTEM ADDED?

TABLE OF Q501 BY PTYPE

Q501	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	182	208	390
	44.72	51.11	95.82
YES	7	5	12
	1.72	1.23	2.95
NO	3	1	4
	0.74	0.25	0.98
UNKNOWN	0	1	1
	0.00	0.25	0.25
Total	192	215	407
	47.17	52.83	100.00

OTHER REFRIGERATION CHANGES?

TABLE OF Q502 BY PTYPE

Q502	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	189 46.44	213 52.33	402 98.77
YES	2 0.49	1 0.25	3 0.74
NO	1 0.25	0 0.00	1 0.25
UNKNOWN	0 0.00	1 0.25	1 0.25
Total	192 47.17	215 52.83	407 100.00

MO/YR OF REFRIGERATION SYSTEM CHANGES?

TABLE OF Q510 BY PTYPE

Q510	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	176 43.24	204 50.12	380 93.37
<=JUN90	1 0.25	0 0.00	1 0.25
JAN91-JUN91	2 0.49	1 0.25	3 0.74
JUL91-DEC91	3 0.74	0 0.00	3 0.74
JAN92-JUN92	4 0.98	0 0.00	4 0.98
JUL92-DEC92	1 0.25	0 0.00	1 0.25
JAN93-JUN93	0 0.00	2 0.49	2 0.49
JUL93-DEC93	2 0.49	4 0.98	6 1.47
>=JAN94	1 0.25	3 0.74	4 0.98
UNKNOWN	2 0.49	1 0.25	3 0.74
Total	192 47.17	215 52.83	407 100.00

CHANGE IN LIGHTING SYSTEM SINCE 1/90?

TABLE OF Q520 BY PTYPE

Q520	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	33	25	58
	8.11	6.14	14.25
NO	159	187	346
	39.07	45.95	85.01
UNKNOWN	0	3	3
	0.00	0.74	0.74
Total	192	215	407
	47.17	52.83	100.00

OLD LIGHTING SYSTEM REPLACED?

TABLE OF Q530 BY PTYPE

Q530	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	159	190	349
	39.07	46.68	85.75
YES	25	12	37
	6.14	2.95	9.09
NO	8	13	21
	1.97	3.19	5.16
Total	192	215	407
	47.17	52.83	100.00

MO/YR OF LIGHTING SYSTEM CHANGE?

TABLE OF Q531 BY PTYPE

Q531	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	167 41.03	203 49.88	370 90.91
<=JUN90	0 0.00	1 0.25	1 0.25
JAN91-JUN91	5 1.23	1 0.25	6 1.47
JUL91-DEC91	3 0.74	2 0.49	5 1.23
JAN92-JUN92	3 0.74	1 0.25	4 0.98
JUL92-DEC92	3 0.74	0 0.00	3 0.74
JAN93-JUN93	4 0.98	5 1.23	9 2.21
JUL93-DEC93	3 0.74	0 0.00	3 0.74
>=JAN94	1 0.25	2 0.49	3 0.74
UNKNOWN	3 0.74	0 0.00	3 0.74
Total	192 47.17	215 52.83	407 100.00

ANOTHER LIGHTING SYSTEM ADDED?

TABLE OF Q532 BY PTYPE

Q532	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	159 39.07	190 46.68	349 85.75
YES	10 2.46	10 2.46	20 4.91
NO	23 5.65	15 3.69	38 9.34
Total	192 47.17	215 52.83	407 100.00

MO/YR OF LIGHTING SYSTEM ADDITION?

TABLE OF Q533 BY PTYPE

Q533	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	182 44.72	205 50.37	387 95.09
JAN91-JUN91	2 0.49	0 0.00	2 0.49
JUL91-DEC91	2 0.49	0 0.00	2 0.49
JAN92-JUN92	1 0.25	1 0.25	2 0.49
JAN93-JUN93	1 0.25	7 1.72	8 1.97
JUL93-DEC93	2 0.49	1 0.25	3 0.74
>=JAN94	1 0.25	1 0.25	2 0.49
UNKNOWN	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

OTHER LIGHTING CHANGES?

TABLE OF Q534 BY PTYPE

Q534	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	159 39.07	190 46.68	349 85.75
YES	6 1.47	6 1.47	12 2.95
NO	27 6.63	19 4.67	46 11.30
Total	192 47.17	215 52.83	407 100.00

MO/YR OF OTHER LIGHTING SYSTEM CHANGES?

TABLE OF Q540 BY PTYPE

Q540	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	186 45.70	209 51.35	395 97.05
JAN92-JUN92	1 0.25	0 0.00	1 0.25
JAN93-JUN93	1 0.25	3 0.74	4 0.98
JUL93-DEC93	1 0.25	1 0.25	2 0.49
>=JAN94	2 0.49	2 0.49	4 0.98
UNKNOWN	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

DHW SYSTEM IN FACILITY?

TABLE OF Q550 BY PTYPE

Q550	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	176 43.24	198 48.65	374 91.89
NO	16 3.93	17 4.18	33 8.11
Total	192 47.17	215 52.83	407 100.00

PRIMARY DHW FUEL?

TABLE OF Q560 BY PTYPE

Q560	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	16 3.93	17 4.18	33 8.11
ELECTRIC	110 27.03	125 30.71	235 57.74
NATURAL GAS	49 12.04	54 13.27	103 25.31
OTHER	2 0.49	2 0.49	4 0.98
STEAM	8 1.97	6 1.47	14 3.44
PROPANE	2 0.49	0 0.00	2 0.49
ELECTRIC & GAS	3 0.74	2 0.49	5 1.23
UNKNOWN	2 0.49	9 2.21	11 2.70
Total	192 47.17	215 52.83	407 100.00

CHANGE IN DHW SYSTEM SINCE 1/90?

TABLE OF Q570 BY PTYPE

Q570	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	16 3.93	17 4.18	33 8.11
YES	26 6.39	18 4.42	44 10.81
NO	149 36.61	179 43.98	328 80.59
UNKNOWN	1 0.25	1 0.25	2 0.49
Total	192 47.17	215 52.83	407 100.00

OLD DHW SYSTEM REPLACED?

TABLE OF Q580 BY PTYPE

Q580	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	166 40.79	197 48.40	363 89.19
YES	21 5.16	14 3.44	35 8.60
NO	5 1.23	4 0.98	9 2.21
Total	192 47.17	215 52.83	407 100.00

MO/YR OF DHW SYSTEM CHANGE?

TABLE OF Q581 BY PTYPE

Q581	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	171 42.01	201 49.39	372 91.40
<=JUN90	4 0.98	0 0.00	4 0.98
JAN91-JUN91	1 0.25	2 0.49	3 0.74
JAN92-JUN92	4 0.98	3 0.74	7 1.72
JUL92-DEC92	1 0.25	0 0.00	1 0.25
JAN93-JUN93	3 0.74	3 0.74	6 1.47
JUL93-DEC93	6 1.47	1 0.25	7 1.72
>=JAN94	0 0.00	4 0.98	4 0.98
UNKNOWN	2 0.49	1 0.25	3 0.74
Total	192 47.17	215 52.83	407 100.00

ANOTHER DHW SYSTEM ADDED?

TABLE OF Q582 BY PTYPE

Q582	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	166 40.79	197 48.40	363 89.19
YES	6 1.47	6 1.47	12 2.95
NO	20 4.91	12 2.95	32 7.86
Total	192 47.17	215 52.83	407 100.00

MO/YR OF DHW SYSTEM ADDITION?

TABLE OF Q583 BY PTYPE

Q583	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	186 45.70	209 51.35	395 97.05
<=JUN90	1 0.25	0 0.00	1 0.25
JAN92-JUN92	3 0.74	2 0.49	5 1.23
JUL92-DEC92	0 0.00	1 0.25	1 0.25
JAN93-JUN93	1 0.25	3 0.74	4 0.98
JUL93-DEC93	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

CHANGE IN DHW FUEL?

TABLE OF Q584 BY PTYPE

Q584	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	166 40.79	197 48.40	363 89.19
YES	4 0.98	3 0.74	7 1.72
NO	22 5.41	14 3.44	36 8.85
UNKNOWN	0 0.00	1 0.25	1 0.25
Total	192 47.17	215 52.83	407 100.00

MO/YR OF DHW FUEL CHANGE?

TABLE OF Q586 BY PTYPE

Q586	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	188 46.19	212 52.09	400 98.28
<=JUN90	1 0.25	0 0.00	1 0.25
JAN91-JUN91	0 0.00	1 0.25	1 0.25
JAN92-JUN92	1 0.25	0 0.00	1 0.25
JAN93-JUN93	1 0.25	1 0.25	2 0.49
>=JAN94	0 0.00	1 0.25	1 0.25
UNKNOWN	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

PRIOR DHW FUEL?

TABLE OF Q590 BY PTYPE

Q590	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	188 46.19	212 52.09	400 98.28
ELECTRIC	2 0.49	2 0.49	4 0.98
OTHER	0 0.00	1 0.25	1 0.25
STEAM	1 0.25	0 0.00	1 0.25
PROPANE	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

OTHER DHW CHANGES?

TABLE OF Q595 BY PTYPE

Q595	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	166 40.79	197 48.40	363 89.19
YES	2 0.49	2 0.49	4 0.98
NO	24 5.90	16 3.93	40 9.83
Total	192 47.17	215 52.83	407 100.00

MO/YR OF OTHER DHW SYSTEM CHANGES?

TABLE OF Q600 BY PTYPE

Q600	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	190	213	403
	46.68	52.33	99.02
JAN90	1	0	1
	0.25	0.00	0.25
JAN91	0	1	1
	0.00	0.25	0.25
JUN91	1	0	1
	0.25	0.00	0.25
UNKNOWN	0	1	1
	0.00	0.25	0.25
Total	192	215	407
	47.17	52.83	100.00

REMOVED ANY OTHER EQUIPMENT SINCE 1/90?

TABLE OF Q610 BY PTYPE

Q610	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	20	22	42
	4.91	5.41	10.32
NO	170	187	357
	41.77	45.95	87.71
UNKNOWN	2	6	8
	0.49	1.47	1.97
Total	192	215	407
	47.17	52.83	100.00

STOPPED ANY ENERGY-USE JOBS SINCE 1/90?

TABLE OF Q620 BY PTYPE

Q620	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	6	13	19
	1.47	3.19	4.67
NO	184	197	381
	45.21	48.40	93.61
UNKNOWN	2	5	7
	0.49	1.23	1.72
Total	192	215	407
	47.17	52.83	100.00

ADDITION OF OTHER EQUIPMENT SINCE 1/90?

TABLE OF Q630 BY PTYPE

Q630	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	67	82	149
	16.46	20.15	36.61
NO	124	131	255
	30.47	32.19	62.65
UNKNOWN	1	2	3
	0.25	0.49	0.74
Total	192	215	407
	47.17	52.83	100.00

NEW EQUIPMENT TYPE?

TABLE OF Q630_1 BY PTYPE

Q630_1	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	125	134	259
	30.71	32.92	63.64
OFFICE EQUIP	49	71	120
	12.04	17.44	29.48
MACHINE EQUIP	4	1	5
	0.98	0.25	1.23
LIGHTING	1	0	1
	0.25	0.00	0.25
OTHER	12	9	21
	2.95	2.21	5.16
UNKNOWN	1	0	1
	0.25	0.00	0.25
Total	192	215	407
	47.17	52.83	100.00

ADDITIONAL FACTOR AFFECTING USAGE?

TABLE OF Q640 BY PTYPE

Q640	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	24	26	50
	5.90	6.39	12.29
NO	168	189	357
	41.28	46.44	87.71
Total	192	215	407
	47.17	52.83	100.00

ADDITIONAL FACTOR TYPE?

TABLE OF Q640_1 BY PTYPE

Q640_1	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	168 41.28	189 46.44	357 87.71
FLUOR LIGHT/ELB	1 0.25	0 0.00	1 0.25
LIGHT CONTROLS	1 0.25	0 0.00	1 0.25
LIGHT EFFICIENCY	1 0.25	1 0.25	2 0.49
WEATHERSTRIPPING	3 0.74	2 0.49	5 1.23
HVAC IMPROVEMNTS	0 0.00	2 0.49	2 0.49
REFR IMPROVEMNTS	0 0.00	1 0.25	1 0.25
EMS	2 0.49	0 0.00	2 0.49
EE OFFICE EQUIP	5 1.23	1 0.25	6 1.47
OTHER	10 2.46	19 4.67	29 7.13
UNKNOWN	1 0.25	0 0.00	1 0.25
Total	192 47.17	215 52.83	407 100.00

FACILITY ENERGY MANAGER?

TABLE OF Q650 BY PTYPE

Q650	PTYPE		
Frequency / Percent	PART	NON-PART	Total
YES	78 19.16	64 15.72	142 34.89
NO	109 26.78	140 34.40	249 61.18
UNKNOWN	5 1.23	11 2.70	16 3.93
Total	192 47.17	215 52.83	407 100.00

DURATION OF ENERGY MANAGER POSITION?

TABLE OF Q655 BY PTYPE

Q655	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT APPLICABLE	114 28.01	151 37.10	265 65.11
<2 YRS	7 1.72	4 0.98	11 2.70
2 - 5 YRS	17 4.18	7 1.72	24 5.90
5 - 10 YRS	23 5.65	17 4.18	40 9.83
>10 YRS	30 7.37	35 8.60	65 15.97
UNKNOWN	1 0.25	1 0.25	2 0.49
Total	192 47.17	215 52.83	407 100.00

IMPORTANCE OF ENERGY EXPENDITURES?

TABLE OF Q660 BY PTYPE

Q660	PTYPE		
Frequency Percent	PART	NON-PART	Total
NOT IMPORTANT	5 1.23	20 4.91	25 6.14
SOME IMPORTANT	25 6.14	34 8.35	59 14.50
IMPORTANT	45 11.06	56 13.76	101 24.82
VERY IMPORTANT	55 13.51	54 13.27	109 26.78
XTRMLY IMPORTANT	48 11.79	33 8.11	81 19.90
UNKNOWN	14 3.44	18 4.42	32 7.86
Total	192 47.17	215 52.83	407 100.00

EXPECTED % SAVINGS FROM MEASURES?

TABLE OF Q670 BY PTYPE

Q670	PTYPE		
Frequency / Percent	PART	NON-PART	Total
0% - 5%	12 2.95	18 4.42	30 7.37
6% - 10%	22 5.41	22 5.41	44 10.81
11% - 15%	18 4.42	21 5.16	39 9.58
16% - 25%	40 9.83	36 8.85	76 18.67
25%+	38 9.34	31 7.62	69 16.95
UNKNOWN	62 15.23	87 21.38	149 36.61
Total	192 47.17	215 52.83	407 100.00

EXPECTATIONS EXCEEDED, MET, OR NOT MET?

TABLE OF Q680 BY PTYPE

Q680	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT APPLICABLE	62 15.23	215 52.83	277 68.06
EXCEEDED	19 4.67	0 0.00	19 4.67
MET	80 19.66	0 0.00	80 19.66
NOT MET	10 2.46	0 0.00	10 2.46
UNKNOWN	21 5.16	0 0.00	21 5.16
Total	192 47.17	215 52.83	407 100.00

$ BILL REDUCTION PER $1000 EXPENDITURE?

TABLE OF Q690 BY PTYPE

Q690	PTYPE		
Frequency Percent	PART	NON-PART	Total
<$200	17 4.18	17 4.18	34 8.35
$200 - $500	73 17.94	53 13.02	126 30.96
$500 - $1000	15 3.69	15 3.69	30 7.37
$1000 - $1500	5 1.23	27 6.63	32 7.86
$1500 - $2000	2 0.49	1 0.25	3 0.74
>$2000	4 0.98	4 0.98	8 1.97
UNKNOWN	76 18.67	98 24.08	174 42.75
Total	192 47.17	215 52.83	407 100.00

HOURS EFFORT FOR PROGRAM PARTICIPATION?

TABLE OF Q700 BY PTYPE

Q700	PTYPE		
Frequency Percent	PART	NON-PART	Total
<10	56 13.76	76 18.67	132 32.43
10-20	51 12.53	35 8.60	86 21.13
20-30	18 4.42	15 3.69	33 8.11
30-40	9 2.21	6 1.47	15 3.69
40-50	7 1.72	9 2.21	16 3.93
>50	28 6.88	10 2.46	38 9.34
UNKNOWN	23 5.65	64 15.72	87 21.38
Total	192 47.17	215 52.83	407 100.00

CONVENIENCE LEVEL OF PROGRAM PAPERWORK?

TABLE OF Q710 BY PTYPE

Q710	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NO DIFFICULTY	67	27	94
	16.46	6.63	23.10
MINOR DIFFICULTY	103	120	223
	25.31	29.48	54.79
MAJOR DIFFICULTY	7	32	39
	1.72	7.86	9.58
UNKNOWN	15	36	51
	3.69	8.85	12.53
Total	192	215	407
	47.17	52.83	100.00

IMPORTANCE OF BILL REDUCTION?

TABLE OF Q720 BY PTYPE

Q720	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT IMPORTANT	5	10	15
	1.23	2.46	3.69
SOME IMPORTANT	12	10	22
	2.95	2.46	5.41
IMPORTANT	32	33	65
	7.86	8.11	15.97
VERY IMPORTANT	39	47	86
	9.58	11.55	21.13
XTRMLY IMPORTANT	89	97	186
	21.87	23.83	45.70
UNKNOWN	15	18	33
	3.69	4.42	8.11
Total	192	215	407
	47.17	52.83	100.00

IMPORTANCE OF CHANGES IN COMFORT?

TABLE OF Q730 BY PTYPE

Q730 / Frequency / Percent	PTYPE: PART	PTYPE: NON-PART	Total
NOT IMPORTANT	27	18	45
	6.63	4.42	11.06
SOME IMPORTANT	19	14	33
	4.67	3.44	8.11
IMPORTANT	36	52	88
	8.85	12.78	21.62
VERY IMPORTANT	43	46	89
	10.57	11.30	21.87
XTRMLY IMPORTANT	55	58	113
	13.51	14.25	27.76
UNKNOWN	12	27	39
	2.95	6.63	9.58
Total	192	215	407
	47.17	52.83	100.00

IMPORTANCE OF ENERGY EFFICIENCY?

TABLE OF Q740 BY PTYPE

Q740 / Frequency / Percent	PTYPE: PART	PTYPE: NON-PART	Total
NOT IMPORTANT	4	7	11
	0.98	1.72	2.70
SOME IMPORTANT	11	18	29
	2.70	4.42	7.13
IMPORTANT	41	47	88
	10.07	11.55	21.62
VERY IMPORTANT	52	59	111
	12.78	14.50	27.27
XTRMLY IMPORTANT	76	67	143
	18.67	16.46	35.14
UNKNOWN	8	17	25
	1.97	4.18	6.14
Total	192	215	407
	47.17	52.83	100.00

IMPORTANCE OF SIMULTANEOUS REMODELLING?

TABLE OF Q750 BY PTYPE

Q750	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT IMPORTANT	64 15.72	34 8.35	98 24.08
SOME IMPORTANT	20 4.91	17 4.18	37 9.09
IMPORTANT	35 8.60	37 9.09	72 17.69
VERY IMPORTANT	24 5.90	38 9.34	62 15.23
XTRMLY IMPORTANT	31 7.62	58 14.25	89 21.87
UNKNOWN	18 4.42	31 7.62	49 12.04
Total	192 47.17	215 52.83	407 100.00

IMPORTANCE OF CORPORATE IMAGE?

TABLE OF Q760 BY PTYPE

Q760	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT IMPORTANT	39 9.58	38 9.34	77 18.92
SOME IMPORTANT	26 6.39	39 9.58	65 15.97
IMPORTANT	35 8.60	26 6.39	61 14.99
VERY IMPORTANT	31 7.62	31 7.62	62 15.23
XTRMLY IMPORTANT	43 10.57	52 12.78	95 23.34
UNKNOWN	18 4.42	29 7.13	47 11.55
Total	192 47.17	215 52.83	407 100.00

IMPORTANCE OF ENVIRONMENT?

TABLE OF Q770 BY PTYPE

Q770	PTYPE		
Frequency / Percent	PART	NON-PART	Total
NOT IMPORTANT	15	9	24
	3.69	2.21	5.90
SOME IMPORTANT	16	17	33
	3.93	4.18	8.11
IMPORTANT	46	38	84
	11.30	9.34	20.64
VERY IMPORTANT	40	50	90
	9.83	12.29	22.11
XTRMLY IMPORTANT	67	82	149
	16.46	20.15	36.61
UNKNOWN	8	19	27
	1.97	4.67	6.63
Total	192	215	407
	47.17	52.83	100.00

C

ON-SITE SURVEY RESULTS

Site-specific results of the retrofit evaluation on-site survey are presented in this appendix.

RETROFIT EVALUATION ON-SITE SUMMARY

ISSUE INVESTIGATED	CHANGE IN TENANTS	EQUIPMENT INCREASE	EQUIPMENT DECREASE	MORE MEASURES	FEWER MEASURES	OPERATIONS INCREASE	OPERATIONS DECREASE	UNUSUAL OCCURRENCE	NO EXPLANATION	METERS LISTED	METERS FOUND	FACILITY SQFT	ANNUAL KWH IMPACT	TEXT
NON PARTICIPANT LOAD INCREASE		1								1	1	6,000	7,500	ADDED USE OF BASEBOARD HEATERS, 12/92
NON PARTICIPANT SAVINGS			1							1	1	1,200	0	REMOVAL OF ELECTRIC KILN, 2/92
NON PARTICIPANT LOAD INCREASE								1		1	1	3,000	0	MAJOR STORM DOWNED A TREE INTO THEIR BUSINESS 12/92. PHONE SURVEY MENTIONS HEAT AND AC CHANGES IN 10/92 BUT NO DETAILS ARE PROVIDED. SIZE INCREASE?
NON PARTICIPANT SAVINGS									1	1	1	4,000	0	NEED TO REVIEW BILLING DATA
LOWER-THAN-EXPECTED SAVINGS		1								2	2	10,000	3,256	INITIAL SAVINGS ESTIMATE TOO HIGH, HEAT PUMP ADDED 6/92
LOWER-THAN-EXPECTED SAVINGS									1	3	2	4,000	0	PHONE SURVEY AND MEASURES LISTED FROM TRACKING INDICATE THAT THE INITIAL SAVINGS ESTIMATE APPEARS HIGH
LOWER-THAN-EXPECTED SAVINGS						1				2	2	5,780	0	EXAGGERATED INITIAL SAVINGS ESTIMATE, UTILITY CONCURRED, ALSO INCREASED ELEC HEATING USE
LOWER THAN EXPECTED SAVINGS									1	1	2	32,000	0	SMALL SAVINGS CHANGES RELATIVE TO TOTAL ENERGY CONSUMPTION, OWNER HAPPLY AND HAS SUBSEQUENTLY ADDED MORE LIGHTING MEASURES
LOAD INCREASE									1	3	4	130,600	0	VERY SMALL SAVINGS AND LOAD CHANGES RELATIVE TO TOTAL LOAD
LOAD INCREASE									1	1	2	8,000	0	MISSING METER?
LOWER THAN EXPECTED SAVINGS									1	1	1	33,000	0	SAVINGS 15%, TRACKING SAVINGS ARE 107% OF PRE-BILL
LOAD INCREASE		1				1				1	1	10,000	39,724	MAJOR FLOOR SPACE EXPANSION, LIGHTS AND EQUIPMENT ADDED (14 KW) 10/92
LOAD INCREASE, HIGH EXPECTED SAVINGS RELATIVE TO PRE- BILL	1									1	2	22,400	X	CHANGE OF TENANT, 10/92

RETROFIT EVALUATION ON-SITE SUMMARY

ISSUE INVESTIGATED	CHANGE IN TENANTS	EQUIPMENT INCREASE	EQUIPMENT DECREASE	MORE MEASURES	FEWER MEASURES	OPERATIONS INCREASE	OPERATIONS DECREASE	UNUSUAL OCCURRENCE	NO EXPLANATION	METERS LISTED	METERS FOUND	FACILITY SQFT	ANNUAL KWH IMPACT	TEXT
LOAD INCREASE						1				2	2	16,000	44,000	BUSINESS INCREASE ABOUT 10%, OCCUPANCY INCREASE FROM 50% TO 60%, 11/92
LOAD INCREASE						1				1	2	40,000	450,000	INCREASED BOILER USE FROM 75 TO 100 HRS PER WEEK ,10/92
LOAD INCREASE, HIGH EXPECTED SAVINGS RELATIVE TO PRE- BILL						1				1	3	4,000	7,300	CLIENT LIST GREW FROM 120 TO 250. ENERGY CONSUMPTION PROPORTIONAL TO NUMBER OF CLIENTS 9/91. ALSO, INITIAL SAVINGS ASSUMPTIONS HIGH FOR GLAZING MEASURES AND A POSSIBLE METER MISS COUNT.
LOAD INCREASE						1				1	1	3,250	10,400	BUSINESS INCREASE AND OPERATING HOURS INCREASE FROM 50 TO 63 HRS PER WEEK. INITIAL ESTIMATED SAVINGS HIGH AT 54% OF PRE- BILL
LOWER THAN EXPECTED SAVINGS, HIGH EXPECTED SAVINGS RELATIVE TO PRE- BILL									1	1	1	3,000	0	SAVINGS 4% (INSULATION AND CFLS) FOR 40 - 45 HR PER WEEK OCCUPANCY, PHONE SURVEY SAID INCREASED ACTIVITY, TRACKING SAVINGS AT 164% OF PRE- BILL
LOAD INCREASE, SAVINGS GREATER THAN BILL						1				1	1	20,000	13,200	HOURS OF OPERATION INCREASED FROM 40 TO 56 HOURS, LATE 91
LOAD INCREASE	1					1				1	3	300,000	X	BUILDING VACANT PRIOR TO 8/91
LOAD INCREASE, HIGH EXPECTED SAVINGS								1		1	2	10,000	1,807	SAVINGS EXPECTATIONS VERY HIGH @60%. ADDED (3) 150 W HPS TO EXTERIOR DUE TO BREAK-INS. 12/91
LOAD INCREASE		1								1	1	17,000	34,744	ADDED LIGHTING AND HEAT PUMP DURING RETROFIT, PREVIOUSLY NO AC 12/91(ALL MEASURES WERE ADD - ON NOT REPLACEMENTS)
LOAD INCREASE		1				1				1	1	12,000	26,460	ADDED EQUIPMENT, CHANGE OF USE 6/91
LOAD INCREASE		1								1	1	11,000	40,296	ADDED ICE CREAM FREEZER, 5/91

RETROFIT EVALUATION ON-SITE SUMMARY

ISSUE INVESTIGATED	CHANGE IN TENANTS	EQUIPMENT INCREASE	EQUIPMENT DECREASE	MORE MEASURES	FEWER MEASURES	OPERATIONS INCREASE	OPERATIONS DECREASE	UNUSUAL OCCURRENCE	NO EXPLANATION	METERS LISTED	METERS FOUND	FACILITY SQFT	ANNUAL KWH IMPACT	TEXT
LOAD INCREASE						1				1	1	10,000	16,472	INCREASED EMPLOYEES (9 TO 16), EQUIPMENT (COMPUTERS ETC.) SPACE (8,000 TO 10,000 SQ FT) AND ADDED 2 AC UNITS, 1/92-4/92
LOAD INCREASE						1				2	1	45,372	960,000	OPENED NEW WING INCREASING SPACE FROM 25,000 TO 45,375 SQ FT 9/92
LOAD INCREASE						1				5	4	20,000	8,800,000	BUSINESS INCREASED 20% - 30% SINCE 10/92. THE COMPANY PRODUCES NITROGEN SO AN INCREASE IN PRODUCT IS PROPORTIONAL TO AN INCREASE IN ELECTRIC CONSUMPTION
LOAD INCREASE		1								2	1	6,600	8,400	CUSTOMER REPAIRED A NON-OPERATIONAL 4-TON HEAT PUMP DURING THE RETROFIT, 12/92
LOAD INCREASE, HIGH EXPECTED SAVINGS	1									1	3	24,000	X	PHONE SURVEY REVEALED A REMODEL 1/92 AND TENANT CHANGE 12/92, ALSO A POSSIBLE METER DISCREPANCY
SAVINGS NOT FOUND						1				2	2	25,000	175,000	ADDED 2ND SHIFT NEARLY DOUBLING USAGE HOURS, 10/92
SMALL LOAD INCREASE INSTEAD OF SMALL SAVINGS				1		1				1	2	123,000	0	INCREASE OCCUPANCY; ADDED EMS IN 6/92
LARGE CUSTOMER (VERIFICATION)										6	NA	86,459	-100,183	VERIFICATION OF SAVINGS FOR LARGE CUSTOMER. INSTALLED ADDITIONAL MEASURES 10/91
LOAD INCREASE		1				1				1	1	66,000	160,000	NEW CHILLER (50 TON TO 70 TON) 10/93, MAJOR TENANT (50% OF BLDG) BROUGHT IN 200 COMPUTERS STARTING 1/90
NO SAVINGS FOUND, LOAD INCREASE									1	2	2	500,000	0	NO EXPLANATION FOR LOAD INCREASE, VERIFIED 200+ CFLS IN PLACE
LOAD INCREASE INSTEAD OF SAVINGS		1				1				1	2	100,000	400,100	ADDED 15HP COMPRESSOR/80HP CIRC FANS AND INCREASED LIGHTING FROM 20 TO 24 HRS/DAY - 7/91; ADDED 10,000 SQFT COOLER 7/92;
LOAD INCREASE						1				1	1	20,000	231,000	INCREASED OPERATING HOURS BEGINNING 10/91 - ADDING A SECOND SHIFT TO HALF THE FACILITY - 33% INCREASE IN HOURS

RETROFIT EVALUATION ON-SITE SUMMARY

ISSUE INVESTIGATED	CHANGE IN TENANTS	EQUIPMENT INCREASE	EQUIPMENT DECREASE	MORE MEASURES	FEWER MEASURES	OPERATIONS INCREASE	OPERATIONS DECREASE	UNUSUAL OCCURRENCE	NO EXPLANATION	METERS LISTED	METERS FOUND	FACILITY SQFT	ANNUAL KWH IMPACT	TEXT
LOAD DECREASE MUCH GREATER THAN ESTIMATED SAVINGS				1						2	2	200,000	-1,400,000	INSTALLED ADDITIONAL HVAC MEASURES AT TIME OF RETROFIT - EMS/REBUILT CHILLER/VSDS
LOAD INCREASE		1		1		1			1	2	1	870,000	0	INCREASING OCCUPANTS/ALSO INSTALLED A VARIETY OF MEASURES - PROGRAM SAVINGS VERY SMALL RELATIVE TO ANNUAL LOAD
NO SAVINGS FOUND						1				3	3	25,000	21,980	USING FACILITY MORE INTENSIVELY, GYM USED NIGHTLY/OFFICE AND WING USED ON WEEKENDS, 9/91
LOAD INCREASE						1				1	2	4,000	16,000	STEADY 3%/YEAR GROWTH SINCE 9/91
LOAD INCREASE/NO SAVINGS						1				1	1	20,000	11,925	33% INCREASE IN HOURS OF MEASURE LIGHTS - PREVIOUS LIGHTS WERE TURNED OFF WHEN NOT IN USE
LOAD INCREASE INSTEAD OF SAVINGS		1				1				3	3	20,000	248,481	CONVERTED 6000 SQFT TO REFRIGERATION - 55 HP OF COMPRESSORS - 6/91; ADDED 3000 SQFT OFFICE - 15 PCS, LIGHTING, 1 5 TON HP 5/92
LOAD DECREASE MUCH GREATER THAN ESTIMATED SAVINGS				1						11	11	400,000	-1,470,000	INSTALLED EMS ON 1200 HP OF REFRIGERATION MOTORS - APPROX 20% SAVINGS
LOWER THAN EXPECTED SAVINGS									1	2	2	85,000	0	NO REASON; ALL LIGHTING MEASURES AND SAVINGS APPEAR TO BE BASED ON 24HR/DAY USE
LOAD INCREASE	1									3	3	25,000	X	CUSTOMER OCCUPIED BUILDING IN 6/91 - MEASURES INSTALLED IN FALL 91
LOAD INCREASE									1	2	2	282,000	0	SMALL SAVINGS RELATIVE TO LOAD, NO EXPLANATION FOR CHANGE
LOAD INCREASE		1				1						50,300	220,000	ADDED 800 SQFT FREEZER, 5/92; ADDED 2ND FULL PRODUCTION SHIFT (10% ELEC INCREASE), 5/92
LOWER THAN EXPECTED SAVINGS									1	3	3	232,112	0	NO EXPLANATION
GRADUAL LOAD INCREASE/SAVINGS NOT FOUND		1				1				3	3	15,000	10,800	ADDED AC AND DISHWASHER, 7/92; EST. SAVINGS VERY SMALL RELATIVE TO TOTAL LOAD
SLIGHT LOAD INCREASE INSTEAD OF SAVINGS		1				1				1	1	5,000	7,804	WENT FROM 8 TO 11 EMPLOYEES (WITH ADDITIONAL COMPUTERS, HOURS INCREASED BY 5/WEEK, 6/92

RETROFIT EVALUATION ON-SITE SUMMARY

ISSUE INVESTIGATED	CHANGE IN TENANTS	EQUIPMENT INCREASE	EQUIPMENT DECREASE	MORE MEASURES	FEWER MEASURES	OPERATIONS INCREASE	OPERATIONS DECREASE	UNUSUAL OCCURRENCE	NO EXPLANATION	METERS LISTED	METERS FOUND	FACILITY SQFT	ANNUAL KWH IMPACT	TEXT
LOAD INCREASE						1				1	1	450,000	66,500	ENROLLMENT INCREASE SINCE 8/92 CAUSING INCREASED LIGHTING LOAD
LOAD DECREASE MUCH GREATER THAN ESTIMATED SAVINGS									1	1	1	55,000	0	NO EXPLANATION
SAVINGS LESS THAN EXPECTED		1								1	2	5,000	7,700	ADDED AC AND BASEBOARD HEAT AT TIME OF RETROFIT, 9/92
DRAMATIC LOAD INCREASE		1				1				1	1	13,800	90,000	ADDED 3000 SQFT OFFICE AND 2000 SQFT MFG, 10/91
NONPARTICIPANT LOAD DECLINE				1						4	4	29,000	0	REPLACED RESISTANCE HEAT/AC WITH HEAT PUMPS, 6/91
LOAD DECREASE							1			1		8,000	-109,500	GRADUAL DECREASE IN BUSINESS - 50%
LOAD DECREASE				1						2	2	17,000	0	ENCLOSED CARGO LOADING AREA, 11/91 - LESSENS SPACE CONDITIONING LOAD
LARGE LOAD DECREASE							1			1	1	44,000	-83,333	BUILDING CLOSED TO PUBLIC, 11/91-8/94; HVAC STILL USED AND SOME STAFFERS; ALSO HOSTED SPECIAL EVENTS
LOAD INCREASE	1					1				2	1	94,500	472,500	AT TIME OF REMODEL AND SHUTDOWN THERE WAS A CONVERSION FROM REHAB CENTER WITH 25% OCCUPANCY TO OFFICES WITH HIGH OCCUPANCY
LOAD INCREASE		1				1				1	1	2,500	12,096	INCREASE OF EMPLOYEES FORM 4 TO 20, OPERATING HOURS FROM 55 TO 65 PER WEEK, AND EQUIPMENT
SAVINGS SMALLER THAN EXPECTED									1	1	1	15,000	0	INITIAL SAVINGS ESTIMATE 199% OF TOTAL CONSUMPTION, CURRENT ENERGY SAVINGS REASONABLE.
NO SAVINGS FOUND/SLIGHT LOAD INCREASE						1				3	2	9,200	1,440	6 ROOM SCHOOL, PRIOR TO 9/92 THEY WERE ONLY USING 4 ROOMS (ALTHOUGH HEATING ALL 6 WITH HEATPUMP), 9/92 - SAVINGS SMALL RELATIVE TO LOAD
SAVINGS SMALLER THAN EXPECTED									1	2	1	55,000	0	UNKNOWN

RETROFIT EVALUATION ON-SITE SUMMARY

ISSUE INVESTIGATED	CHANGE IN TENANTS	EQUIPMENT INCREASE	EQUIPMENT DECREASE	MORE MEASURES	FEWER MEASURES	OPERATIONS INCREASE	OPERATIONS DECREASE	UNUSUAL OCCURRENCE	NO EXPLANATION	METERS LISTED	METERS FOUND	FACILITY SQFT	ANNUAL KWH IMPACT	TEXT
NO SAVINGS SEEN						1				1	1	2,000	4,100	INCREASED OCCUPANCY FROM 55 TO 64 UNITS WITH RESULTING INCREASED USE OF THE LAUNDRY FACILITY, 7/92
LOAD INCREASE	1					1				1	1	60,000	240,000	TENANT MOVED INTO THE FIFTH FLOOR WHICH WAS VACANT FOR 4 YEARS , 9/92 INCREASED USE OF COMPUTER EQUIP AND LIGHTING
NO SAVINGS FOUND/LOAD INCREASE		1				1				4	1	100,000	223,500	ENCLOSED BREEZEWAY, ADDED LIGHTING, ADDED KITCHEN EQUIPMENT, 6/92 (REMODEL DATE IN SURVEY IS 1/92)
LOAD INCREASE									1	1	1	21,000	0	NO EXPLANATION GIVEN, NO DETAILS ABOUT THE EQUIPMENT OR ACTIVITY INCREASE MENTIONED IN THE PHONE SURVEY
LARGER THAN EXPECTED DECLINE '90 TO '91				1						1	1	120,000	-119,830	INSTALLED ADDITIONAL NONPROGRAM MEASURES AT TIME OF RETROFIT, 4/93
LOAD INCREASE		1				1				1	1	10,000	23,440	GRADUAL INCREASE BUSINESS ACTIVITIES. INCREASED COMPUTER EQUIPMENT PLUS UNINTERRUPTIBLE POWER SOURCE 12/92
LOAD INCREASE		1								1	1	5,000	3,000	LACK OF SAVINGS FROM PROGRAM MEASURES UNKNOWN. REMODEL AND ADDED 4.5 KW OF LIGHTING 6/93
STRANGE ELECTRIC USE PATTERN	1									1	2	26,500	X	CUSTOMER OCCUPIED BUILDING FROM 2/91 AND OPENED 6/91. MEASURES PART OF RENOVATION. LOAD PATTERN REASONABLE AFTER THAT TIME.
LOAD INCREASE						1					2	60,000	150,000	OCCUPIED SQUARE FOOTAGE HAS DOUBLED SINCE 7/91
SAVINGS SMALLER THAN EXPECTED									1	1	1	4,000	0	UNKNOWN, POSSIBLE INITIAL SAVINGS ESTIMATE TOO HIGH, ELECTRIC HEAT ADDED 11/93
NON PARTICIPANT LOAD INCREASE		1				1				4	3	50,000	182,802	REPAIR SHOP OPEN ON SATURDAYS AFTER 8/91, ADDED 41KW OF EXTERIOR LIGHTING 2/92

RETROFIT EVALUATION ON-SITE SUMMARY

ISSUE INVESTIGATED	CHANGE IN TENANTS	EQUIPMENT INCREASE	EQUIPMENT DECREASE	MORE MEASURES	FEWER MEASURES	OPERATIONS INCREASE	OPERATIONS DECREASE	UNUSUAL OCCURRENCE	NO EXPLANATION	METERS LISTED	METERS FOUND	FACILITY SQFT	ANNUAL KWH IMPACT	TEXT
NON PARTICIPANT SAVINGS			1				1			1	1	50,000	0	PHONE SURVEY INDICATES REMOVAL OF EQUIPMENT AND CHANGE IN AC. ONSITE SAYS PROCESS CHANGE AND BUSINESS DECLINE HAS REDUCED ELECTRIC CONSUMPTION 10% FROM 6/93 TO PRESENT
DECLINE IN LOAD				1						2	?	50,000	-20,736	POLICY TO USE ONLY HALF OF LIGHTS INSTITUTED, 9/91; INEFFICIENT HEAT PUMPS REPLACED WITH ELECTRIC FORCED AIR UNITS, 4/92
NON PARTICIPANT SAVINGS	1		1				1			1	1	25,000	73,333	75% EMPLOYEES RELOCATED, MAJOR EQUIPMENT REMOVED 10/91 -12/91
	8	**21**	**3**	**8**	**0**	**36**	**4**	**2**	**17**	**134**	**132**	5,347,573	-1,095,585	

D

PARTICIPATION MODEL

A participation model is used to quantify the influential factors in the choice to participate in the programs. The results of the participation model are incorporated into the energy savings model, via a selectivity correction variable known as an inverse Mills ratio, to correct any biases that might result from customers' self-selecting themselves into the programs.

Self-selection bias in modeling results can occur because of systematic differences between the participant group and the control group as revealed by the participants choosing to participate in the program and the control group choosing not to participate. Because participants volunteer for the program, it is difficult to obtain a true experimental control group of nonparticipants through random sampling. Differences between participants and the control group (which are often unobservable) can lead to self-selection bias.

For this study, a binary discrete choice logit model was specified to implement the participation model. It has the following functional form:

$$Prob[Part] = \frac{e^{\beta' z}}{(1 + e^{\beta' z})}$$

where:

Prob[Part] = the probability that a customer participates in the program

z = a vector of independent variables explaining customer participation

β = a vector of parameters

The dependent variable in the estimated equation takes on the value of "1" if the customer participated in the program and "0" if not. The models are estimated using Maximum Likelihood Estimation (MLE). The estimated model is presented in Table D-1.

The model indicates that sites with remodels, sites with floorspace increases, and sites whose energy expenditures are an important portion of their total expenditures are more likely to participate in the programs. Multi-tenant sites and sites with declines in business activity, were less likely to participate. Program nonparticipants were also more likely to require larger bill reductions to participate. The model also indicates that perceived program inconveniences are a significant deterrent to participation.

Table D-1
Participation Decision Model, Dependent Variable = Participation

Independent Variables	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square
Intercept	2.69	0.56	23.4	0.0001
Remodeled site	1.55	0.59	7.0	0.0082
Multi business site	–0.73	0.30	5.7	0.0172
Business decline pre to post	–0.88	0.45	3.8	0.0523
Floor space increase	1.04	0.55	3.5	0.0601
Importance of energy expenditures	0.55	0.27	4.0	0.0450
Amount of required bill reduction	–0.57	0.20	8.0	0.0047
Required bill reduction–don't know	–0.78	0.37	4.5	0.0338
Program inconveniences	–1.24	0.26	23.2	0.0001
Program inconveniences–don't know	–2.11	0.54	15.3	0.0001
Importance of bill reduction–don't know	1.52	0.73	4.4	0.0366
Importance of comfort–don't know	–2.51	0.71	12.6	0.0004
Being energy efficient is important	0.29	0.30	1.0	0.3273
Retrofit with remodeling is important	–1.03	0.29	12.2	0.0005
Environment is an important factor	–0.66	0.29	5.2	0.0226
Have discontinued energy using activities	–1.61	0.70	5.3	0.0217
Retail business	–0.61	0.40	2.3	0.1294
n	347			
Log Likelihood at Zero	478			
Log Likelihood at Convergence	364			

Using results of the participation model, a selectivity correction variable (also referred to as an inverse Mills ratio) is calculated for inclusion in the energy savings model to help correct self-selection bias. This variable is based on the estimated probability of participation, as calculated in the participation model. The correction variable is calculated as:

$$MILLS = \left[\frac{(1-\hat{P}) \times In(1 \times \hat{P})}{\hat{P}} + In(\hat{P})\right]$$

where $\hat{P}$ is the estimated probability of participation from the participation model. (For nonparticipants, $1 - \hat{P}$ is substituted for $\hat{P}$.)

The rationale for this approach is to view self-selection bias as an omitted variables problem. Self-selection bias will be minimized in the energy savings equation through incorporation of all the variables that characterize program participation (via the self-selection term).

E

ENERGY SAVINGS MODELS

This appendix presents the different regression models that were developed to estimate program energy savings. These models are discussed and compared in the subsection "Energy Savings Model" in Section 3 of this report. The following models are presented:

Model 1: This model was developed during the preliminary analysis; it does not contain information obtained from the on-site follow-up surveys. Billing data is temperature adjusted, and an SAE model specification is used.

Model 2: This model is similar to Model 1, but it includes information from the on-site follow-up surveys to refine variables initially obtained from the telephone survey.

Model 3: This model is similar to Model 2, but it also includes a variable developed from the on-site surveys that explicitly quantifies non-program changes in electricity consumption.

Model 4: This model is similar to Model 3, but it does not use temperature-adjusted billing data. Instead, temperature impacts are incorporated directly into the model.

Model 5: This model is similar to Model 3, but uses a binary participation variable.

Model 6: This model is similar to Model 4, but uses a binary participation variable.

Model 7: This model is similar to Model 3, but participants with expected savings less than two percent of their pre-installation bill were excluded from the regression.

Of the seven models, Model 3 provided the best overall results. The R^2 statistic is higher than the other comparable models and the t-statistics for the realization rates are the highest. This model used an SAE specification, temperature-adjusted billing data, and an on-site non-program impact variable.

Table E-1
Model 1: Preliminary Model

Dependent Variable: **Post Retrofit kWh/sqft**

Temperature Adjustment: **Yes**

Participant Variable: **SAE**

On-site kWh change variable: **No**

Independent Variables	Parameter Estimate	Standard Error	t-statistic	Probability
Intercept	–0.58	0.71	–0.8	0.4162
Pre Retrofit kWh/sqft	1.01	0.00	203.6	0.0001
Mills ratio	–0.50	0.52	–1.0	0.3405
Lighting kWh savings /sqft	–0.43	0.08	–5.5	0.0001
Other kWh savings /sqft	–0.29	0.12	–2.4	0.0167
SCL kWh savings/sqft	–0.45	0.13	–3.4	0.0007
Have energy manager	–5.89	2.52	–2.3	0.0201
New tenants	2.55	1.51	1.7	0.0921
Remodeled site	2.67	1.64	1.6	0.1032
Floor space increase	1.43	1.08	1.3	0.1840
Decrease in hours	–8.72	3.77	–2.3	0.0214
n	332			
Dependent Mean	37.8			
Root Mean Square Error	6.5			
Adjusted R^2	0.9932			

Table E-2
Model 2: Updated Variables, Excluding On-site Variable

Dependent Variable: **Post Retrofit kWh/sqft**

Temperature Adjustment: **Yes**

Participant Variable: **SAE**

On-site kWh change variable: **No**

Independent Variable	Parameter Estimate	Standard Error	t-statistic	Probability
Intercept	0.79	0.51	1.5	0.1233
Pre Retrofit kWh/sqft	0.98	0.01	103.2	0.0001
Mills Ratio	–0.22	0.26	–0.9	0.3952
Lighting kWh Savings/sqft	–0.75	0.08	–9.4	0.0001
Other kWh Savings/sqft	–0.38	0.12	–3.2	0.0015
SCL kWh savings/sqft	–0.22	0.15	–1.5	0.1330
Owner Occupied Site	–0.80	0.41	–2.0	0.0494
Floor Space Increase	2.01	0.71	2.8	0.0050
Op Hours Increase	1.76	0.66	2.7	0.0083
Op Hours Decrease	–5.10	1.96	–2.6	0.0095
Increase in Employees	0.43	0.55	0.8	0.4329
Added Equipment	0.66	0.38	1.7	0.0845
Did Other Conservation	–1.43	0.62	–2.3	0.0230
n	347			
Dependent Mean	21.3			
Root Mean Square Error	3.3			
Adjusted R^2	0.9715			

Table E-3
Model 3: Temperature Adjusted SAE with On-site Variable

Dependent Variable: **Post Retrofit kWh/sqft**

Temperature Adjustment: **Yes**

Participant Variable: **SAE**

On-site kWh change variable: **Yes**

Independent Variable	Parameter Estimate	Standard Error	t-statistic	Probability
Intercept	0.15	0.36	0.4	0.6720
Pre Retrofit kWh/sqft	0.99	0.01	122.3	0.0001
Mills Ratio	–0.19	0.22	–0.8	0.4076
Lighting kWh Savings/sqft	–0.71	0.07	–11.2	0.0001
Other kWh Savings/sqft	–0.54	0.10	–5.8	0.0001
SCL kWh savings/sqft	–0.24	0.12	–1.9	0.0563
On-site Change—kWh/sqft	0.94	0.08	11.8	0.0001
Energy Manager Present	–0.41	0.32	–1.3	0.2065
Floor Space Increase	1.07	0.61	1.8	0.0804
Added Equipment	0.67	0.32	2.1	0.0341
Did Other Conservation	–0.90	0.54	–1.7	0.0979
n	347			
Dependent Mean	21.3			
Root Mean Square Error	2.8			
Adjusted R^2	0.9789			

Table E-4
Model 4: Unadjusted SAE with On-site Variable

Dependent Variable: **Post Retrofit kWh/sqft**

Temperature Adjustment: **No**

Participant Variable: **SAE**

On-site kWh change variable: **Yes**

Independent Variable	Parameter Estimate	Standard Error	t-statistic	Probability
Intercept	0.07	0.43	0.2	0.8749
Pre Retrofit kWh/sqft	0.99	0.01	104.3	0.0001
Mills Ratio	–0.29	0.26	–1.1	0.2660
Lighting kWh Savings/sqft	–0.77	0.08	–9.7	0.0001
Other kWh Savings/sqft	–0.75	0.12	–6.3	0.0001
SCL kWh savings/sqft	–0.05	0.15	–0.3	0.7645
On-site Change—kWh/sqft	0.93	0.09	10.0	0.0001
Change in HDD * Electric Heat	0.0011	0.0004	2.4	0.0170
Energy Manager Present	–0.49	0.38	–1.3	0.1970
Floor Space Increase	1.37	0.71	1.9	0.0562
Added Equipment	0.81	0.37	2.2	0.0296
Did Other Conservation	–1.04	0.63	–1.7	0.0982
n	347			
Dependent Mean	21.2			
Root Mean Square Error	3.3			
Adjusted R^2	0.9714			

Table E-5
Model 5: Temperature Adjusted Binary with On-site Variable

Dependent Variable: **Post Retrofit kWh/sqft**
Temperature Adjustment: **Yes**
Participant Variable: **Binary (0/1)**
On-site kWh change variable: **Yes**

Independent Variable	Parameter Estimate	Standard Error	t-statistic	Probability
Intercept	0.86	0.43	2.0	0.0456
Pre Retrofit kWh/sqft	0.96	0.01	109.6	0.0001
Mills Ratio	–0.04	0.26	–0.2	0.8646
Program Participant (0/1)	–2.46	0.37	–6.7	0.0001
On-site Change—kWh/sqft	0.89	0.09	9.8	0.0001
Energy Manager Present	–0.49	0.37	–1.3	0.1893
Floor Space Increase	1.42	0.70	2.0	0.0431
Added Equipment	0.93	0.36	2.6	0.0111
Did Other Conservation	–0.36	0.62	–0.6	0.5563
n	347			
Dependent Mean	21.3			
Root Mean Square Error	3.3			
Adjusted R^2	0.9721			

Table E-6
Model 6: Unadjusted Binary with On-site Variable

Dependent Variable: **Post Retrofit kWh/sqft**

Temperature Adjustment: **No**

Participant Variable: **Binary (0/1)**

On-site kWh change variable: **Yes**

Independent Variable	Parameter Estimate	Standard Error	t-statistic	Probability
Intercept	0.79	0.49	1.6	0.1057
Pre Retrofit kWh/sqft	0.96	0.01	96.2	0.0001
Mills Ratio	–0.17	0.29	–0.6	0.5548
Program Participant (0/1)	–2.64	0.42	–6.2	0.0001
On-site Change—kWh/sqft	0.89	0.10	8.6	0.0001
Change in HDD * Electric Heat	0.0007	0.0005	1.3	0.1930
Energy Manager Present	–0.49	0.42	–1.2	0.2477
Floor Space Increase	1.60	0.80	2.0	0.0457
Added Equipment	1.10	0.41	2.7	0.0082
Did Other Conservation	–0.47	0.70	–0.7	0.5000
n	347			
Dependent Mean	21.3			
Root Mean Square Error	3.7			
Adjusted R^2	0.9642			

Table E-7
Model 7: Excludes Participants with Savings Below 2%

Dependent Variable:	**Post Retrofit kWh/sqft**
Temperature Adjustment:	**Yes**
Participant Variable:	**SAE**
On-site kWh change variable:	**Yes**

Independent Variable	Parameter Estimate	Standard Error	t-statistic	Probability
Intercept	0.27	0.37	0.7	0.4643
Pre Retrofit kWh/sqft	0.99	0.01	115.3	0.0001
Mills Ratio	–0.15	0.23	–0.7	0.5125
[redacted]				
On-site Change—kWh/sqft	0.93	0.08	11.4	0.0001
Energy Manager Present	–0.44	0.34	–1.3	0.1939
Floor Space Increase	1.13	0.64	1.8	0.0803
Added Equipment	0.65	0.33	2.0	0.0512
Did Other Conservation	–0.90	0.58	–1.5	0.1244
n	325			
Dependent Mean	20.4			
Root Mean Square Error	2.9			
Adjusted R^2	0.9782			

F

ESD PARTICIPATING UTILITIES

This appendix contains a list of utilities participating in the ESD program. Utilities who provided data for the retrofit evaluation are highlighted.

Utilities Participating in the ESD Program

(* Indicates Participation in the Retrofit Evaluation)**

ALBION, CITY OF
ALDER MUTUAL LIGHT COMPANY
ASHLAND, CITY OF
BANDON, CITY OF
BENTON COUNTY PUD ***
BENTON RURAL ELEC. ASSO.
BIG BEND ELECTRIC COOP., INC.
BLACHLY-LANE ELECTRIC COOP.
BLAINE, CITY OF
BONNERS FERRY, CITY OF
BURLEY, CITY OF
CANBY UTILITY BOARD
CASCADE LOCKS, CITY OF
CENTRAL ELEC. COOP., INC.
CENTRAL LINCOLN PUD
CENTRALIA, CITY OF
CHELAN COUNTY PUD #1 ***
CHENEY, CITY OF
CLALLAM COUNTY PUD
CLARK PUBLIC UTILITIES ***
CLATSKANIE PUD
CLEARWATER POWER CO.
COLUMBIA BASIN ELEC
COLUMBIA POWER COOP
COLUMBIA RIVER PUD
COLUMBIA RURAL ELEC. ASSOC.
CONSOLIDATED IRRIGATION DIST
CONSUMER'S POWER, INC.
COOS-CURRY ELECTRIC COOP, INC
COULEE DAM, CITY OF, LIGHT
COWLITZ COUNTY PUD
DECLO, CITY OF
DOUGLAS COUNTY PUD NO. 1
DOUGLAS ELECTRIC COOP., INC
DRAIN, CITY OF
EAST END MUTUAL ELEC. CO., LTD
EATONVILLE POWER AND LIGHT CO
ELLENSBURG, CITY OF
ELMHURST MUTUAL POWER & LIGHT
EMERALD PUD
EUGENE WATER & ELECTRIC BOARD ***
FALL RIVER RURAL ELEC. COOP.
FARMERS ELECTRIC CO
FERRY COUNTY PUD
FIRCREST, CITY OF
FLATHEAD ELEC. COOP., INC
FOREST GROVE, CITY OF
FRANKLIN COUNTY PUD
GLACIER ELEC. COOP., INC
GRANT COUNTY PUD ***
GRAYS HARBOR COUNTY PUD NO. 1 ***
HARNEY ELEC. COOP., INC.
HEYBURN, CITY OF
HOOD RIVER ELECTRIC COOP.
IDAHO CO. L&P COOP. ASSO., INC
IDAHO FALLS, CITY OF
IDAHO POWER
INLAND POWER AND LIGHT
KITTITAS COUNTY PUD NO. 1
KLICKITAT COUNTY PUD
KOOTENAI ELEC. COOP., INC.
LAKEVIEW LIGHT & POWER CO.
LANE ELECTRIC COOP., INC.
LEWIS COUNTY PUD
LINCOLN ELEC. COOP., INC.,(MT)
LINCOLN ELEC. COOP., INC.,(WA)
LOST RIVER ELEC. COOP., INC.
LOWER COLUMBIA AREA
LOWER VALLEY POWER & LIGHT CO.
MASON COUNTY PUD NO. 1
MASON COUNTY PUD NO. 3
MCCLEARY LIGHT AND POWER
MCMINNVILLE WATER & LIGHT
MIDSTATE ELECTRIC COOP., INC.
MILTON, TOWN OF
MILTON-FREEWATER, CITY OF
MINIDOKA, CITY OF
MISSION VALLEY POWER
MISSOULA ELEC. COOP., INC.
MONMOUTH, CITY OF
MONTANA POWER COMPANY
NESPELEM VALLEY ELEC. COOP.
NORTHERN LIGHTS, INC.
NORTHERN WASCO COUNTY PUD
OHOP MUTUAL LIGHT CO.
OKANOGAN CO. ELEC. COOP., INC.
OKANOGAN COUNTY PUD NO. 1
ORCAS ISLAND POWER & LIGHT CO.
OREGON TRAIL ELECTRIC
PACIFIC COUNTY PUD NO. 2
PACIFIC POWER AND LIGHT CO.
PARKLAND LIGHT AND WATER CO.
PEND OREILLE COUNTY PUD
PENINSULA LIGHT CO., INC.
PORT ANGELES CITY LIGHT ***
PORTLAND GENERAL ELECTRIC
PRAIRIE POWER COOP., INC.
PUGET SOUND POWER AND LIGHT
RAFT RIVER RURAL ELEC. COOP.,
RAVALLI COUNTY ELEC. COOP , IN
RICHLAND, CITY OF
RIVERSIDE ELEC CO LTD
RUPERT, CITY OF
RURAL ELECTRIC COMPANY
SALEM ELECTRIC
SALMON RIVER ELEC. COOP., INC.
SEATTLE CITY LIGHT ***
SKAMANIA COUNTY PUD
SNOHOMISH COUNTY PUD ***
SODA SPRINGS, CITY OF
SOUTH SIDE ELEC. LINES, INC.
SPRINGFIELD UTILITY BOARD
STEILACOOM, TOWN OF
SUMAS, CITY OF
SURPRISE VALLEY ELEC. COOP.
TACOMA PUBLIC UTILITIES ***
TANNER ELECTRIC COOP.
TILLAMOOK PUD
TROY LIGHT AND POWER
UMATILLA ELECTRIC COOP. ASSN.
UNITY LIGHT AND POWER CO.
UPPER COLUMBIA AREA
VERA IRRIGATION DISTRICT #15
VIGILANTE ELEC. COOP., INC.
WAHKIAKUM COUNTY PUD NO. 1
WASCO ELECTRIC COOP
WASHINGTON WATER POWER CO.
WELLS RURAL ELECTRIC COMPANY
WEST OREGON ELEC. COOP., INC.
WHATCOM COUNTY PUD

G

GLOSSARY

Glossary of Selected Terms

Billing Analysis: A method used to estimate program impacts that relies on analysis of customers' energy bills. Billing analyses range from simple bill comparisons to complex econometric models.

Confidence Interval: An interval associated with a parameter estimate which would contain would contain the true value of the parameter with some given degree of probability. For example, if a 90 percent confidence interval for a parameter is 0.6 to 0.8, then there is a 90 percent probability that the true parameter falls in the 0.6 to 0.8 range.

Degree Days: The difference between the average daily temperature and a reference temperature. When the average temperature falls below the reference temperature, *heating degree days* are calculated as the reference temperature minus the average temperature. When the average temperature rises above the reference temperature, *cooling degree days* are calculated as the average temperature minus the reference temperature.

Discrete Choice Model: A statistical model designed to analyze an individual's choice of one alternative out of a finite set of mutually exclusive alternatives.

Cross-Sectional Model: A model that uses data from one point in time and estimates relationships between variables across different groups (i.e. customers).

Disturbance Term: A random variable which is used to explicitly capture all influences on the statistical model for which there are no data, as well as small errors in functional form.

Econometric Models: A broad range of statistical models that focus on estimating parameters that define relationships between a dependent variable and other explanatory variables.

Expected Measure Life: The predicted average life of a DSM measure.

Incremental Measure Cost: The difference in price between that of an efficient technology or measure and the alternative standard technology.

Inverse Mills Ratio: A variable developed using a discrete choice model that is based on a customer's probability to participate in a program; it is added to an energy saving model to help correct for self-selection bias. It is also referred to as a selectivity correction term.

Levelized Cost: An equal payment per unit over the life of the resource, taking into account assumed discount or interest rates; a mortgage payment is an example of a levelized cost.

Logit Model: A discrete choice model in which the disturbance terms are assumed to have standard extreme value distributions.

Maximum Likelihood Estimation: An estimation technique which produces parameter estimates that would most likely generate the observed sample.

Mills: One tenth of one cent ($0.001)

Multivariate Regression Analysis: A statistically estimated relationship between a dependent variable and two or more independent variables.

Omitted Variables Problem: When requisite variable is omitted from a regression equation (either unknowingly or because adequate data does not exist), parameters of other variables in the equation are biased, to the extent that these variables are correlated with the omitted variable.

Outlier: An observation that differs greatly from comparable observations.

Participation Bias: A bias which can occur if the savings estimates for a population are based on the savings of early DSM program participants, and the early participants are customers who will benefit the most from programs and this might not be representative of the population.

Precision: The accuracy of an estimator as measured by the size of its standard error.

Realization Rate: The fraction of engineering-based energy savings from the program tracking systems that are actually realized in the form of reduced customer bills

R^2: Represents the proportion of variation in the dependent variable explained by the variation in the independent variables. Shows the "goodness-of-fit" of the regression equation (the nearer the R-squared is to 1, the better the fit).

Regression Intercept: The constant term in a regression equation. For an equation that is specified as Y = a + b*X, "a" is the intercept.

Regression Model: A statistically based model in which the variation of a variable (the dependent variable) is a function of several other variables known as independent variables, and an error term. The error term arises from two sources: model mis-specification and measurement error.

Saturation: The percentage of customers or floorspace in a given market who have a particular type of energy using equipment.

Selectivity Correction: An approach to correcting for self-selection bias that views the bias as an omitted variables problem and corrects it by adding to the energy use equation an estimate of the omitted variable.

Self Selection Bias: Systematic differences between the control group and the participant group as revealed by the participants choosing to participate in the program and control group choosing not to participate.

Standard Error: A measure of the accuracy of an estimate. It is equal to the square root of the variance.

T-statistic: The estimated parameter value divided by its estimated standard error. Because this has a t-distribution, a t-table can be used to test the hypothesis that the parameter is statistically different from zero. The larger the t-value, the higher the statistical significance of the parameter.

Time-series Model: A model that estimates some activity over a period of time, using periodic observations.

Variance: A measure of the spread or dispersion of a distribution.

Weather Normalization: A method for adjusting energy consumption to remove the effects of weather.

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