Evaluation of the Southern California Gas Company 2004-05 Non-Residential Financial Incentives Program

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EXECUTIVE SUMMARY

NRFIP BACKGROUND

The Southern California Gas Company (SCG) Nonresidential Financial Incentives Program (NRFIP) is a local program focusing on small to medium nonresidential (commercial, agricultural, and industrial) gas customers served under core rate schedules. The program incorporates technical support, education, training, outreach, contractor referral, prescriptive rebates and equitable financial incentives through three program elements. The Commercial Food Service Equipment Rebate (Food Service) element provides a list of approved products eligible for rebates. The "Nonresidential Equipment Replacement " (NRER) provides incentives for "kind-for-kind" replacement of old, inefficient commercial or industrial end-use gas-fired technology with higher efficiency alternatives. The "Nonresidential Energy Conservation" (NREC) incentive element provides qualified customers with a financial incentive to implement energy efficient retrofits, industrial process modernizations, or industrial process energy efficiency improvements.

Examples of the measures in the Food Service channel include energy efficient ovens (convection, combination, conveyor, rotisserie, deck and rotating rack), broilers, griddles, fryers, cheese melters, salamanders, steam kettles, braising pans, cabinet steamers and more. The NRER channel includes industrial furnaces, kilns, ovens, dryers, industrial washers, incinerators, thermal oxidizers and others. Qualifying measure examples for the NREC channel include heat recovery applications, process equipment modernization, process steam improvements, high-efficiency burner replacement and other process improvements.

Figure ES-1 shows how participants in 2004-2005 are distributed across the three program elements. As shown below, the majority of the NRFIP participants (80 percent) participated in the Food Service element. Total therm savings, on the other hand, are distributed relatively equally between the three program segments, as can be seen in Figure ES-2. This indicates that projects in the NRER and NREC components tend to be much larger projects with higher savings than projects in the Food Service segment.

Figure ES-1: Share of NRFIP Participants By Segment

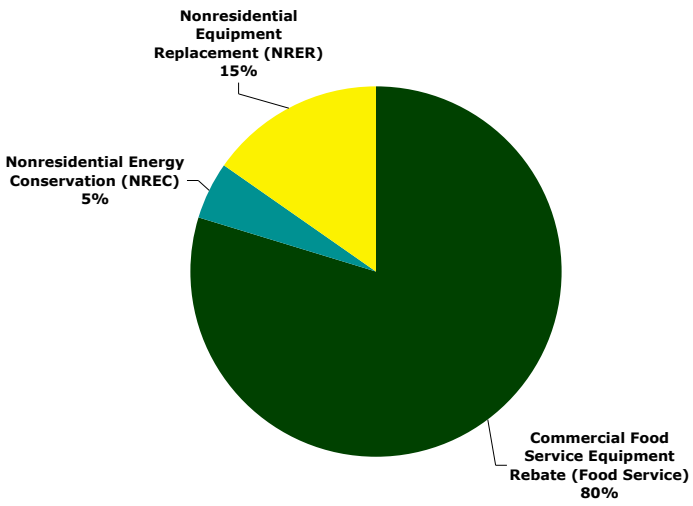
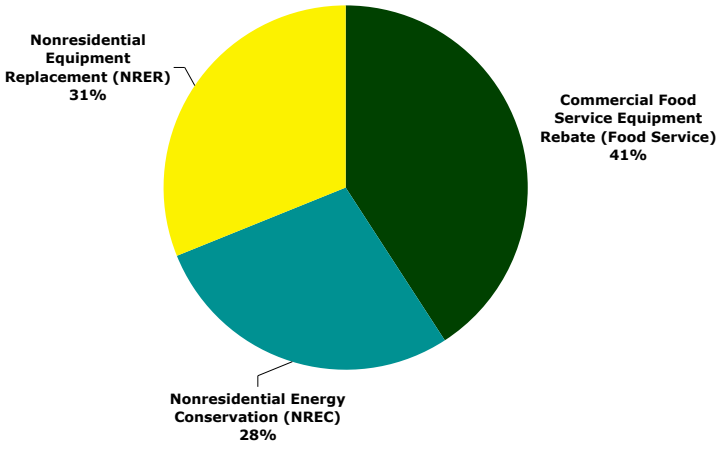


Figure ES-2: Share of NRFIP Therm Savings



EVALUATION OVERVIEW

The 2004-2005 NRFIP evaluation had three primary objectives:

1. **Measure and Verify Energy Savings.** The evaluation verified the *ex ante* gross therm savings claimed by the program by conducting a thorough review of participant records and the program-tracking database. Specific tasks include a billing analysis to determine *ex post* impacts, an engineering review of savings calculations and available background documentation, and a self-report free-ridership analysis. The results of these analysis tasks were used to produce *ex post* net realization rates and report net savings consistent with the CPUC's reporting requirements.

2. **Process Evaluation.** The second objective was to evaluate the program implementation process. This was done through interviews with utility program staff and the implementation contractor in addition to phone surveys of participating and nonparticipating customers. In addition, some of the survey questions are identical to those used in the Express Efficiency evaluation so that responses can be compared. Differences in responses between NRFIP and Express Efficiency participants may help support the underlying program theory for the NRFIP.

3. **Measure Customer Satisfaction and Program Influence.** Through the data collection process, the evaluation identified program strengths so that these can be emphasized in future program years. In addition, the evaluation also identified areas where the program delivery could be improved so that the program can be refined in future years to better meet the needs of the target population. The evaluation also focused on determining the degree to which the program is influencing customer decisions regarding which energy efficient measures they choose to install.

The evaluation was conducted in two stages. The first stage was primarily process oriented and was designed to provide feedback to the program while it is still being implemented. The results of the first evaluation phase were delivered as an interim report in February 2005. The major evaluation tasks for the first phase included completing half of the scheduled participant surveys (150 completes) and on-site audits (50 audits). Preliminary work on savings verification and self-reported free ridership are also included in the first evaluation phase.

The second phase includes an additional round of surveys (150 participants, 246 nonparticipants, 50 on-site audits). The results of the second wave of surveys are combined with the first wave and presented in this report. In addition to the surveys, a detailed engineering review of the savings calculation tools and selected project applications was completed during this phase. A billing analysis was also completed to determine the net realized impacts for the program. These tasks and sample sizes are consistent with those in the original EM&V plan approved by the CPUC for this evaluation.

IMPACT ANALYSIS

To determine net impacts for the NRFIP, a billing regression model was estimated to determine *ex post* net impacts for the 2004-05 NRFIP. For this task, two separate billing regressions were used:

1. **Food Service.** This model utilized monthly usage data from a sample of participants and nonparticipants from the phone surveys, which allowed additional survey information on changes at the facility during the post-installation period to be incorporated into the model.

2. **NRER / NREC.** A combined model for the NRER and NREC components was developed based on participations only and using billing data and measure information contained in the program tracking database. Because this model was estimated using participant data only, additional adjustments were made to the model results based on the self-report analysis to determine net impacts.

Details on the model specifications, data, and estimation results are included in this section. Following the model discussions, the results are applied to the 2004-05 NRFIP participation to determine the *ex post* realized net impacts for the entire program.

Food Service Billing Regression

Using data for both participants and nonparticipants, a Statistically Adjusted Engineering (SAE) billing model is estimated using ordinary least squares regression (OLS). The model includes variables that control for the primary influences on gas usage. These include basic firmographic variables such as pre-installation therm usage, business type, and categorical variables based on therm usage. Weather data expressed as changes in cooling degree days and heating degree days are also incorporated into the model. In addition, phone survey data from both participants and nonparticipants were used to create additional variables that capture any changes at the business that may have affected gas usage in the post-installation period.

The savings variables used in this model are the original gross *ex ante* impact estimates rather than net *ex ante* savings values. Since nonparticipants are included in the model, the coefficient estimate on the savings variable is accounting for free ridership as nonparticipant actions outside the program are used as the baseline. Therefore, the savings coefficient from this model can be used as an *ex post* realization rate that includes any free ridership effect. As discussed below, the coefficient estimate is then adjusted for spillover post- model to derive the *ex post* net realized impacts for this program component.

The basic form for the net billing model for the Food Service component is as follows:

$$Therm_{i,post} = \alpha + \beta' Savings_i + \beta'(SiteChng_i * Therm_{i,pre}) + \beta' Therm_{i,pre}$$
$$+\beta'(UsageCat_i * Therm_{i,pre}) + \beta' NonRestaurant_i + \beta' Weather_i + \varepsilon_i$$

Where :

$Therm_{i,post}$ = *Gas usage during the program post – period for customer i*

$Savings$ = *Adjusted ex ante savings estimates*

$SiteChng_i * Therm_{i,pre}$ = *Survey responses regarding changes at site interacted with usage*

$Therm_{i,pre}$ = *Gas usage during the pre – program period*

$Therm_{i,pre}UsageCat$ = *Gas usage during the pre – program period interacted with usage category*

$NonRestaurant$ = *Variable indicating non - restaurant business*

$Weather$ = *Change in heating degree days and cooling degree days by climate zone*

ε_i = *Random error term assumed normally distributed*

α, β = *Coefficients to be estimated*

Separate therm usage variables were developed for the model based on annual pre-installation consumption from the billing data. These variables were constructed so that approximately 10 percent of the sample falls within each usage category. The usage category definitions are shown in Table ES-1.

Table ES-1: Usage Category Definitions

Usage Category	Therm Range	
	Min	Max
1	765	5,079
2	5,079	6,779
3	6,779	8,478
4	8,478	10,178
5	10,178	11,877
6	11,877	17,733
7	17,733	23,589
8	23,589	29,444
9	29,444	35,300
10	35,300	232,402

To estimate the billing model, several data screens were used to create a dataset with complete billing data and to rule out potential outlier observations that might have undue influence over the model. Specifically, the data screens were designed to remove those observations that had incomplete billing data or did not have sufficient post-installation billing data to estimate annual impacts. In addition, those observations that had disproportionately large estimated savings relative to overall usage were dropped from the analysis, as the large savings (greater than 50 percent of pre-period usage) are likely reflecting errors in the usage data rather than actual impacts given the types of measures promoted by this program.

Table ES-2 shows the estimation results from the final net billing model specification for the Food Service installations. The model fits the data well overall as evidenced by the high R-squared value and the statistically significant F statistic. A high R-squared is common when lag variables are used in regression models, and the high t-value for the pre-usage therm variables also indicates that the lag usage is the predominant driver for this model.

The pre-installation therm variable interacted with the therm usage categories generally decreases in magnitude with the large usage categories. However, only a few of these interaction terms are statistically significant indicating that most of the pre-installation usage effect may be captured in the single pre-installation usage variable PRE-USAGE.

The variable indicating a non-restaurant business was not statistically significant, which indicates that there is not a significant difference in usage between restaurants and non-restaurants in the billing model. Finally, changes in both heating degree days and cooling degree days did not have a significant effect on post-installation usage, indicating that gas usage was generally invariant to weather for these businesses.

The survey variables indicating changes at the business that may affect overall gas usage were all statistically significant. Each of these variables was interacted with pre-installation gas usage so that the coefficient reflects the effect of the change in terms of percentage of pre-installation usage. Changes in production had an average impact of about a 3.9 percent reduction of gas usage in the post-installation period. Similarly, changes in square footage increased usage by 1.5 percent while changes in the number of employees reduced usage by about 2.2 percent.

The highlighted variable in Table ES-2 is the coefficient on the *ex ante* savings estimates. Several different specifications were attempted that broke out savings by measure type (Ovens, Broiler, Fryers, Other). For the broiler category, the coefficient estimate was consistently positive due to the fact that of the 22 broilers in the sample, 16 had increases in therm usage from the pre-installation to the post-installation period. Since it was not possible to get a reasonable realization rate for this particular measure, broilers were dropped from the sample and the other measures were grouped together to get a single coefficient estimate on savings. The coefficient estimate on the combined savings variable would then be applied to all Food Service measures (including broilers) to calculate net realized impacts.

As shown in the table, the savings coefficient has an estimate of -0.50 and is statistically significant from zero at less than 1 percent level. It is also significantly different from 1.0 at the less than 1 percent level of significance. This indicates that 50 percent of the *ex ante* gross savings is being realized by Food Service participants. However, a 90 percent confidence interval around the savings coefficient results in an error band of +/- 56 percent, which indicates a moderate to high level of uncertainty for the *ex post* net realization rate.

The lower realization rate is likely due to several factors. As discussed previously in the engineering review and in *Appendix A* with the review of the savings calculator spreadsheets, there may be a tendency to overstate savings in the *ex ante* savings calculations, particularly when an increase in production is being claimed. To the extent that the savings do not materialize, the model will adjust the coefficient estimate downward to reflect the difference in savings from initial expectations.

Another factor influencing the savings coefficient is the presence of nonparticipants in the sample. Since some nonparticipants are making changes outside the program, the coefficient incorporates the effect of free ridership. In the model, realized net impacts are 50 percent less than the original *ex ante* gross impacts. If this entire reduction were due to free ridership, this would imply a free ridership rate of 50 percent, which is higher than the self-report free ridership analysis discussed earlier (30-39 percent). As discussed above, however, some of the 50 percent reduction is correcting for errors in the savings calculations so the free ridership rate implied by the billing model will be less than 50 percent.

Table ES-2: Net Billing Regression Model Results (Food Service)

Model Statistics	Value
Observations	244
Variables	17
F Statistic	2,194.1
F Statistic Level of Significance	< 1%
Adjusted R-Squared	0.9935

Parameter Estimates	Coefficient	Standard Error	T Value	Level of Significance
Intercept	-1,922.21	699.07	-2.75	1%
Savings-All Measures	-0.50	0.17	-2.91	0%
Survey Response-Gas Increase	-0.02	0.01	-2.24	3%
Survey Response-Square Footage Increase	0.01	0.02	0.79	43%
Survey Response-Employee Increase	0.07	0.02	2.89	0%
Pre Usage	1.09	0.01	131.18	< 1%
Pre Usage*Pre Usage Category 1	0.45	0.19	2.33	2%
Pre Usage*Pre Usage Category 2	0.25	0.13	1.89	6%
Pre Usage*Pre Usage Category 3	0.20	0.11	1.87	6%
Pre Usage*Pre Usage Category 4	0.11	0.10	1.07	29%
Pre Usage*Pre Usage Category 5	0.14	0.08	1.74	8%
Pre Usage*Pre Usage Category 6	0.04	0.05	0.68	50%
Pre Usage*Pre Usage Category 7	0.04	0.04	1.04	30%
Pre Usage*Pre Usage Category 8	-0.02	0.03	-0.64	52%
Pre Usage*Pre Usage Category 9	-0.03	0.03	-0.76	45%
Business Type (Non-Restaurant)	276.16	480.32	0.57	57%
Weather-Change in cooling degree days (post-pre)	-1.69	2.20	-0.77	44%
Weather-Change in heating degree days (post-pre)	-0.71	0.81	-0.87	38%

NRER / NREC Billing Model

A separate billing model was run for the NRER and NREC components of the program that utilizes the same basic structure as the Food Service regression model. However, with the Food Service model it was relatively easy to match a sample of nonparticipants as the measures were generally restricted to food service industries. With the NRER and NREC, there is a much wider range of industries, equipment types, and industrial processes involved and we were not able to identify an appropriate group of nonparticipants to use as a baseline. As a result, the NRER / NREC model was estimated using a sample of participants only.

Since only participants are used in the billing model, the coefficient estimates on savings reflect *ex post* gross realization rates. Any deviation from 1.0 for the savings coefficient will reflect differences in conditions at the site in the post-installation period relative to the conditions

initially assumed for the *ex ante* savings calculations. Since the nonparticipants are not included in the model, the results of this billing model will need to be adjusted post-model to determine the realized net impacts. As discussed below, we combined the results of the NREC / NRER billing model with the self-reported free ridership results and a spillover adjustment factor to determine the final *ex post* net realization rate for the NREC and NRER program components.

The billing model specification is similar to that used for Food Service, with the exception that no information from the phone survey was incorporated in the model. The sample was also screened using similar criteria discussed with the Food Service model. The billing model specification used for NRER and NREC is as follows:

$$Therm_{i,post} = \alpha + \beta'(UsageCat_i * Therm_{i,pre}) + \beta' Expand_i + \beta' Savings_i + \beta' Weather_i + \beta' Application_i + \varepsilon_i$$

$$Where:$$

$$Therm_{i,post} = Gas\ usage\ during\ the\ program\ post-period\ for\ customer\ i$$

$$Expand_i = Therms\ required\ to\ meet\ expanded\ production\ with\ existing\ equipment$$

$$Savings = Ex\ ante\ savings\ estimates$$

$$Therm_{i,pre} = Gas\ usage\ during\ the\ pre-program\ period$$

$$UsageCat_i * Therm_{i,pre} = Gas\ usage\ during\ the\ pre-program\ period\ interacted\ with\ usage\ category$$

$$Weather = Change\ in\ heating\ degree\ days\ and\ cooling\ degree\ days\ by\ climate\ zone$$

$$Application = Indicator\ variables\ for\ reasons\ for\ equipment\ purchase\ from\ NRFIP\ application$$

$$\varepsilon_i = Random\ error\ term\ assumed\ normally\ distributed$$

$$\alpha, \beta = Coefficients\ to\ be\ estimated$$

In this model, three usage variables ($UsageCat_i$) are created that reflect small customers (less than 20,000 therm usage annually), medium customers (20,000 to 80,000 therms annually) and large customers (more than 80,000 therms annually). In addition, the NRER and NREC participants each fill out an application sheet where they are asked to indicate the reasons for the equipment installation. Possible reasons are increased production and labor, failed or impending failure of equipment, and to reduce operating costs and gas costs. Since these reasons may influence the type of equipment chosen, they have been incorporated into the billing model through a series of indicator variables based on the application data.

Each project application also indicates whether or not the equipment installation was part of an expansion in production. The information on production expansion as well as information on existing equipment was used to calculate how much therm usage would have increased had the expanded production been met with the existing equipment. By including this information in the model, the resulting coefficient on savings should reflect the realized savings over what would have been achieved relative to the existing equipment.

The results of the NRER / NREC billing model are shown in Table ES-3. The relatively high R-squared value and the statistically significant F statistic indicate that the model generally fits the data well and has significant explanatory power.

The pre-installation therm variable interacted with the therm usage categories was statistically significant and positive for medium and large customers, indicating that there is a benefit to breaking out the effect of pre-installation usage by customer size in the model. Changes in cooling degrees had a positive and significant effect while changes in heating degree days were statistically insignificant.

The variables developed from the project applications regarding the reasons for the equipment installation (the last 6 coefficients shown in Table 50) had the expected signs but were generally not statistically significant at the 10 percent level. However, the variable indicating that the existing equipment failed is negative and significant at the 11 percent level and the increase in labor was positive and significant at the 15 percent level.

The variable for expanded production had a coefficient estimate of 0.41, which indicates that on average only 41 percent of the estimated increase in usage due to expanded production (assuming existing equipment) is being realized in the post-installation period. This variable is significant at the 17 percent level, however, which is slightly less than the 10 percent significance criteria commonly used for these models.

The highlighted variable in Tables ES-3 is the coefficient on the *ex ante* savings estimates. As shown in the table, the savings coefficient has an estimate of -0.75 and is significantly different from zero at the 1 percent level of significance. This indicates that 75 percent of the *ex ante* gross savings is being realized by NRER and NREC participants. The coefficient estimate is not significantly different from 1.0, however. Using the standard error of 0.26 for the savings coefficient yields a 90 percent confidence interval of +/- 57 percent.

As discussed in this report, there appears to be a tendency to overestimate *ex ante* savings for NRER and NREC projects, especially in those cases when a production expansion is assumed. The realization rate from the billing model provides additional support for this finding, as only 75 percent of the *ex ante* savings are being achieved. Given the issues with the savings variables and the confidence interval for the realization rate, there is a high level of uncertainty with the *ex post* gross impact estimates for the NRER and NREC components.

Table ES-3: NRER / NREC Billing Model Regression Results

Model Statistics	Value
Observations	124
Variables	14
F Statistic	69.977
F Statistic Level of Significance	< 1%
Adjusted R-Squared	0.879

Parameter Estimates	Coefficient	Standard Error	T Statistic	Level of Significance
Intercept	46828.00	14699.14	3.19	< 1%
Small Customer *Pre-Usage (< 20,000 annual therms)	-0.76	0.73	-1.05	30%
Medium Customer *Pre-Usage (20-80,000 annual therms)	0.56	0.20	2.76	1%
Large Customer*Pre-Usage (> 80,000 annual therms)	0.81	0.04	18.87	< 1%
Expanded Production	0.41	0.29	1.40	17%
Savings	-0.75	0.26	-2.82	1%
Change in cooling degree days (post-pre)	171.74	49.73	3.45	< 1%
Change in heating degree days (post-pre)	9.86	19.92	0.50	62%
Increased Gas Costs	-14183.00	10949.35	-1.30	20%
Impending Equipment Failure	-3039.00	7882.10	-0.39	70%
Operating Cost Reduction	-11848.00	15678.56	-0.76	45%
Equipment Failed	-29281.00	18245.48	-1.61	11%
Increased Labor	20249.00	13896.25	1.46	15%
Increased Production	7831.99	7318.06	1.07	29%

Ex Post Net Impacts

Table ES-4 below summarizes the impact adjustments recommended by program component that take into account the results of the billing analysis, spillover, and self-reported free ridership. The final *ex post* net realization rate is the product of all the adjustment factors shown in the table. In those cases where no adjustment is needed (such as with the on-site verifications), an adjustment factor of 1 is used.

For the Food Service component, the *ex post* net realization rate consists of the coefficient estimate from the billing regression, which accounts for free ridership and a general realization rate based on actual post-installation usage. In addition, a 10 percent spillover adjustment is made to create a final adjustment factor of 0.55, which is used as the *ex post* net realization rate for the Food Service component.

For the NRER and NREC components, the billing regression only uses participant data so the resulting savings coefficient needs to be adjusted for both free ridership and spillover. From the self-report analysis we derived a net-to-gross ratio of 0.80 that accounts for both free ridership and spillover. When this is combined with the savings coefficient, the final *ex post* net realization rate is 0.60 for both the NRER and NREC components.

For reasons discussed above, there is a high degree of uncertainty with these *ex post* net realization rates for each of the NRFIP components. Some uncertainty is introduced through the billing models that utilize samples with diverse projects and business types and savings estimates that are potentially overstated. In addition, the self-report free ridership is based on a method that by necessity assigns weights somewhat arbitrarily. The free ridership result was consistent with the result using a different self-report method as well as the results of the billing analysis (for

Food Service) which helps reduce the uncertainty. Finally, the spillover assumption of 10 percent was based on our experience with other energy program evaluation but was not supported with any primary research in its application to this evaluation.

Table ES-4: *Ex Post* Net Realization Rates for Therm Impacts

Program Component	Spillover (1 + Spillover)	Self-Report Net-to-Gross Ratio	Verification	Billing Analysis Realization Rate	*Ex Post* Net Realization Rate
Food Service	1.1	--	1	0.50	0.55
NRER	--	0.8	1	0.75	0.60
NREC	--	0.8	1	0.75	0.60

Using the *ex post* net realization rates, the *ex post* net savings numbers are shown below in Table ES-5 by program component. Note that Table ES-4 shows the adjustment between the *ex ante* gross and *ex post* net savings. Table ES-5 shows a comparison between the *ex ante* and *ex post* net savings numbers.

The reductions in net savings shown in Table ES-5 are due in part to free ridership, as evidenced by both the billing regression model results and the self-report free ridership analysis. In addition, our engineering review indicates that the initial savings estimates may be overestimated. There is little or no background documentation on how the savings values are calculated, however, so the evaluation was unable to review the underlying calculation assumptions beyond the review of a small sample of applications and the calculation spreadsheets for selected measures.

Note that the Food Service component realized a larger reduction going from *ex ante* net impacts to *ex post* net impacts than the other components. This is due to the fact that SCG applies an 80 percent net-to-gross ratio to the NRER and NREC components, and a 100 percent net-to-gross ratio is applied to calculate the net therm impacts for the Food Service component. The SCG net therm savings for the NRER and NREC components have therefore already been reduced by 20 percent from the gross savings value while the Food Service component has not realized any reduction from gross savings to SCG net savings.

Table ES-5: Comparison of *Ex Ante* and *Ex Post* Net Therm Impacts

Program Component	Number of Participants	*Ex Ante* Gross Therm Savings	SCG *Ex Ante* Net Therm Savings	Evaluation *Ex Post* Net Therm Savings	Difference Between Evaluation and SCG Net Savings (%)
Food Service	1,135	2,203,054	2,203,054	1,343,863	-39%
NREC	69	1,570,078	1,256,063	942,047	-25%
NRER	219	1,697,750	1,358,200	1,018,650	-25%
Total	1,423	5,470,883	4,817,317	3,304,560	-31%

CONCLUSIONS AND RECOMMENDATIONS

Based on the evaluation results presented in this report, we draw the following conclusions for the 2004-5 NRFIP evaluation.

- **Participation satisfaction with the NRFIP is very high.** In the survey, 88 percent of participants said they were very satisfied with the program and none of the participants said they were dissatisfied with their overall program experience. In addition, most participants also expressed high levels of satisfaction with the equipment installed through the program (79 percent responded with "Very Satisfied".)

- **All measures included in the on-site audit sample were verified.** Through the 100 on-site audits we were able to verify virtually every measure that was included in the tracking system for these customers.

- **Participant satisfaction, program influence, and awareness levels similar to Express Efficiency.** Participants from both programs had very high satisfaction levels, were strongly influenced by the program to purchase energy efficient equipment in the future, and relatively low awareness levels of other energy efficiency programs. These similarities are not surprising given that these programs are implemented in the same manner.

- **The program is effectively addressing the hard-to-reach aspects of its target customers.** Current participation shows high levels of customers that speak languages other than English, and this rate is higher than what was observed for SCG customers in the 2003 Express Efficiency evaluation. Similarly, the NRFIP has been successful in recruiting renters, which traditionally has been a difficult group to reach with energy efficiency programs. The NRFIP has also been successful in reaching customers in more remote geographic locations. Participant survey results also indicate that these customers are generally unaware of other energy efficiency programs.

- **SCG program sponsorship is important.** From the participant survey, 73 percent of respondents said that having SCG sponsor the program was very important and that just over half (57 percent) first became aware of the NRFIP through a SCG representative. In addition, 93 percent of the participants indicated that their program participation caused them to be more likely to install other energy efficient measures in the future.

- **Free ridership is high.** Our self-report analysis suggests that free ridership may be in the neighborhood of 30 percent for this program, a result that is consistent with net billing analysis completed for the Food Service component. While this finding is similar with the rate observed for some other non-residential programs (such as Standard Performance Contracting) it is much higher than the rate that has been assumed historically for this program.

Based on the evaluation results presented in this report, we offer the following recommendations for improving the NRFIP.

- **Background documentation on all savings calculations is urgently needed.** There was not adequate background documentation to support any of the savings calculations for any of the measures included in the NRFIP. Developing work papers to document the savings assumptions should be made a high priority for this program. (Conversations with utility staff regarding the 2006-08 NRFIP indicate that significant progress has already been made on this issue.)

- **Projects with large therm savings should receive more engineering scrutiny.** Large projects should not rely only on field staff calculations or recommendations by vendors to determine savings. Engineers should be reviewing and adjusted savings calculations as needed for these projects. (See *Section 4* and *Appendix A* for engineering-related recommendations for specific measures.)

- **Include bill information on project application for use in calculating savings.** For a sample of projects reviewed in the engineering review, it appears that the savings estimates may be overstated. Including a customer bill showing monthly therm usage for the prior year to verify actual therm usage should help produce more accurate savings estimates during the application process.

- **Assumptions regarding production increases in the savings calculations should be limited to special circumstances.** Part of the overestimation of savings may be due to assuming increases in production that ultimately do not materialize. As discussed in this report, an increase in capacity does not necessarily result in an increase in production. If production increases are allowed in the savings calculations, they should be limited to special circumstances that are well documented.

- **For engine rebuilds, the 15-year measure life assumption should be re-evaluated.** Two of the three customers we visited during on-sites that had engine rebuilds stated that they rebuild their engines within 5 years or less. Even with modest use, it is unlikely that this measure will last 15 years as currently assumed.