Final Report

Measurement and Evaluation Study of the 2003 Southern California Gas Company Non-Residential Financial Incentives Program (NRFIP)

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1. Executive Summary

This document is the final report for the Measurement and Evaluation Study of the 2003 SCG Local Non-Residential Financial Incentives Program (NRFIP). This report contains verification of the measures installed by delivery channel. The verified measure installations were combined with the stipulated parameters to estimate the Therms savings achieved by the program. Additionally, this report contains measures of program effectiveness resulting from a process evaluation.

The SCG Local Non-residential Financial Incentives Program (NRFIP) is a local program targeting small to medium commercial and industrial gas customers. The program includes technical support, education, training, outreach, contractor referral, bulk procurement, prescriptive rebates, and incentives.

The primary objectives of the study are to:

1. Verify achieved levels of energy and peak demand savings through a program savings study, and
2. Measure indicators of program effectiveness through a process evaluation.

The evaluation is based on telephone surveys with 80 program participants. We attempted to contact a total of 87 participants. Of these 87 participants, 80 completed a telephone survey, corresponding to conversion rate of 92.0%[1]. Not one participant refused to complete the survey, yielding a refusal rate of 0%. Refer to Table 24 for a complete listing of all survey dispositions. The survey responses have been statistically extrapolated to the program population.

Savings Verification Results

Table 1 presents the evaluated number of measures installed relative to the number of measures installed according to the program tracking system, both by delivery channel and overall. For all program measures, the total number of installations was evaluated to be 936 measures representing an installation rate of 100%. For each delivery channel, we did not encounter one participant who could not verify the measure installations..[2]

	Program Tracking # Measures Installed	Evaluated # Measures Installed	Installation Rate
NREC	44	44	100.0%
NRER	373	373	100.0%
PARR	519	519	100.0%
Total	**936**	**936**	**100.0%**

Table 1: Measure Installation Rates by Delivery Channel

[1] The conversion rate is defined as the ratio of successfully completed surveys to all attempted contacts.

[2] During the course of the evaluation, RLW discovered that the program tracking data had been entered incorrectly for one site. For this site, the program tracking data showed the existing equipment in the data fields that contained the installed measure, resulting in a substantial difference in the installed size-units. Consequently, the program corrected the tracking data and an erratum will be filed to modify the net Therms savings recorded in the AEAP filing.

The energy savings and demand reduction achieved by the program was calculated using IPMVP option A, Stipulated Energy Savings, and the parameters assumed in the cost-effectiveness workpapers. For the 2003 SCG NRFIP program, the stipulated parameters calculated in the cost-effectiveness workpapers were calculated on a "size-unit" basis as opposed to an equipment-unit basis. Specifically, the therms savings recorded in the cost-effectiveness workpapers for each measure are per number of "size-units" installed as opposed to per number of "equipment-units" installed[3]. Therefore, while we have extrapolated the verified measure installations in the sample to the program population to estimate the total number of measure installations achieved by the program, we have also extrapolated the verified "size-unit" installations in the sample to the program population to estimate the total number of "size-unit" installations achieved by the program. The estimated total number of "size-unit" installations achieved by the program was then combined with the stipulated parameters calculated in the cost-effectiveness workpapers to estimate the energy savings and demand reduction achieved by the program.

Table 2 presents the evaluated number of size-units installed relative to the number of size-units installed according to the program tracking system, both by delivery channel and overall. For all program measures, the total number of size-unit installations was evaluated to be 331,024 size-units representing an installation rate of 100%. All three delivery channels had an installation rate of 100%. All measures that were initially installed are reported to still be installed and in operation.

	Program Tracking # Size-Units	Evaluated # Size-Units Installed	Installation Rate
NREC	169,160	169,160	100.0%
NRER	99,931	99,931	100.0%
PARR	61,933	61,933	100.0%
Total	**331,024**	**331,024**	**100.0%**

Table 2: Size-Unit Installation Rates by Delivery Channel

Once the number of installed size-units was estimated, we determined the program's annual Therm savings, using IPMVP option A, stipulated energy savings. The stipulated values for the relevant parameters were combined with the verified measure installations. Note that the program had two different values recorded for the stipulated parameter for the annual therms energy savings per size-unit for measures included in the NRER Misc. Process Equipment Replacement category (11.73 Therms per size-unit and 4.53 Therms per size-unit). When we asked which value for the stipulated annual therms energy savings per size-unit was to be applied to the measures within this category, the program staff could not clearly articulate how to match the stipulated values to the measure data for this category. Consequently, we have closely examined the measure installations comprising the NRER Misc. Process Equipment Replacement category and calculated a weighted average of the 2 values for the parameter. For each measure in the category in the program tracking data, we have calculated the measure-specific gross therms savings per size-unit and determined which parameter value was closer. Each measure was assigned the closer parameter value. Then, we calculated a

[3] The types of size units recorded in the program tracking data are HP (Horsepower), MBTUH (MBTU per hour), SQ. FEET (Square Feet), and UNIT (equipment unit).

weighted average (weighted by size-units) of the two parameter values to arrive at one value for the stipulated annual therms energy savings per size-unit for the NRER Misc. Process Equipment Replacement category[4].

Table 3 shows the annual therms savings results. The first column shows the number of size-unit installations recorded in the program tracking data, and the second column shows the evaluated installation rate. Multiplying the first column by the second column yields the evaluated number of size-unit installations. Overall, the program is achieving an annual gross Therms savings of 1,932,368 Therms and an annual net Therms savings of 1,627,698 Therms.

	Program Tracking # Size-Units Installed	Evaluated Installation Rate	Evaluated # Size-Units Installed	Gross Therms Per Size-Unit	Evaluated Annual Gross Therms	Net to Gross Ratio	Evaluated Annual Net Therms
NREC Engine Rebuilds	863	100%	863	5.2	4,522	80%	3,618
NREC Equip. Modernization	160,347	100%	160,347	4.2	673,457	80%	538,766
NREC Heat Recovery	7,950	100%	7,950	1.2	9,540	80%	7,632
NRER Engine Replacement	1,255	100%	1,255	2.1	2,623	80%	2,098
NRER Furnace Replacement	8,280	100%	8,280	12.3	102,010	80%	81,608
NRER Misc. Process Equip. Replacement *	69,564	100%	69,564	5.6	387,471	80%	309,977
NRER Oven Replacement	20,832	100%	20,832	16.5	343,728	80%	274,982
PARR Braising Pan	1,754	100%	1,754	5.3	9,331	100%	9,331
PARR Cabinet Steamer	46	100%	46	5.5	251	100%	251
PARR Cheese melter	936	100%	936	11.0	10,249	100%	10,249
PARR Combination Oven	2,595	100%	2,595	11.7	30,413	100%	30,413
PARR Convection Oven	8,020	100%	8,020	4.3	34,566	100%	34,566
PARR Deck Oven	771	100%	771	3.6	2,791	100%	2,791
PARR Fryer - High Effic. Unit	5,965	100%	5,965	4.1	24,337	100%	24,337
PARR Fryer - High Effic. Unit with Electr. Ignition	600	100%	600	8.6	5,136	100%	5,136
PARR Fryer - Unit with Electr. Ignition	2,585	100%	2,585	2.2	5,635	100%	5,635
PARR Griddle	7,527	100%	7,527	4.5	33,570	100%	33,570
PARR Over-fired [char] broiler	1,556	100%	1,556	9.4	14,642	100%	14,642
PARR Rotating Rack Oven	6,776	100%	6,776	11.4	77,382	100%	77,382
PARR Salamander	197	100%	197	7.9	1,556	100%	1,556
PARR Steam Kettle	2,866	100%	2,866	17.2	49,209	100%	49,209
PARR Under-fired broiler	19,739	100%	19,739	5.6	109,946	100%	109,946
Total	**331,024**	**100%**	**331,024**		**1,932,368**	**84%**	**1,627,698**

Table 3: Program Annual Gross and Net Therms Savings

Table 4 shows the life-cycle therms savings results[5]. The first column shows the number of size-unit installations recorded in the program tracking data, the second column shows the evaluated annual gross therms, the third column shows the evaluated annual net therms, and the fourth column shows the EUL. Multiplying the second and third columns by the forth column yields the life-cycle gross and net therms, respectively. Overall, the program is achieving a lifecycle gross Therms savings of 35,339,507 Therms and a lifecycle net Therms savings of 29,253,246 Therms.

[4] There were 10,020 size units associated with the value 11.73 and 59,544 size-units associated with the value 4.53, so we have calculated the parameter value as $\frac{59{,}544 * 4.53 + 10{,}020 * 11.73}{59{,}544 + 10{,}020} = 5.57$

[5] We have calculated the life-cycle therms savings as the product of the annual therms savings and the Effective Useful Life, or (life-cycle therms savings) = (annual therms savings) * (EUL).

	Program Tracking # Size-Units Installed	Evaluated Annual Gross Therms	Evaluated Annual Net Therms	EUL	Life-Cycle Gross Therms	Life-Cycle Net Therms
NREC Engine Rebuilds	863	4,522	3,618	15	67,832	54,265
NREC Equip. Modernization	160,347	673,457	538,766	20	13,469,148	10,775,318
NREC Heat Recovery	7,950	9,540	7,632	20	190,800	152,640
NRER Engine Replacement	1,255	2,623	2,098	15	39,344	31,475
NRER Furnace Replacement	8,280	102,010	81,608	20	2,040,192	1,632,154
NRER Misc. Process Equip. Replacement	69,564	387,471	309,977	20	7,749,430	6,199,544
NRER Oven Replacement	20,832	343,728	274,982	20	6,874,560	5,499,648
PARR Braising Pan	1,754	9,331	9,331	12	111,975	111,975
PARR Cabinet Steamer	46	251	251	12	3,014	3,014
PARR Cheese melter	936	10,249	10,249	12	122,990	122,990
PARR Combination Oven	2,595	30,413	30,413	12	364,961	364,961
PARR Convection Oven	8,020	34,566	34,566	12	414,794	414,794
PARR Deck Oven	771	2,791	2,791	12	33,492	33,492
PARR Fryer - High Effic. Unit	5,965	24,337	24,337	12	292,046	292,046
PARR Fryer - High Effic. Unit with Electr. Ignition	600	5,136	5,136	12	61,632	61,632
PARR Fryer - Unit with Electr. Ignition	2,585	5,635	5,635	12	67,624	67,624
PARR Griddle	7,527	33,570	33,570	12	402,845	402,845
PARR Over-fired [char] broiler	1,556	14,642	14,642	12	175,704	175,704
PARR Rotating Rack Oven	6,776	77,382	77,382	12	928,583	928,583
PARR Salamander	197	1,556	1,556	12	18,676	18,676
PARR Steam Kettle	2,866	49,209	49,209	12	590,511	590,511
PARR Under-fired broiler	19,739	109,946	109,946	12	1,319,355	1,319,355
Total	**331,024**	**1,932,368**	**1,627,698**		**35,339,507**	**29,253,246**

Table 4: Program Life-Cycle Gross and Net Therms Savings

Table 5 compares the evaluated annual net Therms savings to those recorded in the program's AEAP filing. The verified net Therms savings exceed both those recorded in the program's errata to the AEAP filing as well as the CPUC target. The difference between the savings filed by the program and the verified savings is due to one issue. As described earlier in this section, the program had two different values recorded for the stipulated parameter for the annual therms energy savings per size-unit for measures included in the NRER Misc. Process Equipment Replacement category (11.73 Therms per size-unit and 4.53 Therms per size-unit), whereas we used a value of 5.57 Therms per size-unit.

	CPUC Target	Program AEAP Filed	Verified
Net Therms Savings	1,453,639	1,624,200	1,627,698

Table 5: Annual Net Therms Savings Compared to AEAP Filing

Process Evaluation Results

Approximately 40% of program participants state they have experienced a noticeable change in their gas bill. The program measures are resulting in noticeable gas savings, as evidenced by the fact that 40% of participants have seen a reduction in their utility costs.

Most participants found it somewhat easy to identify, specify, and install the equipment and to complete their program application. This finding reinforces the fact that participating in the program is not cumbersome or a burden to customers.

Participants need support in knowing more about energy efficient equipment and operations. Approximately 10% of participants report needing significant support in knowing more about these issues with another 30% stating they could use some support. Just over 10% of participants stated they didn't need any support in knowing more about energy efficient equipment and operation. These findings suggest that the program is primarily reaching those customers that require support in understanding how to maximize their energy efficiency.

Observations and Recommendations

Several observations were made about the 2003 Non-Residential Financial Incentives Program through the course of conducting this evaluation. Some of these observations have resulted in recommendations for the program. Our major observations are[6]:

1. Excellent Overall Measure and Size-Unit Installation Rates,
2. Program Participants are Very Satisfied with the Program
3. Care Is Needed When Managing Program Tracking Data,
4. Stipulated Parameters Must Directly Link to Measures in Program Tracking Data,
5. NRER Misc. Process Equipment Replacement Measure Category Should Be Divided Into Two Separate Measure Categories, and
6. SCG should conduct a thorough review of the stipulated parameters as part of the next evaluation, measurement and verification study.

[6] Detailed specifics for each observation are articulated in the chapter entitled "Observations and Recommendations".

2. Introduction

This is the final report for the Measurement and Evaluation Study of the 2003 SCG Local Non-Residential Financial Incentives Program (NRFIP). In this chapter, we will describe the 2003 program as well as our general evaluation approach.

Program Overview

The SCG Local Non-residential Financial Incentives Program (NRFIP) is a local program targeting small to medium commercial and industrial gas customers. The program includes technical support, education, training, outreach, contractor referral, bulk procurement, prescriptive rebates, and incentives.

The SCG Local Non-residential Financial Incentives Program is comprised of three program elements:

1. The "Purchase-Apply-Receive Rebate" (PARR) provides streamlined rebates to non-residential customers who install one or more identified energy efficient measures from a prescribed list. This element focuses primarily on foodservice type equipment.
2. The "Non-Residential Equipment Replacement" (NRER) element is limited to "kind-for-kind" replacement of old, inefficient commercial or industrial end use gas fired technology for higher efficiency alternatives. Examples of measures incented under this element are gas engines and high temperature industrial process technologies.
3. The "Non-Residential Energy Conservation" incentive element provides qualified customers with a financial incentive to implement comprehensive energy savings commercial building envelope or industrial process changes on a unique, site-specific, case-by-case basis. Examples of measures incented under this element are commercial building envelope upgrades, engine rebuilds, energy management controls, and a variety of industrial process efficiency improvements.

In 2003, according to the program tracking data, the NRFIP program incented 59 measures to 33 participants under the NREC delivery channel and 373 measures to 65 participants under the NRER delivery channel. Under the PARR delivery channel, the 2003 NRFIP program rebated 519 measures to 272 participants.

Evaluation Overview

The primary objectives of the study are to:

1. Verify achieved levels of energy and peak demand savings through a program savings study, and
2. Measure indicators of program effectiveness through a process evaluation.

To verify the achieved levels of energy and peak demand savings, the study will determine the number of measure installations achieved during the 2003 program year using telephone surveys. The same telephone survey will also be utilized to measure indicators of program effectiveness.

Using the SCG program tracking data as a sampling frame, we selected a statistically representative sample of 80 participants for the telephone survey. We ultimately completed a survey with 80 participants. All results were extrapolated to the program participant population.

We used a telephone survey to serve two purposes: verifying the measure installations and assessing the effectiveness of the program approach in delivering customer satisfaction. For each participant in the sample, the survey verified the measures listed in the SCG tracking database. The survey also determined how participants heard of the program, reasons for participation, and customer perceptions on how the program has helped them manage their energy bills.

The energy savings and demand reduction achieved by the program was calculated using IPMVP option A, Stipulated Energy Savings, and the parameters assumed in the cost-effectiveness workpapers. For the 2003 SCG NRFIP program, the stipulated parameters calculated in the cost-effectiveness workpapers were calculated on a "size-unit" basis as opposed to an equipment-unit basis. Specifically, the therms savings recorded in the cost-effectiveness workpapers for each measure are per number of "size-units" installed as opposed to per number of "equipment-units" installed[7]. Therefore, while we have extrapolated the verified measure installations in the sample to the program population to estimate the total number of measure installations achieved by the program, we have also extrapolated the verified "size-unit" installations in the sample to the program population to estimate the total number of "size-unit" installations achieved by the program. The estimated total number of "size-unit" installations achieved by the program was then combined with the stipulated parameters calculated in the cost-effectiveness workpapers to estimate the energy savings and demand reduction achieved by the program. For the process evaluation component of the study, the statistical analysis of the data consisted of weighted frequency distributions, means, and cross-tabulations, where appropriate, to measure indicators of program effectiveness.

[7] The types of size units recorded in the program tracking data are HP (Horsepower), MBTUH (MBTU per hour), SQ. FEET (Square Feet), and UNIT (equipment unit).

3. Results

Savings Verification Results

The energy savings and demand reduction achieved by the program was calculated using IPMVP option A, Stipulated Energy Savings, and the parameters assumed in the cost-effectiveness workpapers. For the 2003 SCG NRFIP program, the stipulated parameters calculated in the cost-effectiveness workpapers were calculated on a "size-unit" basis as opposed to an equipment-unit basis. Specifically, the therms savings recorded in the cost-effectiveness workpapers for each measure are per number of "size-units" installed as opposed to per number of "equipment-units" installed[8]. Therefore, while we have extrapolated the verified measure installations in the sample to the program population to estimate the total number of measure installations achieved by the program, we have also extrapolated the verified "size-unit" installations in the sample to the program population to estimate the total number of "size-unit" installations achieved by the program. The estimated total number of "size-unit" installations achieved by the program was then combined with the stipulated parameters calculated in the cost-effectiveness workpapers to estimate the energy savings and demand reduction achieved by the program.

Verification of Number of Measures Installed

Table 6 presents the evaluated number of measures installed relative to the number of measures installed according to the program tracking system, both by delivery channel and overall. For all program measures, the total number of installations was evaluated to be 936 measures representing an installation rate of 100%. For each delivery channel, we did not encounter one participant who could not verify the measure installations[9].

	Program Tracking # Measures Installed	Evaluated # Measures Installed	Installation Rate
NREC	44	44	100.0%
NRER	373	373	100.0%
PARR	519	519	100.0%
Total	**936**	**936**	**100.0%**

Table 6: Measure Installation Rates by Delivery Channel

Table 7 shows the evaluated number of measures installed and associated error bound by delivery channel as well as overall. The total number of measures installed was 936 measures, with an error bound of 0 measures, yielding a 90% confidence interval of (936 to 936)

[8] The types of size units recorded in the program tracking data are HP (Horsepower), MBTUH (MBTU per hour), and UNIT (equipment unit).

[9] During the course of the evaluation, RLW discovered that the program tracking data had been entered incorrectly for one site. For this site, the program tracking data showed the existing equipment in the data fields that contained the installed measure, resulting in a substantial difference in the installed size-units. Consequently, the program corrected the tracking data and an erratum will be filed to modify the net Therms savings recorded in the AEAP filing.

measures. All measures that were initially installed are reported to still be installed and in operation.

	Evaluated # Measures Installed	Error Bound	Relative Precision
NREC	44	0	0.0%
NRER	373	0	0.0%
PARR	519	0	0.0%
Total	**936**	**0**	**0.0%**

Table 7: Number of Measures Installed by Delivery Channel

Verification of Number of "Size-Units" Installed

Table 8 presents the evaluated number of size-units installed relative to the number of size-units installed according to the program tracking system, both by delivery channel and overall. For all program measures, the total number of size-unit installations was evaluated to be 331,024 size-units representing an installation rate of 100%. All three delivery channels had an installation rate of 100%.

	Program Tracking # Size-Units	Evaluated # Size-Units Installed	Installation Rate
NREC	169,160	169,160	100.0%
NRER	99,931	99,931	100.0%
PARR	61,933	61,933	100.0%
Total	**331,024**	**331,024**	**100.0%**

Table 8: Size-Unit Installation Rates by Delivery Channel

Table 9 shows the evaluated number of size-units installed and associated error bound by delivery channel as well as overall. The total number of size-units installed was 331,024 size-units, with an error bound of 0 size-units, yielding a 90% confidence interval of (331,024 to 331,024) size-units. All size-units that were initially installed are reported to still be installed and operating as intended.

	Evaluated # Size-Units Installed	Error Bound	Relative Precision
NREC	169,160	-	0.0%
NRER	99,931	-	0.0%
PARR	61,933	-	0.0%
Total	**331,024**	**-**	**0.0%**

Table 9: Number of Size-Units Installed by Delivery Channel

Verify Program Savings

Once the number of installed size-units was estimated, we determined the program's annual Therm savings, using IPMVP option A, stipulated energy savings. The stipulated values for the relevant parameters were combined with the verified measure installations. Note that the program had two different values recorded for the stipulated parameter for the annual therms energy savings per size-unit for measures included in the NRER Misc. Process Equipment Replacement category (11.73 Therms per size-unit and 4.53 Therms per size-unit). When we asked which value for the stipulated annual therms energy savings per size-unit was to be applied to the measures within this category, the program staff could not clearly articulate how to match the stipulated values to the measure data for this category. Consequently, we have closely examined the measure installations comprising the NRER Misc. Process Equipment Replacement category and calculated a weighted average of the 2 values for the parameter. For each measure in the category in the program tracking data, we have calculated the measure-specific gross therms savings per size-unit and determined which parameter value was closer. Each measure was assigned the closer parameter value. Then, we calculated a weighted average (weighted by size-units) of the two parameter values to arrive at one value for the stipulated annual therms energy savings per size-unit for the NRER Misc. Process Equipment Replacement category[10].

[10] There were 10,020 size units associated with the value 11.73 and 59,544 size-units associated with the value 4.53, so we have calculated the parameter value as $\frac{59{,}544 * 4.53 + 10{,}020 * 11.73}{59{,}544 + 10{,}020} = 5.57$

Table 10 shows the annual therms savings results. The first column shows the number of size-unit installations recorded in the program tracking data, and the second column shows the evaluated installation rate. Multiplying the first column by the second column yields the evaluated number of size-unit installations. Overall, the program is achieving an annual gross Therms savings of 1,932,368 Therms and an annual net Therms savings of 1,627,698 Therms.

	Program Tracking # Size-Units Installed	Evaluated Installation Rate	Evaluated # Size-Units Installed	Gross Therms Per Size-Unit	Evaluated Annual Gross Therms	Net to Gross Ratio	Evaluated Annual Net Therms
NREC Engine Rebuilds	863	100%	863	5.2	4,522	80%	3,618
NREC Equip. Modernization	160,347	100%	160,347	4.2	673,457	80%	538,766
NREC Heat Recovery	7,950	100%	7,950	1.2	9,540	80%	7,632
NRER Engine Replacement	1,255	100%	1,255	2.1	2,623	80%	2,098
NRER Furnace Replacement	8,280	100%	8,280	12.3	102,010	80%	81,608
NRER Misc. Process Equip. Replacement *	69,564	100%	69,564	5.6	387,471	80%	309,977
NRER Oven Replacement	20,832	100%	20,832	16.5	343,728	80%	274,982
PARR Braising Pan	1,754	100%	1,754	5.3	9,331	100%	9,331
PARR Cabinet Steamer	46	100%	46	5.5	251	100%	251
PARR Cheese melter	936	100%	936	11.0	10,249	100%	10,249
PARR Combination Oven	2,595	100%	2,595	11.7	30,413	100%	30,413
PARR Convection Oven	8,020	100%	8,020	4.3	34,566	100%	34,566
PARR Deck Oven	771	100%	771	3.6	2,791	100%	2,791
PARR Fryer - High Effic. Unit	5,965	100%	5,965	4.1	24,337	100%	24,337
PARR Fryer - High Effic. Unit with Electr. Ignition	600	100%	600	8.6	5,136	100%	5,136
PARR Fryer - Unit with Electr. Ignition	2,585	100%	2,585	2.2	5,635	100%	5,635
PARR Griddle	7,527	100%	7,527	4.5	33,570	100%	33,570
PARR Over-fired [char] broiler	1,556	100%	1,556	9.4	14,642	100%	14,642
PARR Rotating Rack Oven	6,776	100%	6,776	11.4	77,382	100%	77,382
PARR Salamander	197	100%	197	7.9	1,556	100%	1,556
PARR Steam Kettle	2,866	100%	2,866	17.2	49,209	100%	49,209
PARR Under-fired broiler	19,739	100%	19,739	5.6	109,946	100%	109,946
Total	**331,024**	**100%**	**331,024**		**1,932,368**	**84%**	**1,627,698**

Table 10: Program Annual Gross and Net Therms Savings

Table 11 shows the life-cycle therms savings results[11]. The first column shows the number of size-unit installations recorded in the program tracking data, the second column shows the evaluated annual gross therms, the third column shows the evaluated annual net therms, and the fourth column shows the EUL. Multiplying the second and third columns by the forth column yields the life-cycle gross and net therms, respectively. Overall, the program is achieving a lifecycle gross Therms savings of 35,339,507 Therms and a lifecycle net Therms savings of 29,253,246 Therms.

	Program Tracking # Size-Units Installed	Evaluated Annual Gross Therms	Evaluated Annual Net Therms	EUL	Life-Cycle Gross Therms	Life-Cycle Net Therms
NREC Engine Rebuilds	863	4,522	3,618	15	67,832	54,265
NREC Equip. Modernization	160,347	673,457	538,766	20	13,469,148	10,775,318
NREC Heat Recovery	7,950	9,540	7,632	20	190,800	152,640
NRER Engine Replacement	1,255	2,623	2,098	15	39,344	31,475
NRER Furnace Replacement	8,280	102,010	81,608	20	2,040,192	1,632,154
NRER Misc. Process Equip. Replacement	69,564	387,471	309,977	20	7,749,430	6,199,544
NRER Oven Replacement	20,832	343,728	274,982	20	6,874,560	5,499,648
PARR Braising Pan	1,754	9,331	9,331	12	111,975	111,975
PARR Cabinet Steamer	46	251	251	12	3,014	3,014
PARR Cheese melter	936	10,249	10,249	12	122,990	122,990
PARR Combination Oven	2,595	30,413	30,413	12	364,961	364,961
PARR Convection Oven	8,020	34,566	34,566	12	414,794	414,794
PARR Deck Oven	771	2,791	2,791	12	33,492	33,492
PARR Fryer - High Effic. Unit	5,965	24,337	24,337	12	292,046	292,046
PARR Fryer - High Effic. Unit with Electr. Ignition	600	5,136	5,136	12	61,632	61,632
PARR Fryer - Unit with Electr. Ignition	2,585	5,635	5,635	12	67,624	67,624
PARR Griddle	7,527	33,570	33,570	12	402,845	402,845
PARR Over-fired [char] broiler	1,556	14,642	14,642	12	175,704	175,704
PARR Rotating Rack Oven	6,776	77,382	77,382	12	928,583	928,583
PARR Salamander	197	1,556	1,556	12	18,676	18,676
PARR Steam Kettle	2,866	49,209	49,209	12	590,511	590,511
PARR Under-fired broiler	19,739	109,946	109,946	12	1,319,355	1,319,355
Total	**331,024**	**1,932,368**	**1,627,698**		**35,339,507**	**29,253,246**

Table 11: Program Life-Cycle Gross and Net Therms Savings

[11] We have calculated the life-cycle therms savings as the product of the annual therms savings and the Effective Useful Life, or (life-cycle therms savings) = (annual therms savings) * (EUL).

Table 12 compares the evaluated annual net Therms savings to those recorded in the program's errata to the AEAP filing. The verified net Therms savings exceed both those recorded in the program's errata to the AEAP filing as well as the CPUC target. The difference between the savings filed by the program and the verified savings is due to one issue. As described earlier in this section, the program had two different values recorded for the stipulated parameter for the annual therms energy savings per size-unit for measures included in the NRER Misc. Process Equipment Replacement category (11.73 Therms per size-unit and 4.53 Therms per size-unit), whereas we used a value of 5.57 Therms per size-unit.

	CPUC Target	Program AEAP Filed	Verified
Net Therms Savings	1,453,639	1,624,200	1,627,698

Table 12: Annual Net Therms Savings Compared to AEAP Filing

Process Evaluation Results

Table 13 shows how participants first became aware of SCG's 2003 Non-Residential Financial Incentives Program by delivery channel. Overall, nearly 45% of participants learned of the program through their SCG account rep, while approximately 20% learned of the program through a friend or colleague. PARR participants were significantly more likely to learn of the program through a friend or colleague, while NREC participants were more likely to become aware of the program through their SCG account representative. NRER participants were significantly more likely to learn of the program through an equipment vendor, manufacturer, or distributor.

	% of Participants			
	NREC	**NRER**	**PARR**	**Overall**
Referred by a utility account representative	79.4%	16.9%	45.4%	43.5%
Friend / Colleague	-	4.6%	25.3%	19.4%
SCG - Other Than Website	5.9%	4.6%	13.9%	11.6%
Vendor / Manufacturer / Distributor	-	40.0%	1.5%	8.1%
SCG Website	2.9%	13.8%	-	2.7%
Bill Insert	-	3.1%	-	0.5%
Letter / Mailing Other than Bill Insert	-	1.5%	-	0.3%
Don't Know	5.9%	12.3%	11.7%	11.3%
Other	5.9%	3.1%	2.2%	2.7%

Table 13: Source of Awareness of Non-Residential Financial Incentives Program By Delivery Channel

Next, respondents were asked to provide the primary reason they participated in the program. Table 14 displays the responses by delivery channel. Over 55% of participants chose to participate to upgrade to new equipment. Nearly 25% of participants state their primary reason for participating in the program was to achieve energy savings. NREC and NRER participants were significantly more likely than PARR participants to state that direct energy savings was their primary reason for participating. PARR participants were significantly more likely to participate in order to upgrade to new equipment.

	% of Participants			
	NREC	**NRER**	**PARR**	**Overall**
Upgrade to New Equipment	33.3%	35.4%	64.0%	56.2%
Energy Savings	39.4%	56.9%	14.0%	23.8%
Increase Production	6.1%	6.2%	19.9%	16.2%
Environmental Concerns	21.2%	-	-	1.9%
Other	-	1.5%	2.2%	1.9%

Table 14: Primary Reason for Participating in Non-Residential Financial Incentives Program By Delivery Channel

Table 15 presents the incidence of participants noticing a change in their gas bill since participating in the Non-Residential Financial Incentives Program by delivery channel. Overall, over 40% of participants have noticed a change in their bill. Approximately another 45% of participants do not know if they have seen a change in their bill. Many of the participants that

do not know if they are experiencing a change in their energy bill reported making additional equipment changes at or around the same time as installing the program measures, making it difficult to distinguish any changes.

	% of Participants			
	NREC	**NRER**	**PARR**	**Overall**
Yes	47.1%	64.1%	37.1%	42.7%
No	11.8%	7.8%	14.3%	13.0%
Don't Know	41.2%	28.1%	48.5%	44.3%

Table 15: Incidence of Noticing a Change in Gas Bill

All participants who have noticed a change in their gas bill were asked to compare the change to their expectations. As shown in Table 16, only about 1% of all participants who have noticed a change are experiencing less energy savings than they expected, while nearly 60% of participants who have noticed a change are saving about as much as they expected. Just over 35% of participants who have noticed a change are saving even more than they expected. PARR participants are more likely to report saving more than expected, while NREC and NRER participants are the only respondents reporting savings less than expected.

	% of Participants With Change in Bill			
	NREC	**NRER**	**PARR**	**Overall**
Less Than I expected	6.3%	2.4%	-	1.3%
About As Much As I Expected	87.5%	53.7%	57.4%	59.5%
More Than I Expected	-	36.6%	42.6%	36.7%
Don't Know	6.3%	7.3%	-	2.5%

Table 16: Change in Gas Bill Compared to Participant Expectations Among Participants Who Noticed A Change in Bill

All respondents were read a list of items about the Non-Residential Financial Incentives Program and asked to rate the level of ease associated with each[12], using a scale of 1 to 5, where 1 means very difficult and 5 means very easy. Table 17 displays the mean rating of ease for each item by delivery channel. Overall, participants find it easy to participate, as the mean rating of each item is 4.18 or higher. On average, NRER participants found the various components of participating slightly more difficult than their NREC or PARR counterparts.

	Mean Rating			
	NREC	**NRER**	**PARR**	**Overall**
Identify & Specify Rebated (Incented) Equipment	4.73	4.22	4.70	4.62
Install the Rebated (Incented) Equipment	4.47	4.24	4.71	4.60
Complete Your Program Application	4.52	4.18	4.41	4.38

Table 17: Level of Ease Associated with Various Aspects of Participating

Participants were asked how long it took to receive their rebate once the equipment was installed and their application was complete. Table 18 summarizes the responses. Over 20%

[12] The order in which the items were read was different for PARR participants than for NREC and NRER participants, in order to reflect the sequence of participation events for each unique delivery channel.

of participants received their check within 30 days of installing the equipment and completing their application. Nearly 30% of participants report receiving payment within 30 – 59 days, while over 25% of participants report that it took 60 – 89 days to receive payment.

	% of Participants			
	NREC	**NRER**	**PARR**	**Overall**
Less Than 30 Days	20.6%	18.5%	23.2%	22.1%
30 - 59 Days	26.5%	41.5%	26.8%	29.4%
60 - 89 Days	11.8%	20.0%	30.9%	27.2%
90 Days or Greater	26.5%	13.8%	19.1%	18.9%
I Still Haven't Received It	-	1.5%	-	0.3%
Don't Know	14.7%	4.6%	-	2.2%

Table 18: Length of Time to Receive Rebate Once Application Was Complete By Delivery Channel

Participants were asked to describe their need to know more about energy efficient equipment and operations. As shown in Table 19, just over 10% of participants state they could use significant support in having more information related to energy efficiency. Over 15% of participants could use some support only in certain areas, and almost 30% could use a little support only in certain areas. NREC customers report needing the most support in terms of energy efficiency and equipment operation, 75% of these participants report needing some or significant support in this area.

	% of Participants			
	NREC	**NRER**	**PARR**	**Overall**
I Know Pretty Much What I Need to Know	-	12.3%	15.8%	13.7%
I Can Use A Small Amount of Support in Knowing More in Certain Areas	14.7%	3.1%	35.3%	27.8%
I Can Use Some Support in Knowing More in Certain Areas	8.8%	33.8%	13.6%	16.7%
I Can Use Some Support	41.2%	33.8%	29.0%	31.0%
I Can Use Significant Support	35.3%	16.9%	6.3%	10.8%
Don't Know	-	-	-	-

Table 19: Participant Need to Know More About Energy Efficient Equipment & Operations by Delivery Channel

Participants were asked to spontaneously indicate what they liked or disliked about the program. Table 20 summarizes the results. Over 40% of participants state they have no suggestions or comments, about 25% of participants state they found the utility staff and support to be excellent and helpful, and about 25% of participants found the program easy to use and had no complaints. Over 20% of PARR participants stated they would like to see the participation process streamlined, with over 10% of PARR participants stating they would like the program to be available year-round. Over 20% of NREC participants would like the timeliness of the incentive to improve.

	% of Participants			
	NREC	**NRER**	**PARR**	**Overall**
No Suggestions	21.2%	29.2%	47.8%	42.2%
Utility Staff and Support Was Excellent and Helpful	30.3%	10.8%	29.4%	26.2%
Easy Program to Use, No Complaints	44.1%	44.6%	15.4%	23.2%
Streamline The Program Process	0%	0.0%	21.3%	15.7%
Would Like The Programs to Be Year-Round	3.0%	0%	11.8%	8.9%
Extend Purchase to Installation Period (Dates Are Too Close)	0%	1.5%	11.8%	8.9%
Improve the Timeliness of The Rebate	23.5%	12.3%	0%	4.3%
The Program Saved Us Money and Lowered Our Bills	9.1%	7.7%	0%	2.2%
Process and Evaluation was Efficient	0%	3.1%	0%	0.5%
Rebate Delivery Was Timely	5.9%	0%	0%	0.5%
Expand The List of Rebated Equipment	2.9%	0%	0.0%	0.3%
Other	0%	7.7%	4.8%	4.9%

Table 20: Participant Likes / Dislikes of Program

Demographics

Table 21 presents the participant firm's main line of business by delivery channel. Over 50% of participants report they are a restaurant or caterer. Over 60% of NRER participants are laundry facilities. Over half of NREC participants are industrial businesses.

	% of Participants			
	NREC	**NRER**	**PARR**	**Overall**
Restaurant / Catering	-	-	74.7%	54.8%
Laundry	-	63.1%	-	11.0%
Bakery	5.9%	3.1%	4.0%	4.0%
School / College	-	-	11.7%	8.6%
Industrial	52.9%	21.5%	-	8.6%
Food Manufacturing	8.8%	7.7%	0.4%	2.4%
Grocery Store	-	-	7.0%	5.1%
Hotel	-	-	0.7%	0.5%
Nursery	5.9%	1.5%	-	0.8%
Hospital / Care Home	-	3.1%	-	0.5%
Other	26.5%	-	1.5%	3.5%

Table 21: Firm's Main Line of Business

4. Observations and Recommendations

This chapter presents observations made about the 2003 Non-Residential Financial Incentives Program through the course of conducting this evaluation. Recommendations to improve the program are also presented.

Excellent Overall Measure and Size-Unit Installation Rates

Overall, the program is experiencing a high rate of measure installation. Overall, the measure installation rate is 100%. For each delivery channel, we did not encounter one participant who could not verify the measure installations. Furthermore, all measures that were initially installed are reported to still be installed and operating as intended

Program Participants are Very Satisfied with the Program

Results from the process evaluation show that NRFIP participants are generally very satisfied with the major components of the program. Participants found it very easy to identify equipment, install the equipment, and complete the required program application material. Participants had high praise for the program and had very few complaints regarding their participation.

About 40% of participants report they have noticed a reduction in their gas bill since installing the equipment rebated by the program. Among participants that have noticed a change, more than 95% report they are saving as much gas as they expected or more. Participants who have not noticed a change in their gas bill state this is because several equipment modifications took place at the same time so they cannot discern any changes related to the program measures. Moreover, a significant number of participants (37%) are experiencing more energy savings than they had anticipated the conservation measure would produce.

As we understand it, this participant installed some amount of insulation through the program that interacted with the 16 existing space heaters at the site

Care Is Needed When Managing Program Tracking Data

During the course of the evaluation, we discovered that the program tracking data had been entered incorrectly for one site. For this site, the program tracking data showed the existing equipment in the data fields that contained the installed measure, resulting in a substantial difference in the installed size-units. Consequently, the program corrected the tracking data and filed an erratum modifying the net Therms savings recorded in the AEAP filing.

Stipulated Parameters Must Directly Link to Measures in Program Tracking Data

The program had 2 different values recorded for the stipulated parameter for the annual therms energy savings per size-unit for measures included in the NRER Misc. Process Equipment Replacement category (11.73 Therms per size-unit and 4.53 Therms per size-unit). When we asked which value for the stipulated annual therms energy savings per size-unit was to be applied to which measures within the category, the program staff could not clearly articulate that information and also indicated there was no such column in the program tracking data. Consequently, in order to be conservative in our estimates of annual and life-cycle Therms achieved by the program, we have utilized a value of 4.53 Therms annually per size-unit for all measures in the NRER Misc. Process Equipment Replacement category.

Because there was some unidentifiable number of measures within the NRER Misc. Process Equipment Replacement category where the program applied a value of 11.73 annual Therms

per size-unit and we have applied a value of 4.53 Therms per size-unit. This was because the program staff could not articulate which measures within the category ought to have which stipulated value for the parameter; therefore we have closely examined the measure installations comprising the NRER Misc. Process Equipment Replacement category and calculated a weighted average of the 2 values for the parameter.

NRER Misc. Process Equipment Replacement Measure Category Should Be Divided Into Two Separate Measure Categories

Of the 343 measure installations comprising the NRER Misc. Process Equipment Replacement category, 332, or 97%, of the measure installations are dryers. Furthermore, of the 59,564 size-units comprising the measure category, 57,864, or 83%, of the size-units are associated with dryers. Therefore, we recommend separating the dryer measures from the remaining measures comprising the NRER Misc. Process Equipment Replacement measure category.

The Stipulated Parameters should be Reviewed as Part of the Next EM&V Study

The budget for this study did not provide the resources to conduct a thorough review of the stipulated parameter values used by the program to track energy savings. We strongly encourage that a larger EM&V budget be designated to EM&V so that these parameters can be evaluated. These activities will likely require on-site surveys, data logging and engineering analysis for each measure, which will require a significant increase in the EM&V budget.

5. EM&V Methodology

To evaluate the number of measures and size-units installed through the Non-Residential Financial Incentives Program, RLW utilized telephone surveys with a statistically representative sample of program participants. We used the program tracking data to design a sample statistically representative of the program. For each program participant in the sample, we verified the measures installed according to the program tracking data using a phone survey. We also assessed the effectiveness of the program approach in delivering customer satisfaction using phone surveys. The process evaluation component was also designed to explore how participants first became aware of the program, reasons for participation, whether the participant has noticed a change in their gas usage since participating, and the level of ease associated with identifying and installing the rebated/incented equipment and completing the program application.

Sample Design

The selection of the sample participants was guided by a model-based statistical sampling plan. Model-based sampling methods were also used to analyze the data, i.e., to extrapolate the findings from the sample participants to the target population of all program participants and to evaluate the statistical precision of the results. We stratified the participant population by delivery channel (i.e. NREC, NRER, and PARR) and Therms savings, as a way to maximize the Therms savings verified in our sample.

Theoretical Foundation

MBSS™ methodology was used to develop an efficient sample design and to assess the likely statistical precision associated the planned sample. The target variable of analysis, denoted *y*, is the verified number of measures (size-units) installed through the program. The primary stratification variable, the program tracking number of measures (size-units) installed, will be denoted *x*. A ratio model was formulated to describe the relationship between *y* and *x* for all units in the population, e.g., program participants.

The MBSS™ ratio model consists of two equations called the primary and secondary equations:

$$\begin{aligned} y_k &= \beta x_k + \varepsilon_k \\ \sigma_k &= sd(y_k) = \sigma_0 x_k^{\gamma} \end{aligned}$$

Here $x_k > 0$ is known throughout the population. *k* denotes the sampling unit, i.e., the participant. $\{\varepsilon_1, \ldots, \varepsilon_N\}$ are independent random variables with zero expected value, and β, σ_0, and γ (gamma) are parameters of the model. The primary equation can also be written as

$$\mu_k = \beta x_k$$

Under the MBSS ratio model, it is assumed that the expected value of *y* is a simple ratio or multiple of *x.*

Here, y_k is a random variable with expected value μ_k and standard deviation σ_k. Both the expected value and standard deviation generally vary from one unit to another depending on

x_k, following the primary and secondary equations of the model. In statistical jargon, the ratio model is a (usually) heteroscedastic regression model with zero intercept.

One of the key parameters of the ratio model is the error ratio, denoted *er*. The error ratio is a measure of the strength of the association between *y* and *x*. The error ratio is suitable for measuring the strength of a heteroscedastic relationship and for choosing sample sizes. It is *not* equal to the correlation coefficient. It *is* somewhat analogous to a coefficient of variation except that it describes the association between two or more variables rather than the variation in a single variable.

Using the model discussed above, the error ratio, *er*, is defined to be:

$$er = \frac{\sum_{k=1}^{N} \sigma_k}{\sum_{k=1}^{N} \mu_k} = \frac{\frac{1}{N}\sum_{k=1}^{N} \sigma_k}{\frac{1}{N}\sum_{k=1}^{N} \mu_k}$$

Figure 1 gives some typical examples of ratio models with different error ratios. An error ratio of 0.2 represents a very strong association between *y* and *x*, whereas an error ratio of 0.8 represents a weak association.

As Figure 1 indicates, the error ratio is the principle determinant of the sample size required to satisfy the 90/10 criteria for estimating *y*. If the error ratio is small, then the required sample is correspondingly small.

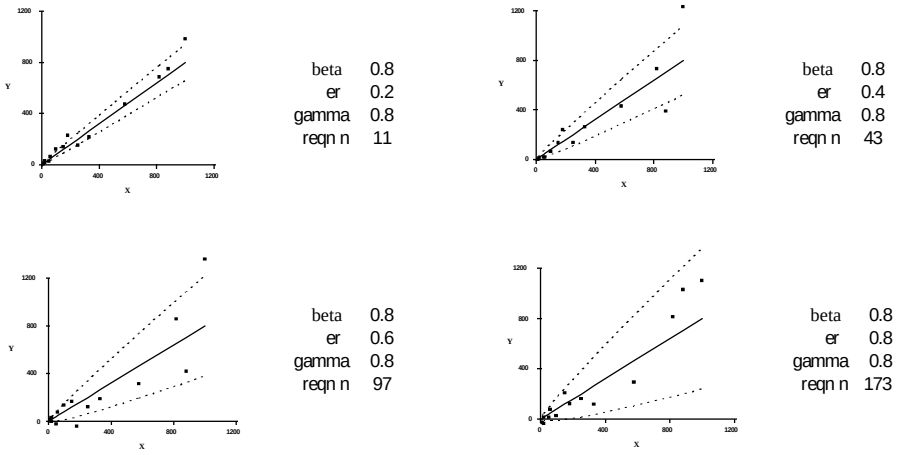

Figure 1: Examples of MBSS Ratio Models

Sampling Plan

At the planning stage of the M&V evaluation for the Non-Residential Financial Incentives Program, we proposed a sample of 80 participants for the telephone survey effort. Based on our past experience with programs of this nature, we conservatively assumed an error ratio of 0.2 for the telephone survey sample design. The expected relative precision associated with our sampling plan was $\pm 1.3\%$ for the overall program. By selecting what we believed to be a conservative value for the error ratio, we believed the expected relative precision associated with the planned sample could be considered an upper bound. Therefore, we expected the

overall program-level relative precision achieved with our sample would be less than or equal ± 1.3%.

We stratified the program population by delivery channel (i.e. NREC, NRER, and PARR) and Therms savings, as a way to maximize the Therms savings verified in our sample. Table 22 shows our original sampling plan. Our sampling plan called for a sample of 81 participants for telephone survey data collection. This sample design was expected to yield a relative precision of ±1.3% at the 90% level of confidence for the overall number of measures installed through the program.

	Stratum	Max Therms	Population Size	Sample Size
NREC	1	15,106	14	2
	2	19,734	4	2
	3	25,457	3	2
	4	32,812	3	2
	5	400,000	9	9
	Total		**33**	**17**
NRER	1	8,908	20	3
	2	11,409	8	3
	3	18,512	6	3
	4	26,935	4	3
	5	30,700	4	3
	6	600,000	23	23
	Total		**65**	**38**
PARR	1	1,095	158	5
	2	2,929	56	5
	3	4,481	31	5
	4	14,433	18	5
	5	39,351	8	5
	6	60,000	1	1
	Total		**272**	**26**

Table 22: Original Non-Residential Financial Incentives Program Sample Design

Final Sample Design

The case weights were calculated using the strata cutpoints from our original sample design. We considered using balanced post-stratification as an alternative. However, the achieved relative precision was better, or lower, using our original strata cutpoints. Table 23 shows the final sample design that was used to calculate the case weights. For example, the case weight for the 2 sites in the first stratum of the NREC delivery channel is 14 / 2 = 7.

	Stratum	Max Therms	Population Size	Population # Measures	Population # Size-Units	Sample Size	Case Weight
NREC	1	15,106	14	19	17,993	2	7.000
	2	19,734	4	4	8,600	2	2.000
	3	25,457	3	4	44,450	2	1.500
	4	32,812	3	3	6,764	2	1.500
	5	400,000	9	29	475,353	9	1.000
	Total		**33**	**59**	**553,160**	**17**	
NRER	1	8,908	20	48	9,660	3	6.667
	2	11,409	8	28	9,541	4	2.000
	3	18,512	6	21	7,110	4	1.500
	4	26,935	4	9	6,139	3	1.333
	5	30,700	4	14	11,499	3	1.333
	6	600,000	23	253	55,982	20	1.150
	Total		**65**	**373**	**99,931**	**37**	
PARR	1	1,095	158	198	17,498	5	31.600
	2	2,929	56	133	12,323	5	11.200
	3	4,481	31	83	12,048	5	6.200
	4	14,433	18	61	10,544	5	3.600
	5	39,351	8	41	8,650	5	1.600
	6	60,000	1	3	870	1	1.000
	Total		**272**	**519**	**61,933**	**26**	

Table 23: Final Non-Residential Financial Incentives Program Sample Design

Telephone Survey Instrument Design

We developed a questionnaire for the evaluation with separate sections dedicated to the verification of measure installations and the process evaluation. The first section of the survey instrument is dedicated to verifying the installation of measures recorded in the SCG program tracking database including:

- Verification that the measure was installed,
- If not installed, reason why not,
- Verification that the measure is still installed,
- If not still installed, why not,

The next section of the participant survey instrument was designed to obtain a variety of information for the process evaluation including:

- How participants heard of the program,
- The reasons for program participation,
- Customer perceptions on how the program has helped them manage their energy bills,
- Participant satisfaction and recommended program improvements, and

- Market barriers to participation and installation.

The survey also contained a series of demographic questions. The following demographics were captured with the survey:

- Business Type,
- Title & Position, and
- Number of Years at Organization and Position.

RLW submitted the survey instrument to the SCG project manager and other interested parties for a final review and ultimately approval.

Telephone Survey Data Collection

Using the survey instrument described above, telephone surveys were conducted from RLW's CA office. All telephone surveyors were provided instruction on program operation, proper etiquette for contacting participants, and how to interpret participant responses.

All survey calls were tracked and any refusals or incomplete responses were recorded. Upon completing each interview, the telephone survey manager reviewed the survey for accuracy and completeness and then entered the data into an electronic database designed specifically for this survey by the project analyst.

Data were validated automatically using imbedded database functionality. The entered data were also continuously reviewed by the telephone survey manager. Prior to analysis, the project analyst thoroughly performed a quality control check on the data, identifying and correcting any illogical or unreasonable responses.

Table 24 presents the dispositions of the telephone survey data collection effort. We attempted to contact a total of 87 participants. Of these 87 participants, 80 completed a telephone survey, corresponding to conversion rate of 92.0%[13]. Not one participant refused to complete the survey, yielding a refusal rate of 0%.

	# of Participants
Completed	80
Language Barrier	2
Busy	1
Contact No Longer With Company	1
Disconnected	1
Left Message	1
Wrong Number	1
Total	**87**
Conversion Rate	**92.0%**

Table 24: Telephone Survey Dispositions

[13] The conversion rate is defined as the ratio of successfully completed surveys to all attempted contacts.

Measure Verification Analysis

Model-Based Statistical Sampling or MBSS™ was used to extrapolate the sample results to the target population. The general idea behind model-based statistics is that there is a relationship between the variable of interest – in this case, the verified number of measures (size-units) installed – and a variable that is known for the entire population – in this case, the program tracking number of measures (size-units) installed. Using this prior information allows for greater precision with a given sample size because the prior information eliminates some of the statistical uncertainty.

The estimate of the number of measures (size-units) installed in the population is expressed as the ratio of the sample average evaluated number of measures (size-units) installed to the sample average program tracking number of measures (size-units) installed times the population total program tracking number of measures (size-units) installed.

$$Y = y/x\ X$$

Where:

Y is the population total number of measures (size-units) installed

y is the average number of measures (size-units) installed in the sample

X is the population total program tracking number of measures (size-units) installed

x is the average program tracking number of measures (size-units) installed in the sample.

Measure installation rates for the overall program are calculated in the results chapter. Results are also disaggregated for by delivery channel (i.e. NREC, NRER, and PARR).

Theoretical Background

The sample design discussion in the methodology section of this report described the sample designs used in this study. Therefore this section will describe in more detail the methods used to extrapolate the results to the target population. Two topics will be described:

- Case weights, and
- Stratified ratio estimation using case weights.

Case Weights

Background

Given observations of a variable *y* in a stratified sample, estimate the population total *Y*.

Note that the population total of *y* is the sum across the *H* strata of the subtotals of y in each stratum. Moreover each subtotal can be written as the number of cases in the stratum times the mean of *y* in the stratum. This gives the equation:

$$Y = \sum_{h=1}^{H} N_h \mu_h$$

Motivated by the preceding equation, we estimate the population mean in each stratum using the corresponding sample mean. This gives the conventional form of the stratified-sampling estimator, denoted $\hat{Y}$, of the population total *Y:*

$$\hat{Y} = \sum_{h=1}^{H} N_h \bar{y}_h$$

With a little algebra, the right-hand side of this equation can be rewritten in a different form:

$$\begin{aligned}\hat{Y} &= \sum_{h=1}^{H} N_h \bar{y}_h \\ &= \sum_{h=1}^{H} N_h \left(\frac{1}{n_h} \sum_{k \in s_h} y_k \right) \\ &= \sum_{k=1}^{n} \left(\frac{N_h}{n_h} \right) y_k\end{aligned}$$

Motivated by the last expression, we define the ***case weight*** of each unit in the sample to be $w_k = \frac{N_h}{n_h}$. Then the conventional estimate of the population total can be written as a simple weighted sum of the sample observations:

$$\hat{Y} = \sum_{k=1}^{n} w_k y_k$$

The case weight w_k can be thought of as the number of units in the population represented by unit *k* in the sample. The conventional sample estimate of the population total can be obtained by calculating the weighted sum of the values observed in the sample.

Stratified Ratio Estimation

Ratio estimation is used to estimate the population total *Y* of the target variable *y* taking advantage of the known population total *X* of a suitable explanatory variable *x*. The ratio estimate of the population total is denoted $\hat{Y}_{ra}$ to distinguish it from the ordinary stratified sampling estimate of the population total, which is denoted as $\hat{Y}$.

Motivated by the identity $Y = BX$, we estimate the population total *Y* by first estimating the population ratio *B* using the sample ratio $b = \bar{y}/\bar{x}$, and then estimating the population total as the product of the sample ratio and the known population total *X*. Here the sample means are calculated using the appropriate case weights. This procedure can be summarized as follows:

$$\begin{aligned}\hat{Y}_{ra} &= b\,X \quad \text{where} \\ b &= \frac{\bar{y}}{\bar{x}} \\ \bar{y} &= \frac{1}{\hat{N}} \sum_{k=1}^{n} w_k y_k \\ \bar{x} &= \frac{1}{\hat{N}} \sum_{k=1}^{n} w_k x_k \\ \hat{N} &= \sum_{k=1}^{n} w_k\end{aligned}$$

The conventional 90 percent confidence interval for the ratio estimate of the population total is usually written as

$$\begin{aligned} \hat{Y}_{ra} &\pm 1.645\sqrt{V\left(\hat{Y}_{ra}\right)} \quad \text{where} \\ V\left(\hat{Y}_{ra}\right) &= \sum_{h=1}^{H} N_h^2\left(1-\frac{n_h}{N_h}\right)\frac{s_h^2(e)}{n_h} \\ s_h^2(e) &= \frac{1}{n_h-1}\sum_{k\in s_h}\left(e_k-\bar{e}_h\right)^2 \\ e_k &= y_k - b\,x_k \end{aligned}$$

We can calculate the relative precision of the estimate $\hat{Y}_{ra}$ using the equation

$$rp = \frac{1.645\sqrt{V\left(\hat{Y}_{ra}\right)}}{\hat{Y}_{ra}}$$

MBSS theory has led to an alternative procedure to calculate confidence intervals for ratio estimation, called model-based domains estimation. This method yields the same estimate as the conventional approach described above, but gives slightly different error bounds. This approach has many advantages, especially for small samples, and has been used throughout this study.

Under model-based domains estimation, the ratio estimator of the population total is calculated as usual. However, the variance of the ratio estimator is estimated from the case weights using the equation

$$V\left(\hat{Y}_{ra}\right) = \sum_{k=1}^{n} w_k\left(w_k-1\right)e_k^2$$

Here w_k is the case weight discussed above and e_k is the sample residual $e_k = y_k - b\,x_k$. Then, as usual, the confidence interval is calculated as

$$\hat{Y}_{ra} \pm 1.645\sqrt{V\left(\hat{Y}_{ra}\right)}$$

and the achieved relative precision is calculated as

$$rp = \frac{1.645\sqrt{V\left(\hat{Y}_{ra}\right)}}{\hat{Y}_{ra}}$$

The model-based domains estimation approach is often much easier to calculate than the conventional approach since it is not necessary to group the sample into strata. In large samples, there is generally not much difference between the case-weight approach and the conventional approach. In small samples the case-weight approach seems to perform better. For consistency, we have come to use model-based domains estimation in most work.

This methodology generally gives error bounds similar to the conventional approach. Equally, the model-based domains estimation approach can be derived from the conventional approach by making the substitutions:

$$\begin{aligned} \bar{e}_h &\approx 0 \\ s_h^2(e) &\approx \frac{1}{n_h}\sum_{k\in s_h} e_k^2 \end{aligned}$$

In the first of these substitutions, we are assuming that the within-stratum mean of the residuals is close to zero in each stratum. In the second substitution, we have replaced the within-stratum variance of the sample residual *e,* calculated with $n_h - 1$ degrees of freedom, with the mean of the squared residuals, calculated with n_h degrees of freedom.

Model-based domains estimation is appropriate as long as the expected value of the residuals can be assumed to be close to zero. This assumption is checked by examining the scatter plot of *y* versus *x*. It is important to note that the assumption affects only the error bound, not the estimate itself. $\hat{Y}_{ra}$ will be essentially unbiased as long as the case weights are accurate.

Process Analysis

The project analyst analyzed the results of the telephone survey. The quantitative process survey analysis was carried out using SPSS, a commonly used statistical software package. RLW calculated weighted frequencies, means, and cross tabulations of data, where appropriate, to provide unbiased estimates of population characteristics. All statistical significance tests were conducted at the 90% level of confidence, and statistically significant differences are discussed in the report where appropriate. These tests have been used to make comparisons among the three delivery channels of the program (i.e. NREC, NRER, and PARR).

6. Appendix

Final Telephone Survey Instrument

SCG 2003 Non-Residential Financial Incentive Program
M&V Survey Instrument

Site #: «SITE_NBR» **Class: «Delivery_Channel»** **Stratum:«Stratum»**

Surveyor _____Date _____Time _____

Participant Name:«CNTCT_NM»

Company Name:«Company_Name1» «Company_Name2»

Address «SITE_ADDR» **City: «SITE_CITY»**

Phone: «CNTCT_PH»

Call Log

Codes:

1=Completed 2=Callback 3=Left Message 4=Busy
5=No Answer 6=Refusal 7=Termination 8=Wrong Number
9=Disconnected Number 10=Language Barrier

	Date:	*Time:*		*Code*	*Initials*	*Outcome*	*Notes*
Call 1	____/____	____:____	AM PM				
Call 2	____/____	____:____	AM PM				
Call 3	____/____	____:____	AM PM				
Call 4	____/____	____:____	AM PM				
Call 5	____/____	____:____	AM PM				
Call 6	____/____	____:____	AM PM				
Call 7	____/____	____:____	AM PM				

Introduction

Hello, this is ***<<interviewer>>*** calling on behalf of Southern California Gas regarding their 2003 Non-Residential Financial Incentives Program, also known as the local program. Southern California Gas regularly evaluate their programs to ensure customers like you receive the proper and correct amount of benefits, and to see if the program has added value to businesses like yours.

This is not a sales or telemarketing call. We're contacting 2003 program participants to ask some follow up questions about the program. May I please speak with ***<<Participant Name>>***?

1) If contact not available → **Schedule call back**
2) If contact is different than the name provided → **Reintroduce yourself, use above**
3) Refuses to participate → **Thank for their time and end call**

Southern California Gas is simply interested in following up with you to learn how well the program has worked for you and other people who have participated. This is only a short survey of about 10 minutes. Are you the best person for me to speak with about the program and the equipment you installed through the program?

1) YES → **Continue**
2) NO → **Get Contact Name**_____

Could I go over these questions with you now?

3) YES → **Continue**
4) NO → **Attempt to reschedule**

SCREEN 1: First, just to verify – do you recall receiving a cash incentive for an energy efficiency upgrade or purchase on gas fired equipment or systems?

1) Yes → **Continue**
2) No → **Politely thank and terminate; note error on contact sheet**
3) Unsure → **Politely probe if hesitant or unsure**

IF UNSURE, PROMPT BY REFERRING TO THE PROGRAM DESCRIPTION BELOW. CONTINUE WHEN CONFIRMED – DISCONTINUE IF RESPONDENT IS DOUBTFUL OR DISAGREES THAT HIS/HER FIRM PARTICIPATED

DESCRIPTION: The SCG Local Non-residential Financial Incentives Program (NRFIP) is a local program targeting small to medium commercial and industrial gas customers. The program includes technical support, education, training, outreach, contractor referral, bulk procurement, prescriptive rebates, and incentives.

These questions are mostly short answer, and all of your responses are confidential. All of the survey responses will be reported in aggregate so that no individual participant can be identified.

First I would like to ask some quick background questions about you and your firm or organization.

DEMO1: What is your firm/organization's main line of business?

1) Restaurant/Caterer
2) Laundry
3) Bakery
4) School/College
5) Industrial
6) Other (Specify)_____
7) Food Manufacturing
8) Grocery Store
9) Hotel
10) Nursery
11) Hospital
98) DK ***(Confirm if respondent is the correct person to survey)***
99) Refused

DEMO2: Can you please tell me your title and a brief description of your position?

1) Title: _____
2) Position: _____
98) Refused

DEMO3: How many years have you been at this organization and position?

1) Years at organization _____ 2) Years at position: _____

Q1. How did you *first* become aware of the Non-Residential Financial Incentives Program? ***Do Not Read List*** - ***Record Only One Response****.*

1) ___ Letter or Mailing (Other Than Bill Insert)
2) ___ Bill insert
3) ___ TV/Radio
4) ___ Newspaper
5) ___ Industry magazine - AD
6) ___ Industry magazine - ARTICLE
7) ___ Business/professional organization – WEBSITE
8) ___ Business/professional organization - PRESENTATION
9) ___ Business/professional organization – NEWSLETTER
10) ___ Friend/colleague (word of mouth and/or passed on literature)
11) ___ SCG Web site
12) ___ Community group
13) ___ Referred by a utility account representative
14) ___ Other:_____
98) ___ DK/Can't recall
99) ___ Refused

Q2. Our records indicate that you received a rebate or financial incentive to install the following equipment. Did you install: ***Read List.***

1.	«Measure_Type1»	Yes	No
2.	«Measure_Type2»	Yes	No
3.	«Measure_Type3»	Yes	No
4.	«Measure_Type4»	Yes	No
5.	«Measure_Type5»	Yes	No
6.	«Measure_Type6»	Yes	No
7.	«Measure_Type7»	Yes	No
8.	«Measure_Type8»	Yes	No

If No Rebated Measures Were Installed, Go To Q5.
If At Least One Rebated Measure Was Installed, Go To Q3.

Q3. Is ***<<Rebated Measure>>*** still installed and in operation? ***Ask For Each Measure That Was Installed in Q2.***

1. «Measure_Type1» Yes No
2. «Measure_Type2» Yes No
3. «Measure_Type3» Yes No
4. «Measure_Type4» Yes No
5. «Measure_Type5» Yes No
6. «Measure_Type6» Yes No
7. «Measure_Type7» Yes No
8. «Measure_Type8» Yes No

If All Rebated Measures Were Installed and Are Still in Operation, Go To Q6

Q4. Why is ***<<Rebated Measure>>*** no longer installed and in operation? ***Probe for Specifics. Record Verbatim Response.***

1. «Measure_Type1»: _____
2. «Measure_Type2»: _____
3. «Measure_Type3»: _____
4. «Measure_Type4»: _____
5. «Measure_Type5»: _____
6. «Measure_Type6»: _____
7. «Measure_Type7»: _____
8. «Measure_Type8»: _____

Go To Q6.

Ask Q5 For Any Rebated Measure That Was Not Installed

Q5. Why did you decide to not install ***<<Rebated Measure>>***? ***Probe for Specifics. Record Verbatim Response***.

1. «Measure_Type1»: _____
2. «Measure_Type2»: _____
3. «Measure_Type3»: _____
4. «Measure_Type4»: _____
5. «Measure_Type5»: _____
6. «Measure_Type6»: _____
7. «Measure_Type7»: _____
8. «Measure_Type8»: _____

PROGRAM AWARENESS/PERCEPTION QUESTIONS

I just have a few questions now about the program itself.

Q6. Why did you participate in this program? Do not read list; if more than one response, rank answers in order of respondent priority.

1) _____Energy savings → Ex. "Save on power bills", "reduce electricity use", etc.
2) _____Safety → Ex. "reduce chance of fire", "get rid of hot halogen bulbs", etc.
3) _____ Free benefit → Ex. "get new lamps", "get new bulbs", "no cost for it", etc.
4) _____Environmental Concerns → Ex. "reduce air pollution", "do the right thing", etc.
5) _____Other _____

Q7. Since you've installed this equipment, have you seen a change your gas usage?

1. Yes
2. No → ***Go To Market Barrier Questions***

100) DK → ***Go To Market Barrier Questions***
101) Refused → ***Go To Market Barrier Questions***

Q8. Is the new equipment providing you the energy savings you had expected? ***Read responses if needed***

1. Less than I expected
2. About as much as I expected
3. Even more than I expected

98) DK
99) Refused

Market Barrier Questions

Next, we just would like to gauge how much the program helps people like you.

Delivery Channel Utilized: ***«Delivery_Channel»***

If Delivery Channel is PARR, Administer Q9 and Then Go To Q11.
If Delivery Channel is NRER or NREC, Go To Q10.

Q9. Now, I am going to read a list of items about the program. Please rate the level of ease associated with each item I read, using a scale of 1 to 5, where 1 means very difficult and 5 means very easy. How easy or difficult was it to:

1. Identify & Specify Rebated Equipment	1	2	3	4	5	98	99
2. Install the Rebated Equipment	1	2	3	4	5	98	99
3. Complete Your Program Application	1	2	3	4	5	98	99

Go To Q11.

Q10. Now, I am going to read a list of items about the program. Please rate the level of ease associated with each item I read, using a scale of 1 to 5, where 1 means very difficult and 5 means very easy. How easy or difficult was it to:

1. Complete Your Program Application	1	2	3	4	5	98	99
2. Identify & Specify Incented Equipment	1	2	3	4	5	98	99
3. Install the Incented Equipment	1	2	3	4	5	98	99

Q11. Once the equipment was installed and your application was complete, how long did it take for you to receive your rebate or incentive?

1. Less Than 30 Days
2. 30 – 59 Days
3. 60 – 89 Days
4. 90 Days or Greater
5. I still haven't received my check

98) Don't Know
99) Refused

Q12. Using a scale of one to five, where 1 means "none" and 5 means "much more", how would you rank your need to know more about energy efficiency or efficient operations?

1. I have no need to know more about energy efficiency and operations
2. I need a little bit of support only in certain areas
3. I need some support only in certain areas in knowing more about energy efficiency and operations
4. I need some support in knowing more about energy efficiency and operations
5. I need significant support in knowing more about energy efficiency and operations

98) Don't Know
99) Refused

Q13. Overall, what did you like or dislike about the program? ***Record Verbatim Response. Probe for Specific***

	Q13. Positive/ Neutral Comments		**Negative /Neutral Comments**
1)	Easy program to use no complaints.	9)	Improve timeliness of rebate.
2)	Process & evaluation was efficient.	10)	Lengthy process too much paperwork/bureaucracy.
3)	Utility staff support was excellent & helpful.	11)	Lift $25,000 cap per customer.
4)	Provide more literature on other rebate program.	12)	Keep programs year-around, on/off is difficult to work with.
5)	Program saved us $$ on first cost & lowered our bills.	13)	Edu. Equipment dealers, rebate assumptions are not accurate.
6)	Rebate delivery was timely.	14)	Expand list of rebated equipment (suggestions)_____
7)	No Suggestions	15)	Extend purchase to installation period (dates are too close).
8)	Other)_____		

Q14. Is there anything about the program that the utility should eliminate, adjust, or improve? ***Record Verbatim Response. Probe for Specifics.***

	Q14. Positive/ Neutral Comments		**Negative /Neutral Comments**
1)	Very good program no complaints.	6)	Increase incentives
2)	Effective program no changes necessary,	7)	Build look up table to identify rebates measures & models.
3)	Newsletter very helpful on rebates & availability.	8)	Expand list of rebated equipment list (suggestions)_____
4)	No Suggestions	9)	Advertised amount of rebate misleading.
5)	Other)_____		

These are all of my questions. Thank you for your time.