

NYSERDA 2006 – 2009 Existing Facilities Program Impact Evaluation Report --- Final---

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ABSTRACT

NYSERDA's Existing Facilities Program promotes energy efficiency and demand management in existing commercial and industrial facilities by providing incentives for installation of energy efficiency measures that save electricity and peak load management measures that temporarily reduce electric demand. This evaluation report quantifies the impact of the projects completed between January 1, 2006 and September 30, 2009 through the program.

The evaluation scope included four research tasks: (1) engineering site-based measurement and verification (M&V) of savings for a sample of 92 efficiency projects, (2) interval meter data-based realization rate analysis for a sample of 88 peak load management participants that responded to demand reduction calls issued by the New York Independent System Operator, (3) interviews with participants and service providers associated with the M&V samples to assess free ridership and participant inside and outside spillover effects, and (4) assessment of the long-term persistence of demand response measures for a sample of 51 customers using telephone survey data.

The results of the program include savings realization rates, i.e., the ratio of the evaluated gross savings to the NYSERDA program reported savings of installed measures, net-to-gross ratios, evaluated net savings, and long-term persistence for peak load management projects. The evaluation found savings realization rates of 1.03 and 0.81 for electric energy and demand efficiency savings, respectively. Measuring demand response based on the impact to the electrical grid the realization rate is 0.66. Attribution analysis found an overall net-to-gross ratio of 1.28 and 0.78 for energy efficiency and demand response projects, respectively. The report concludes with recommendations regarding future program operation and future evaluation activities.

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GLOSSARY OF TERMS

American Association for Public Opinion Research (AAPOR)¹ – A leading association of public opinion and survey research professionals.

average coincident load (ACL) –Method adopted in 2011 and currently used by the New York Independent System Operator (NYISO) to calculate the performance of demand response resources during events and tests. It is defined as the average of the 20 highest load hours from the prior summer that occurred during a specified 40 peak-hour period of the 11 New York load zones.

average peak monthly demand (APMD) –Method used prior to 2011 by the New York Independent System Operator (NYISO) to calculate the performance of demand response resource during events and tests. This method compares demand during events and tests with the prior year’s average maximum demand during June, July, August, and September.

census – All individuals in a group. In evaluations of energy efficiency programs census typically refers to all projects in a stratum of program projects.

construct validity – The extent to which an operating variable/instrument accurately taps an underlying concept/hypothesis, properly measuring an abstract quality or idea.

contact rate – One of the final disposition and outcome rates for surveys defined by the American Association for Public Opinion Research (AAPOR).² The contact rate includes all outcomes where an eligible respondent was reached and the interview attempted divided by these plus those not contacted. The three contact rate outcomes are completes, refusals, and break-offs (the numerator of the contact rate).

cooperation rate – One of the final disposition and outcome rates for surveys defined by the American Association for Public Opinion Research (AAPOR).³ The proportion of all cases interviewed of all eligible units ever contacted. Those contacted (the denominator) include completes, refusals, and break-offs.⁴

error ratio – In energy efficiency evaluation, the error ratio is a measure of the degree of variance between the reported savings estimates and the evaluated estimates. For a sample, the error ratio is:

$$er = \frac{\sqrt{\sum_{i=1}^n w_i \frac{e_i^2}{x_i^\gamma} \sum_{i=1}^n w_i x_i^\gamma}}{\sum_{i=1}^n w_i y_i}$$

where,

n is the sample size

w_i is the population expansion weight associated with each sample point i

x_i is the program reported savings for each sample point i

y_i is the evaluated gross savings for each sample point i , the constant gamma, $\gamma = 0.8$ (typically), and the error for each sample point $e_i = y_i - bx_i$, where b is the program realization rate

evaluated gross savings – The change in energy consumption and/or demand that results directly from program-related actions taken by participants in an efficiency program, regardless of why they participated, as calculated by program evaluators.

¹ American Association for Public Opinion Research, *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys*, 2011. The rates presented here have multiple and more-specific categories and definitions. This document is available on AAPOR website: www.aapor.org.

² Ibid.

³ Ibid.

⁴ Ibid.

evaluated net savings – The total change in load that is attributable to an energy efficiency program, as calculated by program evaluators. This change in load may include, implicitly or explicitly, the effects of free drivers, free riders, energy efficiency standards, changes in the level of energy service, and other causes of changes in energy consumption or demand.

free rider, free ridership (FR) – A free rider is a program participant who would have implemented the program measure or practice in the absence of the program. Free ridership refers to the percentage of savings attributed to customers who participate in an energy efficiency program but would have, at least to some degree, installed the same measure(s) on their own if the program had not been available.

interval meter - An electric utility meter that measures and stores energy use and demand in 15-minute intervals. Interval meters are required for New York customers to participate in Independent System Operator demand response programs.

net savings - The total change in load that is attributable to an energy efficiency program. This change in load may include, implicitly or explicitly, the effects of spillover, free riders, energy efficiency standards, changes in the level of energy service, and other causes of changes in energy consumption or demand.

net to gross, net-to-gross ratio (NTG, NTGR) – The relationship between net energy and/or demand savings, where net is measured as what would have occurred without the program, what would have occurred naturally, and gross savings (often evaluated savings). The NTGR is a factor represented as the ratio of net savings actually attributable to the program divided by program gross savings. For NYSERDA programs the NTGR is defined as 1 minus free ridership plus spillover ($1 - FR + SO$).

population expansion weight – The total number of units in a population divided by the number of units in the sample.

realization rate (RR) – The ratio of the evaluated gross savings to the Program’s reported savings. The RR represents the percent of program-estimated savings that the evaluator estimates as being actually achieved based on the results of the evaluation M&V analysis. The RR calculation for electric energy for a sampled project is shown below:

$$RR = \frac{kWh_{evaluation}}{kWh_{program}}$$

where,

RR is the realization rate

$kWh_{evaluation}$ is the evaluation M&V kWh savings (by evaluation M&V contractor)

$kWh_{program}$ is the kWh savings claimed by program

refusal rate – One of the final disposition and outcome rates for surveys defined by the American Association for Public Opinion Research (AAPOR).⁵ The proportion of all cases in which an eligible respondent refuses to be interviewed, or breaks-off an interview, of all potentially eligible cases.

relative precision – Relative precision reflects the variation due to sampling as compared to the magnitude of the mean of the variable being estimated. It is a normalized expression of a sample’s standard deviation from its mean. It represents only sampling precision, which is one of the contributors to reliability and rigor, and should be used solely in the context of sampling precision when discussing evaluation results.

Relative precision is calculated as shown below. It must be expressed for a specified confidence level. The relative precision (rp) of an estimate at 90% confidence is given below:

$$rp = 1.645 \frac{sd(\mu)}{\mu}$$

where,

μ is the mean of the variable of interest

⁵ Ibid.

sd(μ) is the standard deviation of μ

1.645 is the z critical value for the 90% confidence interval

For the 90% confidence interval, the error bound is set at 1.645 standard deviations from the mean. The magnitude of the z critical value varies depending on the level of confidence required.

response rate – One of the final disposition and outcome rates for surveys defined by the American Association for Public Opinion Research (AAPOR).⁶ The response rate estimates the fraction of all eligible working numbers where a request for an interview was made. The denominator of this ratio is the inclusion of all possible components where a request for an interview could be attempted. More specifically, the response rate is the number of completed interviews divided by the sum of completes, refusals, break-offs, not contacted, and the figure estimated for unknown eligibility.

$$\text{Response rate} = \frac{\text{Completes}}{\text{Completes} + \text{refusals} + \text{break-offs} + \text{not contacted} + (e \times \text{unknown eligibility})}$$

where,

e = the estimated eligibility rate of the study (determined from the eligibility rate for those that completed the eligibility screen)

responsible interface party (RIP) – RIPs are approved demand response providers that interact with the New York Independent System Operator (NYISO) on behalf of the demand response program participant.

spillover (SO) – Refers to the energy savings associated with energy efficient equipment installed by consumers who were influenced by an energy efficiency program, but without direct financial or technical assistance from the program. Spillover includes additional actions taken by a program participant as well as actions undertaken by nonparticipants who have been influenced by the program. Sometimes spillover is referred to as “free ridership” or as “market effects.” Market effects are program-induced impacts or program-induced changes in the market. Market effects include impacts over time. These market effects may be current or may occur after a program ends. When market effects occur after a program ends, they are referred to as “momentum” effects or as “post-program market effects.” Spillover is often a narrower definition because it does not include impacts that accrue due to program-induced market structure change and seldom look for effects that occur well after program intervention or effects that occur after a program ends. This evaluation addresses participant inside spillover (ISO), participant outside spillover (OSO), and nonparticipant spillover (NPSO) but not the broader definition of program effects within market effects.

inside spillover - Occurs when, due to the project, additional actions are taken to reduce energy use at the same site, but these actions are not included as program savings, such as when, due to the program, participants add efficiency measures to the same building where program measures were installed but did not participate in the program for these measures.

outside spillover - Occurs when an actor participating in the program initiates additional actions that reduce energy use at other sites that are not participating in the program. This can occur when a firm installs energy efficiency measures they learned about through the program at another of their sites without having that other site participate in a NYSERDA program. Outside spillover is also generated when participating vendors install or sell energy efficiency to nonparticipating sites because of their experience with the program.⁷

nonparticipant spillover - The reduction in energy consumption and/or demand from measures installed and actions taken at nonparticipating sites due to the program but not participating in the program and not induced by program participating vendors. These actions could be program-induced decision-making of nonparticipating building owners or encouraged by nonparticipating vendors or contractors because of the influence of the program.

⁶ Ibid.

⁷ This definition is one that NYSERDA has used throughout its history with energy efficiency programs. There may be other states where the latter circumstance of participating vendors influencing non-participating sites is defined as a type of nonparticipant spillover.

stratified ratio estimator (SRE) – An efficient sampling design combining stratified sample design with a ratio estimator. It's most advantageous when the population has a large coefficient of variation, which occurs, for example, when a substantial portion of the projects have small savings, and a small number of projects have very large savings. The ratio estimator uses supporting information for each unit of the population when this information is highly correlated with the desired estimate to be derived from the evaluation, such as the tracking savings and the evaluated savings.

summer coincident peak demand period – For this evaluation NYSERDA defined the summer coincident peak demand period as the hours between noon and 6 p.m. on nonholiday weekdays during June, July, and August. NYSERDA reports the demand savings as the average reduction in electric demand during the summer coincident peak demand period.

within-site sampling – When the quantity of uniquely controlled lighting circuits (or motors or other installed units) to be evaluated at a site is large, engineers will meter a sample of them. Within-site sampling refers to the process. In this evaluation the default within-site sample design targets $\pm 20\%$ relative precision at 80% confidence.

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EXECUTIVE SUMMARY

The New York State Energy Research and Development Authority (NYSERDA) programs are funded in part by a distribution System Benefits Charge (SBC) paid by customers of Central Hudson Gas and Electric Corporation, Consolidated Edison Company of New York, Inc. (Con Edison), New York State Electric and Gas Corporation, National Grid, Orange and Rockland Utilities, and Rochester Gas and Electric Corporation. The programs are available to all electric distribution customers that pay into the SBC.

The Existing Facilities Program (EFP or Program) is one of NYSERDA's largest programs. It promotes energy efficiency and demand management in existing commercial and industrial (C&I) facilities by providing incentives for installation of energy efficiency measures that save electricity and peak load management (PLM) measures that temporarily reduce electric demand. The program also provides incentives to firm gas customers in Con Edison's service area. However, gas measures were not included in the scope of this evaluation. The PLM component is largely designed to provide the tools needed for participants to enroll in the New York Independent System Operator (NYISO) and Con Edison demand reduction programs. The program funds projects through both prequalified and custom incentives. The Program typically requires performance incentive applicants to perform M&V for projects that are expected to save more than 500,000 kWh/yr or 10,000 MMBtu/yr of natural gas, though measurement and verification (M&V) requirements vary for lighting and special circumstances.

PROGRAM BACKGROUND

NYSERDA formed the Program in 2008 by consolidating two earlier NYSERDA programs: the Enhanced Commercial and Industrial Performance Program (ECIPP) and the Peak Load Management Program (PLMP).⁸ ECIPP funded energy efficiency projects and was itself the product of the 2006 merger of the small commercial-oriented Smart Equipment Choices program and the performance based, energy services company-oriented Commercial and Industrial Performance Program. This evaluation covers all projects completed between January 1, 2006 and September 30, 2009. The evaluation excludes Industrial Process Efficiency (IPE) projects, which were part of the Program but have been managed separately since 2009.

EVALUATION OBJECTIVES

The primary purpose of this impact evaluation is to establish rigorous and defensible estimates of the savings that can be attributed to the Existing Facilities Program. The Impact Evaluation Team independently assessed the savings that program participants are realizing for energy efficiency and demand response projects, and assessed the influence of the program on participants' decisions to complete the funded and other projects.

In addition, the Impact Evaluation Team assessed the long-term persistence for demand response (DR) projects from 2001 through 2005 and sought to identify opportunities to improve program operation and future evaluations.

RESEARCH APPROACH

The evaluation scope included four research tasks: (1) engineering site-based measurement and verification (M&V) of savings for a sample of 92 efficiency projects to determine the realization rate (RR), (2) interval meter (IM) data-based RR analysis for a sample of 71 PLM participants that responded to demand reduction calls issued by the NYISO, (3) interviews with 51 participants and 56 service providers associated with the M&V samples to assess FR and participant inside spillover (ISO) and outside spillover (OSO) effects, and (4) assessment of the long-term persistence of DR measures for a sample of 51 customers using telephone survey data.

This was a substantial evaluation in terms of engineering effort, with a relatively high level of engineering rigor applied to M&V analysis for over 150 projects. It required multiple sample designs, and the NTG analysis was based on multiple surveys of end-use participants and vendors.

Three separate sample designs were necessary for: (1) energy efficiency (EE) measure savings, (2) temporary load reduction measure savings, and (3) load reduction measure long-term persistence. Stratified ratio sampling was selected for each since it allows for efficient sampling design and generally requires a lower sample size for a targeted level of precision than simple random sampling. The confidence level target of 90% confidence within a

⁸ PLMP was previously called the Peak Load Reduction Program (PLRP).

band of 10% error tolerance was used for sampling precision. Separate samples were drawn for each of the upstate and downstate regions to allow evaluators to estimate the RRs separately for each region. Within region, evaluators stratified by project size in accordance with the stratified ratio sampling method. This led to selecting a higher proportion of larger projects in the sample than would occur with random sampling. Dedicated strata were established for projects associated with steam retention. For the persistence study the sample was stratified first by project type: (dispatchable emergency generation [DG], load curtailment [LC], or interval meters [IM]), and then by region (upstate and downstate).

Some participants’ projects spanned multiple sites. Program data was sufficiently detailed to disaggregate savings by site. Evaluators took advantage of this feature and used the site savings as the sampling unit to make M&V more manageable. The variable used for stratification by size was either annual kWh saved, efficiency-based kW saved, or demand response kW reduction depending on the Program project type and region of the state.

RESULTS

Results are presented for EE then DR realization rates, EE then DR attribution, net impact, and long-term persistence of DR measures.

Realization Rates – Efficiency Projects

The RR measures the variance between the program reported savings and the evaluation’s estimated savings. It is defined as the evaluated savings divided by the program reported savings. Table ES-1 shows the aggregate RRs for the Program efficiency projects. The statewide RR for kWh is 1.03, indicating that the evaluation essentially validated the Program’s overall estimates of energy savings. The relative precision on the statewide estimate is 9.8% at 90% confidence.

Table ES-1. Realization Rate Results Summary, Electric Energy Savings (kWh)

Stratum	N Total Projects	n Sample Projects	RR	Relative Precision at 90% Confidence
Downstate	823	30	1.00	16.9%
Upstate	3,702	62	1.04	12.1%
Total	4,525	92	1.03	9.8%

Table ES-2 shows the RRs and relative precision for summer coincident peak demand savings; the statewide RR for summer coincident peak kW is 0.81. The relative precision on the statewide estimate is 8.0% at 90% confidence.

Table ES-2. Realization Rate Results Summary, Summer Coincident Peak Demand Savings (kW)

Stratum	N Total Projects	n Sample Projects	RR	Relative Precision at 90% Confidence
Downstate	823	30	0.85	14.3%
Upstate	3,702	62	0.79	9.8%
Total	4,525	92	0.81	8.0%

Realization Rates – Demand Response Projects

DR can be measured in a number of ways. NYSERDA tracked demand savings for the Program DR projects completed between 2006 and 2009 using the average peak monthly demand (APMD) baseline. This method compares demand during events and tests with the prior year’s single highest peak hour demand. NYSERDA chose the APMD-based method for tracking callable load because it was the same method the NYISO used to track enrolled demand in the Special Case Resource (SCR) Program until 2011. The SCR program is the one in which NYSERDA IM, DG, and LC incentive recipients most often enrolled. In 2011, the NYISO changed the enrollment basis to the average coincident load (ACL) baseline method. This second method compares demand during events and tests to the prior year’s top-20-hour average demand instead of the single highest hour. A third “profile” method compares the demand during events and tests to the likely demand absent the event based on load data from hours and days surrounding the events. The

third method most directly reflects actual response, i.e., reduction and impact on grid capacity and is the basis of the program demand reduction estimates in this report.⁹

Evaluators calculated site-specific callable demand reduction for the sample using all three methods. Table ES-3 shows the effective RRs (evaluated savings for each method divided by program reported savings using the APMD baseline method) and relative precision associated with each ratio’s estimate, by upstate/downstate and overall. Evaluators estimate that the DR-based load reduction on the electric grid during 2011 events was 66% of the reported demand. This estimate is based on application of the profile method and its effective RR of 0.66.

Using the most equivalent basis (2010 APMD-evaluated demand divided by APMD-reported demand), the Program’s RR is 0.90. This ratio does not measure the Program’s impact on the grid, but indicates that the program funding led to enrollment of 90% of the load reduction that it paid to enroll and thus is an important indicator of program performance.

The ACL baseline-based RR is within 5% of the profile baseline-based total RR. Evaluators compared the results for each site and found moderately strong correlation in results between the two methods. The ACL baseline method is almost as easy for program administrators to use as the APMD baseline method because it also uses prior year data to define the baseline, and it is a substantially more accurate. It is also a more practical approach to use than the profile baseline method and gives results that correlate moderately well.

The relative precision on the estimates is slightly higher than targeted (13-14% as opposed to 10% or less) because the sample was smaller than the design called for and because the variance in RRs was greater than expected.

Table ES-3. Demand Response Realization Rate Results by Baseline Basis

Stratum	Population		2010 APMD		2011 ACL		2011 Profile	
	Reported Demand (MW)	Sites (N)	Sample Sites (n)	RR	Sample Sites (n)	RR	Sample Sites (n)	RR
Downstate	75	319	7	0.96	29	0.49	26	0.56
Upstate	85	226	4	0.84	32	0.74	32	0.73
Total	160	545	11	0.90	61	0.63	58	0.66
Relative precision on total at 90% confidence				14%		13%		14%

Net-to-Gross Results

Attribution analysis assessed FR and SO rates, which are combined to produce a net-to-gross ratio (NTGR) that is applied to evaluated gross savings to produce evaluated net savings. The general relationship is:

$$NTGR = 1 - FR + ISO + OSO + NPSO$$

Evaluators considered efficiency and demand response attribution separately. Based on interviews with EE participants and vendors, evaluators found the following NTG components: 31% FR, 12% participating customer ISO (on-site), and 32% participating vendor OSO. NPSO has been estimated for all NYSERDA C&I programs as part of different evaluations, with the most recent such evaluation producing an estimate of 15%. The energy efficiency NTGR was 1.28.

$$Energy\ efficiency\ NTGR = 1 - 0.31 + 0.12 + 0.32 + 0.15 = 1.28$$

The demand response FR rate was found to be 41%. This estimate was based on interviews with the responsible interface parties (RIPs) that provide the DR services, bring the NYISO and electricity users together, and receive the NYSERDA incentives. Demand response gross savings was evaluated based on site-level metered data; therefore any SO occurring on-site is already captured in the evaluated gross savings. ISO was assigned a value of zero to avoid double counting savings. Over one-third of the RIPs reported OSO. Based upon the data available, the demand

⁹ These DR calculations methods are abbreviated and simplified for the Executive Summary. More precise descriptions can be found in the body of the report.

response OSO rate is 4%. NSO could be expected to occur, and assuming zero would likely create a downward bias in the demand response NTGR. As with EE attribution, the DR attribution used NYSERDA’s C/I portfolio-wide 15% NPSO estimate.

The demand response NTGR of 0.78 was calculated in the same fashion as the EE NTGR.

$$\text{Demand response NTGR} = 1 - FR + ISO + OSO + NPSO$$

$$\text{Demand response NTGR} = 1 - 0.41 + 0.00 + 0.04 + 0.15 = 0.78$$

Evaluated Net Savings

Evaluated net savings measures the program savings after adjusting for the RR and the NTGR. That is, the program reported savings multiplied by the RR results in the evaluated gross savings, and the evaluated gross savings multiplied by the NTGR results in the evaluated net savings. The formula is:

$$\text{Evaluated net savings} = \text{Program reported savings} \times \text{Evaluated gross RR} \times \text{NTGR}$$

Tables ES-4 and ES-5 show the overall program gross and net electric energy, summer coincident peak demand, and natural gas savings for projects completed between January 1, 2006 and September 30, 2009.

Table ES-4. Net Savings Summary – Energy Efficiency Projects

Net Savings Parameter	Program Reported Savings	RR	Evaluated Gross Savings	NTGR	Evaluated Net Savings
Electric energy	577,787 MWh/y	1.03	595,121 MWh/yr	1.28	761,755 MWh/yr
Summer coincident peak demand	116 MW	0.81	94 MW	1.28	120 MW

Table ES-5. Net Savings Summary – Demand Response Projects

Net Savings Parameter	Program Reported Savings	RR	Evaluated Gross Savings	NTGR	Evaluated Net Savings
Curtailed load (APMD baseline)	165 MW	0.90	149 MW	0.78	116 MW
Curtailed load (profile baseline)	165 MW	0.66	109 MW	0.78	85 MW

“APMD” measures performance against internal goals. “Profile” baseline best indicates demand response at the meter.

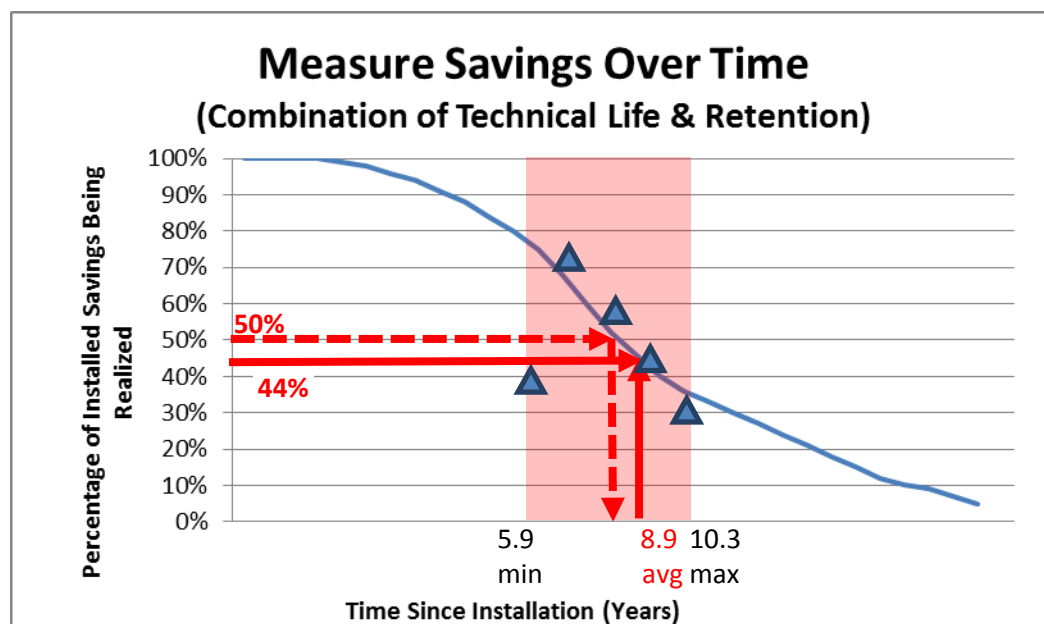
As described previously, the two demand response rows have different purposes. They are not summative. The row with the APMD baseline best reflects the demand savings using the same metric in place at the time the Program funded the evaluated projects and most fairly represents the program performance against goals. The row of results with the profile baseline best reflects the Impact Evaluation Team’s judgment of the actual DR at customers’ meters during NYISO events and tests. Goals and actual load reduction should more closely align in the future as the program enrolls customers using the ACL- instead of the APMD-baseline.

Evaluators found that DR measured using the ACL-baseline method correlated moderately well with the savings using the profile-baseline method and overall produced DR estimates 5% lower and thus represents a plausible means of estimating customer DR.

Long-Term Persistence of Demand Response Measures

The last research subject was DR measure persistence. Overall, the percentage of savings still being delivered to the NYISO and Con Edison programs for projects completed between 2001 and 2005 is 44% of the enrolled demand response kW. This estimate has 22% relative precision at 90% confidence. The weighted average period of time elapsed between project completion and the interview date was 8.9 years. Figure ES-1 illustrates the findings of the long-term persistence study by year.

Figure ES-1. Demand Response Long-Term Persistence by Year



While this research scope was not sufficiently rigorous to be considered a formal measure life study – there was neither engineering analysis of performance degradation nor assessment of technology mean time to failure, for example—the telephone survey response data gave a reasonable indication of DR measure persistence. Based on the persistence survey results, evaluators estimate DR measure savings persist between 7.5 and 8.5 years and that 8 years is a reasonable estimate for long-term retention of DR measures.

RECOMMENDATIONS

The principal goal of the assessment was to analyze the energy savings associated with the projects completed between January 1, 2006 and September 30, 2009 through the Program. During this effort, the Impact Evaluation Team also observed opportunities to improve operation and savings estimation in the future to hopefully narrow the variation in RRs. Key recommendations include the following:

Program Recommendations

- **Disallow like-replacement incentives** – Multiple projects funded variable frequency drive (VFD) installations that replaced pre-existing drives. Current program rules do not allow such funding but either earlier rules, oversight, or charitable interpretation of existing conditions (“the drive had been broken for a while”) allowed the incentives. Disallowing like-replacement incentives for VFDs and other equipment will prevent the use of either an incorrect baseline or a regressive baseline likely associated with high FR.
- **Apply a common algorithm for tracking demand savings** – The high variance in the peak demand savings realized by the Program stems from inconsistencies in algorithms and requirements regarding peak demand calculations. Evaluators recommend that program staff consider requiring that peak demand be calculated in a consistent fashion across projects.
- **Incorporate heating, ventilation, and air conditioning (HVAC) into lighting analysis** – Interactive effects were an integral part of the impact evaluation but were not consistently incorporated into program savings analysis.
- **Set up a data request mechanism from responsible interface parties (RIPs) for future DR evaluations** – Acquiring the DR measure data was challenging and required a lot of calendar time and an unexpected level of “volunteer” work by RIPs. It likely would save effort for all if NYSERDA could require the RIPs

to deliver to NYSERDA the same baseline and performance data they deliver to the NYISO at the time they send it to the NYISO.

- **Systematically collect supporting spreadsheets, models, and metered data from technical assistance providers** – The evaluation benefited greatly from the receipt of technical assistance provider spreadsheets and metered data on a number of projects. Evaluators recommend having program staff routinely gather and retain this data in its native format, which would facilitate program staff review of projects as well as future evaluations.
- **Create and track premise IDs** –Evaluators recommend that NYSERDA establish unique premise IDs that are constant across programs and that remain constant for a facility in the event of name changes or other turnover. This certainly will help evaluators and likely will aid program administrators as well.

Evaluation Recommendations

- **Aggressively involve the program staff in site recruitment** – Recruitment for participation in evaluation activities was more difficult for EFP than for other NYSERDA C&I impact evaluations (FlexTech, Industrial and Process Efficiency, New Construction). Including 10% to 20% backups from the non-census strata in the initial recruitment will help eliminate the late scramble to recruit the backup sites and increase the evaluation participation rate.
- **Use a 0.50 error ratio in the next sample design** – The sample design for this evaluation assumed an error ratio of 0.50 on the electric energy savings realization rate. The final calculated error ratios were 0.58 downstate, 0.46 upstate, and 0.49 overall. The error ratio on the permanent demand savings realization rates was 0.58 for the same projects. Presuming energy savings remains the primary focus and basis of sample designs; 0.50 remains a valid assumption to use for electric projects.
- **Involve the program staff in site-specific plan reviews** – There were evaluation M&V approach issues identified during the site-specific report review phase that could have been addressed earlier in the evaluation if the program staff had been involved in the review of the site-specific evaluation plans. Involving the staff in the plans will help resolve conceptual differences that need to be considered early in the analysis process. It also may prompt delivery of additional site data or contact information from program staff.
- **Use the ACL method to estimate the kW reduction for the DR component** - The APMD-baseline method overstates DR, and the profile-baseline method is expensive and requires a great deal of vendor cooperation to execute. The ACL-baseline approach, while not a direct measurement of response, is almost as easy to execute as the APMD-baseline method and correlates reasonably well with actual DR indicated by the profile-baseline method and thus is a good compromise.
- **Investigate and develop a more reliable method for the estimation of participant ISO and OSO for energy efficiency and OSO for demand response** – The SO rates derived in this evaluation use the same method and survey questions as those in past evaluations. The final ISO and OSO estimates end up being based upon a small number of respondents (after dropping those that report no OSO). The NTGR can have a substantial effect on net savings, and additional evaluation efforts are needed to reduce the uncertainty in many of its components, particularly in measuring SO. Surveys used to gather data for SO estimation need to include SO-respondent quotas when possible. Additional validity checks need to be included regarding items that act as multipliers within the calculation formulas.
- **Perform SO estimation work within a design that gives full consideration to conducting related market effects studies and follow-up verification studies for SO surveys** – This may mean a timeline with staging of different research elements relating to participant ISO, participating vendor SO, and NPSO, all within a context of market change and program-induced market effects. Significantly more resources will be needed to conduct this level of research into SO and market effects.
- **Investigate alternative methods for estimating FR** – The Program has recently initiated a more concentrated approach to fostering lasting relationships with large key account customers. Consequently, future evaluations could benefit from research into other potential methods for determining FR that better consider program long-term engagement with key account customers.

INTRODUCTION

The New York State Energy Research and Development Authority (NYSERDA) energy efficiency programs are funded in part by an electric distribution System Benefits Charge (SBC) paid by customers of Central Hudson Gas and Electric Corporation, Consolidated Edison Company of New York, Inc. (Con Edison), New York State Electric and Gas Corporation, National Grid, Orange and Rockland Utilities, and Rochester Gas and Electric Corporation. The programs are available to all electric distribution customers that pay into the SBC. NYSERDA, a public benefit corporation established in 1975, began administering the SBC funds in 1998.

1.1 PROGRAM BACKGROUND

NYSERDA's Existing Facilities Program (EFP or Program) promotes energy efficiency and demand management in existing commercial and industrial facilities by providing incentives for installation of energy efficiency measures that save electricity and peak load management (PLM) measures that temporarily reduce electric demand. The PLM component is largely designed to provide the tools needed for participants to enroll in the New York Independent System Operator (NYISO) demand response (DR) programs, which call for participants to reduce electricity load in response to emergency and/or market-based price signals. The program also provides incentives to firm gas customers in Con Edison's service area. However, gas measures were not included in the scope of this evaluation.

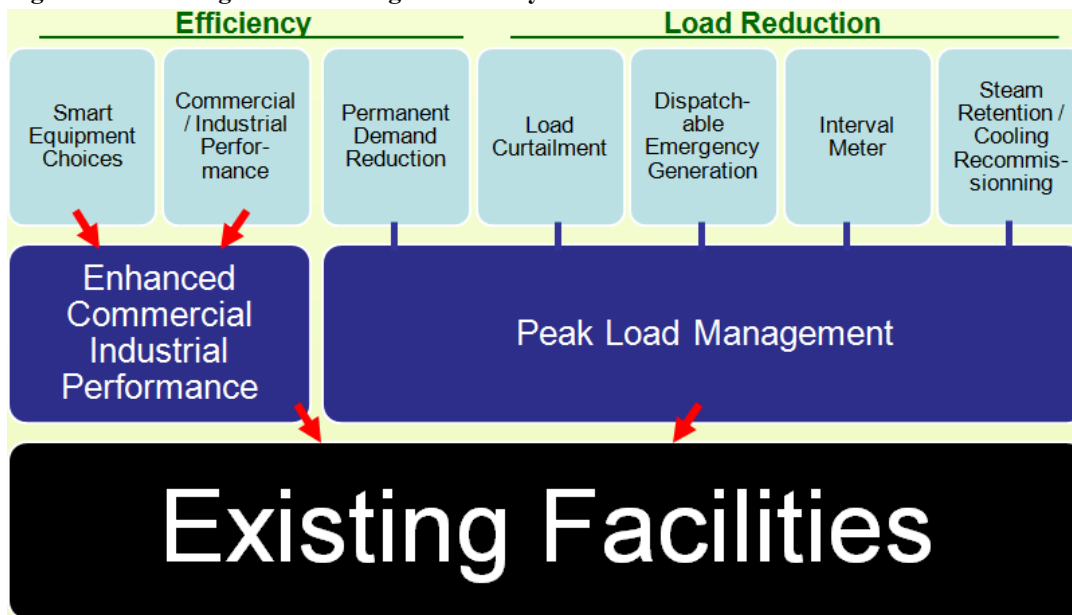
NYSERDA formed the Program in 2008 by consolidating two earlier NYSERDA programs: the Enhanced Commercial and Industrial Performance Program (ECIPP) and the Peak Load Management Program (PLMP). ECIPP funded energy efficiency projects and was itself the product of the 2006 merger of the small commercial-oriented Smart Equipment Choices (SEC) program and the performance-based, energy services company-oriented Commercial and Industrial Performance Program.

PLMP, previously called the Peak Load Reduction Program (PLRP), had multiple components, each of which originally was conceived primarily to reduce summer peak period electric demand. Load curtailment/shifting (LC/S) and dispatchable emergency generation incentives fund the installation of controls and related equipment to respond to calls for temporary load reduction. Incentives for interval meter (IM) partially compensate participants for the cost of installing meters that measure energy use in 15-minute intervals, a requisite for participation in the NYISO DR programs. Incentives for steam retention measures were intended to encourage larger customers in lower Manhattan to continue to purchase district steam from Con Edison to operate steam-driven chillers, rather than switch to electric chillers that would increase the load on this locally strained electric distribution system. The PLMP also offered a Permanent Demand Reduction (PDR) component that funded essentially traditional efficiency projects, but on the basis of their demand savings rather than their energy savings.¹⁰ Figure 1-1 illustrates the historical and current Program components.

This evaluation covers all EFP projects regardless of whether the project was through EFP or one of the earlier programs. The evaluation excludes IPE projects, which were part of the Program but have been managed separately since 2009, as they are the subject of a separate impact evaluation.

¹⁰ In the balance of this report reference to "efficiency" measures includes PDR measures unless stated otherwise.

Figure 1-1. Existing Facilities Program History



The Program targets a range of customer sectors including commercial and industrial (C&I) businesses, healthcare facilities, universities and colleges, and state and local governments. The applicant can apply for incentives through two tracks: prequalified and performance based.

1. Prequalified electric incentives encourage customers working on small-sized energy projects and equipment replacement projects to purchase and install more energy efficient measures. In some cases prequalified measures have deemed savings; in other cases the program assigns application-specific savings estimates.
2. Performance-based incentives are for customers or third-party applicants, such as energy service companies (ESCOs), working on large-scale projects. Performance-based projects require an engineering analysis as well as pre- and post-installation inspections and are potentially subject to measure and verification (M&V) requirements. Performance-based incentives fund projects for the types of measures listed below.
 - Electric efficiency
 - Combined heat and power (CHP)
 - Demand response and energy storage
 - Natural gas efficiency

The Program typically requires applicants for performance-based incentives to perform M&V for projects that are expected to save more than 500,000 kWh/yr or 10,000 MMBtu/yr of natural gas, though M&V requirements vary for lighting and special circumstances.

1.2 EVALUATION OBJECTIVES

The primary purpose of this impact evaluation is to establish rigorous and defensible estimates of the savings that can be attributed to the Program for projects completed between January 1, 2006 and September 30, 2009. The Impact Evaluation Team independently assessed the savings that program participants are realizing for energy efficiency and demand response projects and assessed the influence of the Program on participants' decisions to complete the funded and/or other projects.

In addition, the Impact Evaluation Team assessed the long-term persistence for demand response projects from 2001 through 2005 and sought to identify opportunities to improve program operation and future evaluations.

1.3 REPORT FORMAT

The balance of this impact evaluation report is organized as follows:

- Section 2 provides details on the evaluation method, project tracking, and reporting.
- Section 3 presents the detailed method and results for energy efficiency projects.
- Section 4 presents the detailed method and results for demand response projects.
- Section 5 presents the net-to-gross (NTG) approach and net results.
- Section 6 presents the approach and results for long-term retention of DR measures.
- Section 7 contains conclusions and recommendations to program staff.
- Report appendices follow Section 7.

OVERALL EVALUATION METHODOLOGY

The methodology section describes the methods used to estimate the evaluated net savings of the Program and to estimate the persistence of NYSERDA's DR measures. Separate subsections address the overall approach; the sample designs; RR methods; the NTG approach; the calculation of total program savings; persistence; tracking; and reporting.

2.1 OVERALL APPROACH

The Impact Evaluation Team conducted a retrospective evaluation of a sample of SBC-funded projects completed between 2006 through 2009 using on-site M&V and enhanced attribution techniques. The RR and attribution survey were sample based, with the results extrapolated to all projects in the population. In addition, the Team evaluated the long-term persistence of temporary DR measures for a sample of projects installed between 2001 and 2005.

This impact evaluation consisted of four major components as described below.

1. **Gross savings evaluation of energy efficiency projects** - On-site M&V of a sample of sites to establish RR
2. **Gross savings evaluation of DR projects** - Review of IM data for a sample of sites
3. **NTG evaluation** - On-site and telephone surveys of participating building owners in the M&V and DR samples and a telephone survey of vendors associated with these projects to estimate NTG components
4. **Retention study of DR projects** - Telephone survey of older DR projects to determine who is still enrolled and participating in the NYISO ICAP SCR (Installed Capacity Special Case Resources) Program

The following sections describe how the program tracking data was combined with the evaluation surveys to calculate the EE and DR saving and the DR retention rates.

2.1.1 Program Data

Program tracking data was provided by NYSERDA and used to develop the sample designs for the three surveys. Key data included tracking ID and other customer identifying information, location, status, electric energy (kWh) and peak demand (kW) savings, and measure descriptors for each project. The Impact Evaluation Team reviewed the data set and cleaned the relevant fields to develop the appropriate inputs for evaluation project sampling.

Three separate samples were selected:

1. On-site survey of energy efficiency projects – The on-site survey was used to develop RRs. Respondents who completed the on-site survey also constituted the sample for the participant NTG interviews and vendors associated with the projects selected for the on-site survey of energy efficiency projects.
2. Survey of DR projects – The survey of DR projects constituted the sample for RR analysis and the vendor NTG interviews.
3. DR retention survey – DR projects completed from program inception in 2001 through 2005 were included in the sample frame for the DR retention survey.

Once the EE and DR samples were drawn, a second data request solicited more detailed information about each project selected for the sample, including the following data:

- Project-level information, including address, contact information for the site owner and engineer, type of project (custom, design/build), and type of business
- Measure-level information (in easily readable electronic format), such as measure description, quantity installed, energy savings (electric, gas, and other fuels), and demand savings
- Excel workbooks, building and system simulation input files, and other documentation of savings calculations developed by applicants and review contractors

- Utility consumption data from third-party sources for the pre- and post-retrofit periods for the projects selected for site visits
- Emails and related communications about the project archived by program staff, Focus Outreach contractors, and other parties
- Firmographics including the firm size, number of employees, fuels used for major end uses, and the types of major electric and gas end uses, to the extent this information was available

NYSERDA program staff provided project files that held the majority of this information.

Billing data was required for a sample of the sites selected for on-site survey. Requests for this data were made directly to the site contacts on a case-by-case basis.

2.1.2 Surveys

Once the program data was in hand, the Impact Evaluation Team completed five surveys to collect data for analysis:

1. M&V site visits for RR: Engineers conducted on-site M&V at 92 facilities with completed energy efficiency projects to determine the RR for efficiency projects.
2. DR project participants for RR – Evaluators gathered IM data from a sample of 71 DR participants to determine the RR for DR projects.
3. M&V sample for FR and SO survey – Engineers and interview professionals administered on-site and telephone surveys to facility decision-makers for participating customers to determine FR and participant SO. The target respondent group was the on-site M&V sample group. Interviews were completed for 51 of the sampled projects. (See Appendix A for the survey questionnaire.)
4. Vendor survey for FR and SO – Interview professionals conducted a telephone survey with vendors associated with 56 projects in the on-site M&V and DR samples to determine FR and participant SO for each of the M&V and DR groups. (See Appendix B for the survey questionnaire.)
5. Persistence survey – Engineers interviewed 51 participants that received NYSERDA funding for DR measures between 2001 and 2005 to determine long-term retention of enrollment and participation in the NYISO or Con Edison LC programs. An engineer visited five of the former participants (10%) that completed the telephone interviews to assess the quality of the telephone responses. (See Appendix C for the survey questionnaire.)

2.1.3 Interim Calculations and Results

After collecting the data, the Impact Evaluation Team calculated project-specific RRs for (1) EE projects' annual electricity energy (kWh) savings, (2) EE projects' summer coincident peak demand (kW), and (3) demand response projects' summer coincident peak demand (kW). The results were aggregated to three program-level RRs.

Analysts calculated the FR, participant inside spillover (ISO), and participant outside spillover (OSO) (vendor) for each project (EE and DR) and aggregated the results into a single set of NTG components at the program level. The aggregate FR and participant results were combined with nonparticipant SO (NPSO) results from prior research¹¹ to compute the program overall net-to-gross ratio (NTGR).

The evaluated net savings is the product of the program reported savings \times RR \times NTGR. Long-term retention was analyzed separately.

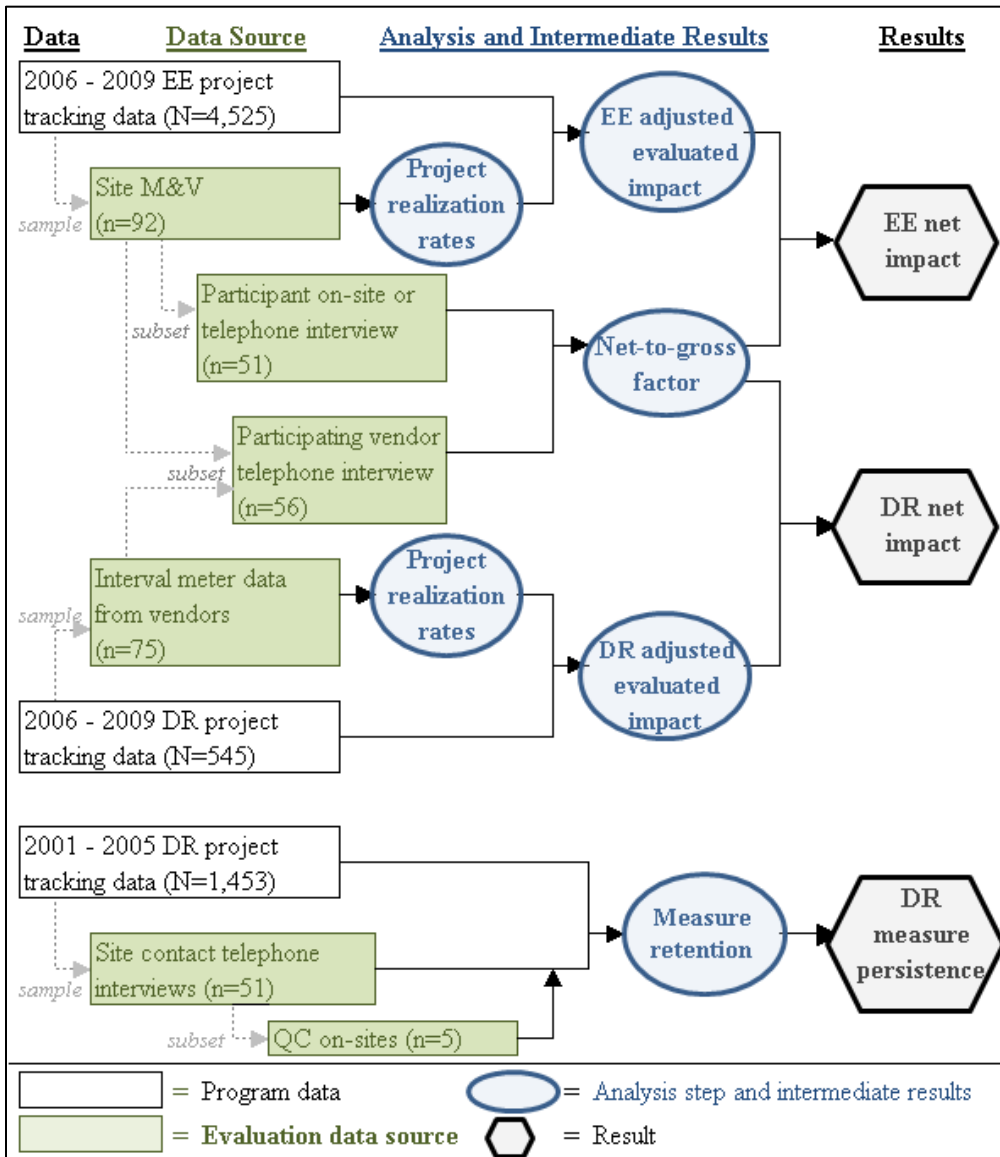
2.1.4 Schedule

On-site M&V and the in-person attribution surveys were conducted in 2011 from July through December. The vendor survey was conducted during November and December of the same year. The long-term persistence interviews were conducted in December 2011, and follow-up visits were conducted in January 2012.

¹¹ NYSERDA *Commercial and Industrial Market Effects Evaluation, Final Report*, submitted by Summit Blue Consulting LLC and Quantec, LLC., October 2007.

Figure 2-1 illustrates the overall method.

Figure 2-1. Overall Evaluation Approach



2.2 DATA TRACKING

The Impact Evaluation Team used a web-based tool called Salesforce to track the telephone survey calls and the site-level progress. Salesforce provides the means of tracking the progress of many events associated with multiple sites in a central database that is accessible from multiple locations; thus the Team could access and track the results of the contacts associated with the sampled sites using a common tool. In this report, the Salesforce database is referred to as the “evaluation tracking system.”

METHOD AND RESULTS FOR ENERGY EFFICIENCY PROJECTS

The Program funded over 3,700 EE projects during the period subject to evaluation. This section first reviews the sample design used for the study, then describes the M&V methods used to develop the RRs for these projects, and finally presents the efficiency project RR results. The RR is the ratio of evaluated energy savings to the program reported savings.¹² The RR represents the percentage of program-estimated savings that evaluators find are being realized based on the results of the M&V analysis and statistical analysis. NTG methods and analysis and net savings are addressed separately in Section 5, as evaluators integrated the attribution research for efficiency and DR projects.

3.1 SAMPLING

The specifics of the sampling plan were established after a review of the data and are summarized below:

- Sampling was designed for stratified ratio estimation.
- The site was the primary sampling unit.
- The sample size was designed to achieve a target confidence/precision level of 90/10 for the program as a whole and for the upstate and downstate regions.
- The sampling frame was stratified by region, program component, and size (summer peak kW reduction or annual kWh savings).
- A census of the largest projects was included in the sample.
- The cut-offs for the strata and sample sizes within each stratum were determined according to the methodology presented in *The California Evaluation Framework*.¹³

The site was used as the primary sampling unit to simplify the process of conducting the on-site surveys. Some projects included multiple sites, and each site was a separate sampling unit. This approach was feasible due to the fact that information was available at the site level for all projects.

There were a total of 4,538 unique site-project combinations from 2006 through 2009. Nearly half of the sites (2,231) accounted for just 3% of the program savings. These sites were removed from the sampling process as they, as a group, have little impact on the final RRs.

Stratified ratio sampling was selected since it allows for efficient sampling design and generally requires a lower sample size for a targeted level of precision.¹⁴ The precision/confidence target of 90/10 was used for the upstate and downstate regions separately, as specified in the evaluation plan.

Separate samples were drawn for each of the upstate and downstate regions to allow evaluators to estimate the RRs separately for each region. Within region, evaluators stratified by project size in accordance with the stratified ratio sampling method. Size was measured based on kWh savings for downstate efficiency projects and kW reduction for upstate efficiency and all DR projects.

¹² The Program reports savings after project installation. For projects subject to program-directed M&V, the savings is subject to revision up to a year or more after applicants complete M&V. A few projects were evaluated based on program reported savings that potentially were subject to later such adjustment. This anomaly does not affect the evaluated net impact but could cause the evaluation realization rates to not reflect the correct value relative to the final post-M&V evaluated gross savings.

¹³ TecMarket Works, et. al, *The California Evaluation Framework*, project number K2033910. Prepared for the California Public Utilities Commission and the Project Advisory Group, June 2004, 327–339 and 361–384.

¹⁴ The stratified ratio estimate (SRE) method produces a more efficient sample as long as the correlation between the program claimed and verified savings is 0.50 or greater, which is typically the case when estimating RRs. For this program, the upstate census strata contained considerably more sites than each of the random strata. A more even allocation would have required dramatically increasing the number of strata and, consequently, reducing the percentage of savings in the largest stratum. To meet the precision target, all sites in the largest size stratum were included in the sample.

3.1.1 Downstate Sample

The annual kWh energy savings were used to define the size categories for the efficiency sites.¹⁵ The efficiency sample is 41 sites of the total population of 821 sites. The steam retention projects were separated from the other projects, as discussed below. The results of the sampling for the efficiency measures are shown in Table 3-1.

Table 3-1. Electric Efficiency Population and Sample by Stratum for the Downstate Region

Stratum	# of Project Sites in Population	# of Project Sites in Sample	Annual MWh in Population	% of Annual MWh in Population
0	455	0	3,258	3%
1	254	10	16,838	15%
2	74	10	22,414	21%
3	27	10	28,937	27%
4	11	11	37,392	34%
Total	821	41	108,839	

Steam retention projects (15) were also included in the downstate population. While these projects have claimed energy (kWh) savings, they differ from other efficiency projects in that the primary purpose is to convince participants to continue to repair and replace their steam equipment as opposed to installing equivalent electric alternatives. The NTG impacts are likely to have a far greater effect on the overall program savings than adjustments in the engineering estimates of savings. Consequently, a primary area of interest for this subgroup of projects is determining the impacts of FR. In addition, NYSERDA has discontinued this program component and thus does not need further input into improving savings estimation methods.

Given these factors and the high costs of conducting a thorough engineering review of these projects, the Impact Evaluation Team decided to conduct verification site visits and administer the NTG survey to a sample of the steam projects. The results of the sampling for the steam projects are shown in Table 3-2.

Table 3-2. Steam Retention Population and Sample by Stratum for the Downstate Region

Stratum	# of Projects in Population	# of Projects in Sample	Annual MWh in Population	% of Annual MWh in Population
0	5	0	368	4%
1	7	3	3,068	32%
2	3	3	6,226	64%
Total	15	6	9,661	

3.1.2 Upstate Sample

The summer peak kW reduction was used to define the size categories for the efficiency sites. While energy savings were decided to be of primary interest, the initial sampling was conducted on summer peak kW reduction¹⁶ and there was no compelling reason to change this approach due to the strong correlation between kW and kWh savings. The Pearson correlation coefficient, which measures the linear relationship between two sets of values, is 0.88 (on a scale of 0 to 1) for the Program upstate efficiency measures, demonstrating that the sample is reasonably

¹⁵ Initially, the sampling for both the upstate and downstate on-site surveys was conducted using kW peak demand reduction rather than kWh energy savings to define sizes. However, the downstate efficiency on-site sample required reconstruction after it was discovered that some DR projects were incorrectly included in the sample frame. At that time, the downstate variable for defining the size was changed to kWh savings. There was a high degree of correlation between kW and annual kWh savings for efficiency projects. Because the upstate sample did not have this problem and upstate project M&V already had begun, the upstate design was not reconstructed and kW remained as the upstate size parameter.

¹⁶ Ibid.

representative of the energy savings. Three projects with no kW reduction but large energy savings were added to the census stratum.¹⁷ The estimated relative precision for the energy savings associated with the efficiency sample is 0.09 for the entire program and 0.12 for the upstate region at the 90% confidence level, based on an error ratio of 0.50.

Table 3-3 shows the number of sites and total MW savings for each stratum by the upstate region. The stratum of very small projects consists of 1,771 upstate sites. These sites make up 3% of the savings and were excluded from the sample since verifying these smaller projects would require resources but would not contribute to reducing the uncertainty in the RR estimates. At the other extreme are the large project sites that account for a disproportionate amount of the savings. For upstate efficiency projects, 1% of the sites account for 25% of the savings. These larger savers are included in the census stratum.

Table 3-3. Electric Efficiency Population and Sample by Size Stratum for the Upstate Region^a

Stratum	Sampling Method	# of Sites in Population	# of Sites in the Sample	Summer MW Reduction in Population
0	None	1,771	0	2.7
1	Random	958	6	9.4
2	Random	442	6	11.3
3	Random	260	6	12.9
4	Random	155	6	14.8
5	Random	82	6	17.1
6	Census	34	34	22.7
Upstate total		3,702	64	90.9

3.1.3 Efficiency Sample Disposition

Engineers performed site-specific M&V on 92 of the 105 EE projects targeted in the sample design. Six of the downstate census stratum projects either refused to participate or were unresponsive to recruitment. Seven sample strata customers were not replaced after both the primary and backup replacement projects were exhausted. In one case, subsequent efficiency upgrades made it impossible to evaluate the original project. Evaluators did not perceive a characteristic or set of characteristics for the lost sample that suggests nonresponse bias should be a concern. Table 3-4 provides a sample disposition for M&V sites.

¹⁷ One project was at a ski resort without summer operation. The other two were VFD projects for which full speed operation was expected during peak and thus no peak savings were reported.

Table 3-4. Sample Disposition for M&V sites

Stratum	Population N	Target Sample	Completed Sites
Upstate			
0	1,771	0	0
1	958	6	6
2	442	6	7
3	260	6	6
4	155	6	5
5	82	6	6
6	34	34	32
Total	3,702	64	62
Downstate			
0	455	0	0
1	254	10	9
2	74	10	9
3	27	10	7
4	13	11	5
Total	823	41	30
Program Totals			
Total	4,525	105	92

3.2 PROGRAM MEASUREMENT AND VERIFICATION

Evaluation of energy efficiency measures involved spot and short-term metering to supplement available data in the project files. Analysts designed M&V plans around equipment metering. Engineers used the International Performance Measurement and Verification Protocol (IPMVP) framework to develop M&V plans, as is discussed below.¹⁸

3.3 BASELINE

The study author(s) characterized each measure as either “retrofit” or “new construction/replace on failure” to define the baseline and calculate measure first-year savings. “Retrofit” means that savings are based on the difference in efficiency between the newly installed high efficiency equipment and the old inefficient equipment that was replaced. The baseline for new construction/replace-on-failure measures is the currently applicable energy code. If no relevant code applies, current standard practice for new construction is used to define the baseline condition. Since energy codes and standard practices are continually increasing efficiency levels, this code baseline typically results in less savings than the retrofit baseline. For both retrofit and new construction/replace-on-failure applications, the savings are assumed to be constant and accrue each year until the end of the measure life.

In May 2011, the New York Department of Public Service (DPS) directed New York EE program administrators to report and evaluate savings using the dual baseline approach when appropriate to do so.¹⁹ When a dual baseline is applied, the initial savings are based on the retrofit definition. This higher level of savings is assumed to accrue for a number of years until the old equipment would have failed. Then the savings for the remaining years of the measure life is based on the new construction/replace-on-failure baseline. Since the M&V for this evaluation was completed prior to this date and the evaluation research plan was also completed before May 2011, this report’s findings do not account for the concept of dual baseline.

¹⁸ The International Performance Measurement and Verification Protocol (IPMVP) defines methods of performing M&V for EE-related projects in four “options.” The options are described in detail in the protocol available at www.evo-world.org.

¹⁹ State of New York Public Service Commission, “Appendix M: Guidelines for Early Replacement Conditions,” created May 5, 2011 as a supplement to the October 2010 DPS *Order Approving Consolidation and Revision of Technical Manuals*.

3.4 M&V SITE WORK

After receiving tracking program data, completing the sample design, and receiving detailed application materials for sampled projects, the engineering team evaluated the savings. The M&V process had five major steps:

1. NYSERDA sent advance letters via email to each participant to let them know they were in the sample and going to receive a call from an impact evaluation engineering team member.
2. The lead engineer for the project sites and his or her team developed site-specific M&V plans. The lead engineer was required to consult with the participant during this process, and a senior evaluation engineer that was not the author reviewed each plan.
3. The lead engineer or other engineer on the project site team scheduled and then conducted an initial site visit and installed logging metering equipment as appropriate. If the decision-maker was available and willing, the engineer completed the NTG interview as well. The engineer then returned to the site to collect the loggers.
4. The engineer completed the analysis and drafted the site-specific M&V report. As with the plans, a senior engineer that was not the author reviewed each draft report.
5. NYSERDA evaluation and program staff then were given the opportunity to provide comments, and analysis was revised as appropriate before finalization.

The balance of this section describes the analytical approach in more detail.

The instrumentation requirements were defined by the engineers in the M&V plans in accordance with IPMVP terminology. Sampled participants were subject to one of three levels of evaluation to determine program RR:

1. Verification-level rigor (17% of projects) – IPMVP Option A-level analysis or less. Inspection or review-only verification, for the smallest savers or those for which savings were seasonally dependent and for which metering was not possible during the evaluation period.
2. Basic rigor (33% of projects)– IPMVP Option A-level analysis if the project delivered moderate savings and the evaluation engineer found that the implementation-side M&V was conducted in a sufficiently rigorous and objective manner to permit leveraging the data. An analysis based on billing would typically be in this level of rigor.
3. Enhanced rigor (50% of projects) – IPMVP Option B-level analysis, for all large savings projects in the sample and for moderate savings projects that lacked prior evaluation-grade analysis through the Program. This level of rigor typically includes modeling of the process or building, calibrated against field measurement of specific equipment.

The evaluation manager responsible for all M&V oversight determined the level of rigor to assign to each project with consideration of the complexity of the analysis, the magnitude of savings, and overall budget available using the same decision-making process as described in the memorandum, Rigor Assignment for the On-Site M&V.²⁰ This document is included as Appendix D.

The referenced memorandum addresses the situation of projects that had previously been evaluated. This issue was applied to the Program as well. Three projects in the sample previously had been evaluated as part of NYSERDA’s Large Savers evaluation. Four had received partial Con Edison System-Wide Program (SWP) funding and previously had been evaluated as part of that program’s impact evaluation. For these seven projects the Impact Team reviewed the prior work and leveraged the results, largely using it without replication. In certain cases the prior evaluation work was dated enough that the lead engineer had to re-contact the customer to determine if practices had changed and, where necessary, update the savings calculations based on the recent data and characterization.

For the basic- and enhanced-rigor projects, the lead engineer drafted a site-specific M&V plan using the NYSERDA and DPS-approved M&V template and available project-level data. The M&V plan identified on-site metering needs and the planned analysis method. The approach either replicated the method used in the program application or used a different approach, depending on whether the evaluator concluded another method was more appropriate for post-installed based evaluator-grade rigor. The evaluation approach was sensitive to customer inconvenience and the perceptions regarding program M&V the customer had already supported.

²⁰ From Jon Maxwell, Satyen Moran, ERS; Kathryn Parlin, WHEC; and Lori Megdal, Megdal & Associates, LLC, to Judeen Byrne, NYSERDA Energy Analysis and the Evaluation Staff of the New York Department of Public Service (DPS), November 16, 2010.

The sample design used the project as the sampling unit, not the measure. For two projects, budget limitations and/or consideration for demands on participant time required that the engineers evaluate a sample of measures instead of all of them. In those cases the evaluation assessed at least 90% of the reported savings. The RR for the sampled measures was considered representative of the project overall. Similarly, on-site sampling was required within many measures, especially lighting, as metering every fixture circuit would have been cost-prohibitive. The engineering team used a formal protocol²¹ to randomly and representatively select samples for motors, air handlers, drives, packaged air conditioning units, lighting circuits, etc., that generally ensured 20% relative precision at 80% confidence.

The data from the evaluator's M&V work was used to develop a project- or measure-level evaluated ex post savings estimate. The evaluator then compared the evaluated savings with the documented program reported savings for that project or measure to determine the RR.

3.5 CALCULATION OF THE REALIZATION RATE

The RR calculation for an individual project is:

$$RR_i = \frac{kWh_{evaluation}}{kWh_{program}}$$

where,

- i = Project number (i.e., the i th project)
- $kWh_{evaluation}$ = Evaluated M&V kWh savings (by evaluation M&V contractor)
- $kWh_{program}$ = kWh savings claimed/reported by program for the project

The goal of the calculations reported in this report is to estimate to RRs at the program level. In statistics the RR term for a sample is considered the ratio estimator and given the symbol b , as shown in the equation below. The RR is the ratio of the evaluated gross savings to the program reported savings.

The program reported savings for each project in the sample is known at the beginning of the evaluation and denoted x_i . Based on the sample design each evaluated project effectively represents itself and, if it is not a census project, also other projects not in the sample. The expansion weight w_i represents this factor. A w of 5.0, for example, means that for every evaluated project in the sample, there are a total of 5.0 projects in the population that are of the same type. In this evaluation the type is defined by the unique geographic location (upstate or downstate) and size (stratum) combination. The product of the reported savings and the expansion weight for each sampled project, summed for all projects in the sample, constitutes the denominator of the program-level RR formula.

The evaluation engineers independently estimated savings for each project based on site M&V. This was the single biggest effort in the impact evaluation. The evaluated gross savings for each project is indicated as y_i in the equation below. As with the program reported savings, the evaluated gross savings is multiplied by the expansion weight and the products are summed for the sample, with the result being the numerator of the program-level RR formula.

The ratio of the numerator to the denominator is the ratio estimator, b , or RR.

$$b = \frac{\sum_{i=1}^n w_i y_i}{\sum_{i=1}^n w_i x_i}$$

where,

- b = RR (ratio estimator)
- i = Project number (i.e., the i th project)
- n = Total number of verified projects in the sample

²¹ A sampling spreadsheet that separated the measure energy savings by desired parameter was used to determine the sample of loggers required.

- w_i = Expansion weight (the total number of projects in the stratum divided by the number of verified projects in the stratum)
- y_i = Verified savings for project i
- x_i = Original claimed savings for project i

The basis for these calculations and the method for calculating the variance are provided in *The California Evaluation Framework*.²² Site engineers estimated and assessed measurement error and other sources of engineering uncertainty and quantified it where possible.

3.6 REALIZATION RATE RESULTS

Evaluation generally followed the level of rigor described in the methodology. In general, the engineering rigor per site increased compared to plans.

Figure 3-1 compares the evaluated annual electric energy savings with that reported by the Program. Ideally, the evaluated savings would always match the program savings. This ideal is shown as a solid black line on the charts. Actual findings are plotted as points on the scatter graph, with program reported savings on the x-axis and evaluated gross savings on the y-axis. If all the points were to fall directly on the line, it would mean that the evaluated savings were exactly the same as the program-reported savings and the RR is 1. A pattern of points below the ideal line suggests an RR of less than 1; more points above the line suggest an RR greater than 1.

While the full-scale program electric energy scatter plot on the left appears to show more points below the ideal line than above it, the close-up view of the 0 to 500 annual MWh scale graph shows a balanced distribution.

Figure 3-1. Program Reported and Evaluated Electric Energy Savings

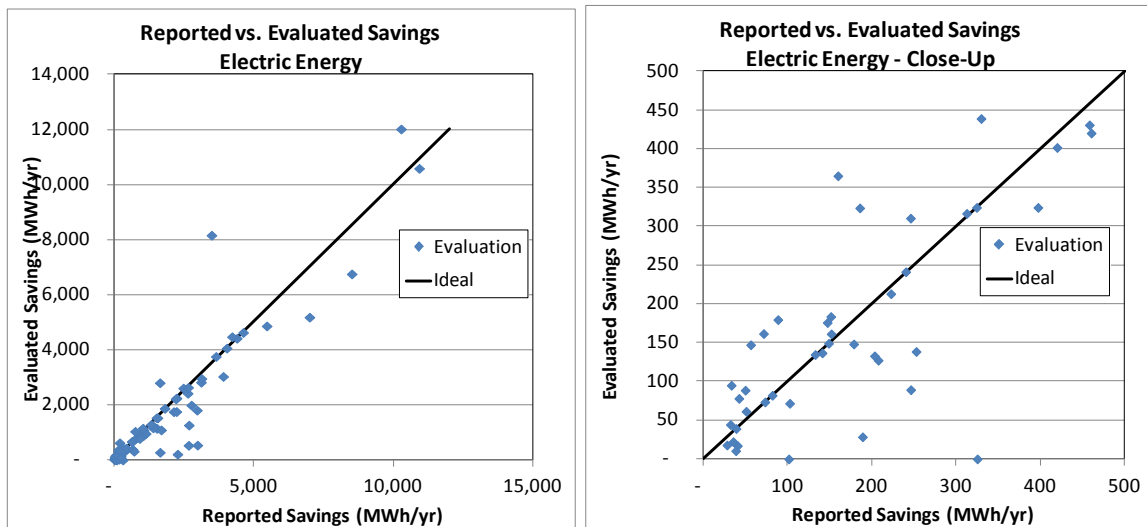
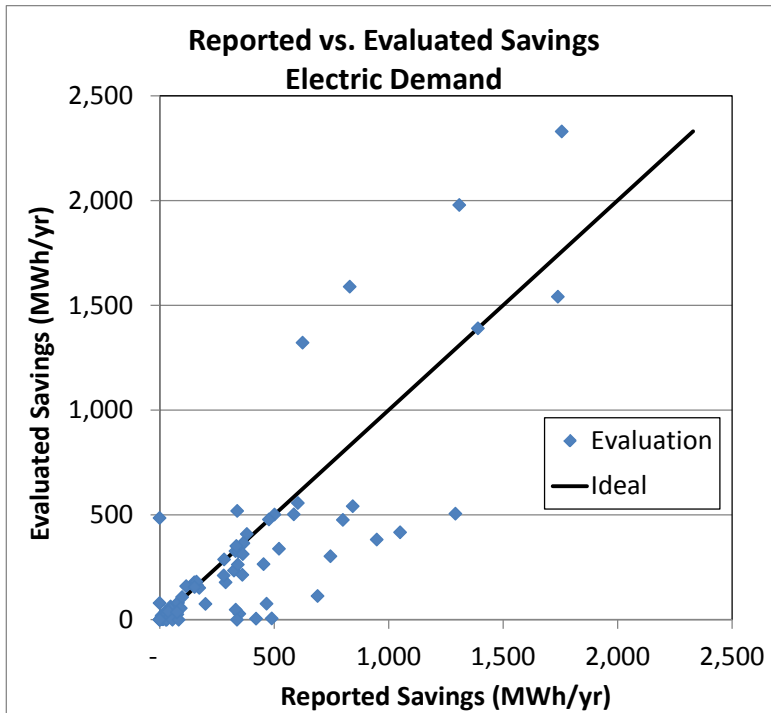


Figure 3-2 provides the same comparison between program reported and evaluated gross savings for summer coincident peak demand. The evaluated demand savings overall had a clear tendency to be less than the reported values. The lower kW RR is at least partially due to the fact that evaluators estimated summer coincident peak demand reduction, the average demand reduction during weekday summer afternoons, whereas the Program’s reported demand savings basis varied but generally used more extreme conditions such as the annual summer peak hour. Demand also had more variation between reported and evaluated estimates than did the energy estimates. The error ratio on the permanent demand savings realization rates was 0.58. The high variance in the peak demand savings realized by the Program stems from inconsistencies in algorithms and requirements regarding peak demand calculations.

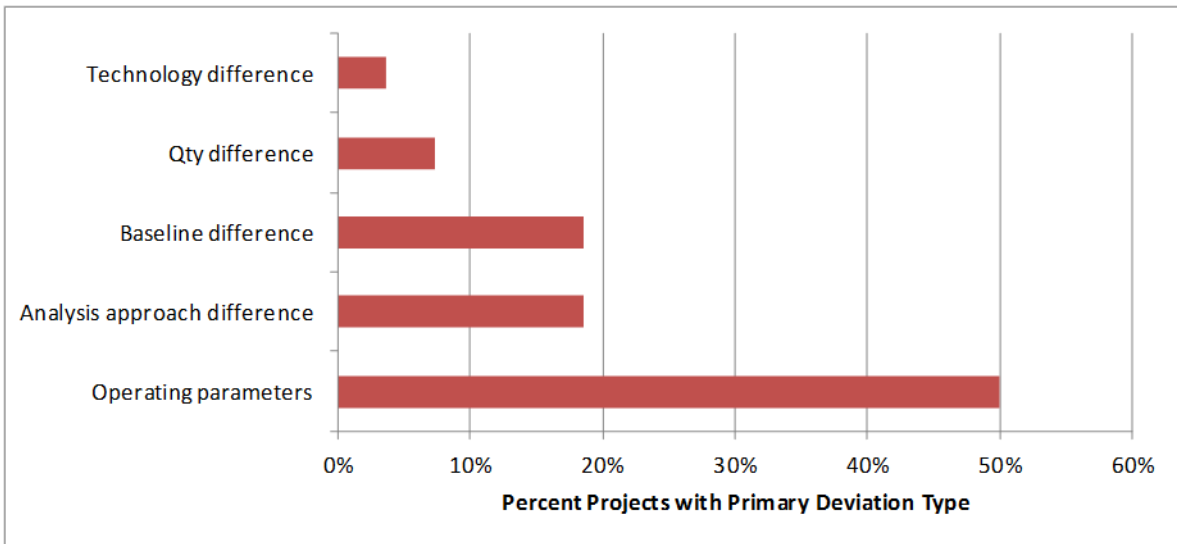
²² TecMarket Works, et. al, *The California Evaluation Framework*, project number K2033910. Prepared for the California Public Utilities Commission and the Project Advisory Group, June 2004, 327–339 and 361–384.

Figure 3-2. Program Reported vs. Evaluated Gross Electric Peak Demand Savings



Ninety-two projects received on-site M&V. Evaluators calculated annual kWh savings that deviated from the estimated energy savings by more than +/-10% for 55 of the projects. For each of these projects the lead evaluation engineer categorized up to two main reasons for such deviation. The chart in Figure 3-3 illustrates the major reasons the evaluation results deviated more than +/-10% when compared to the recommended savings as recorded in NYSERDA’s tracking system. Percentages are shown relative to the 55 projects in which significant deviation was observed. These percentages are not weighted on savings.

Figure 3-3. Reasons Evaluated Savings Deviated from Study Estimates



Reasons for the discrepancies between verified and program savings are described below.

- Technology difference. Assumptions regarding the baseline and as-built equipment efficiencies or related equipment specifications differed between the application and evaluation.
- Quantity differences. Different fixture counts on some lighting projects contributed to the savings deviation.
- Baseline system. Parameters such as operating strategies and new construction versus retrofit baseline did not agree.
- Analysis methodology (e.g., the inclusion of a cooling bonus on lighting efficiency projects in evaluation savings, prescriptive versus custom) was modified by evaluators. In addition, in some cases the program reported savings were based on deemed savings algorithms, whereas the evaluated savings were based on actual site conditions following a different analysis methodology best suited for the site conditions.
- Operating parameters (e.g., schedules, hours per year) between predicted and evaluated calculations were found to differ. This difference in data duration significantly affected the findings on post-retrofit conditions. As with the methods reason noted previously, many EFP-reported savings estimates are based on deemed savings. The use of deemed savings does not inherently lead to high or low RRs for the population but does inherently lead to more variation in site-specific savings estimates compared to evaluated estimates. Operating hours are the most significant contributor to this variance.

The evaluation found that for a vast majority of the projects the equipment quantities, type, make, and model were consistent between program documents and evaluation inspection. This finding reflects a high level of rigor on the part of program staff and technical assistance providers during the post-installation review step of the Program.

Table 3-5 shows the aggregate RRs by stratum. The statewide RR is 1.03, indicating that the evaluation essentially validated the Program’s overall estimates of energy savings. The relative precision on the statewide estimate is 9.8% at 90% confidence.

Table 3-5. Realization Rate Results Summary, Electric Energy Savings (kWh)

Stratum	N Total Population Size	n Sample Size	Sample Size Range		RR	Relative Precision at 90% Confidence
Downstate			Annual MWh			
0	455	0	-	-	1.00	
1	254	9	34	152	1.24	
2	74	9	179	461	0.94	
3	27	7	656	1,656	0.81	
4	13	5	2,997	4,635	1.07	
Subtotal	823	30			1.00	16.9%
Upstate			kW Reduction			
0	1,771	0	-	-	1.00	
1	958	6	5	14	1.76	
2	442	7	22	35	0.84	
3	260	6	38	63	1.09	
4	155	5	76	108	1.00	
5	82	6	153	331	0.97	
6	34	32	332	2,319	0.88	
Subtotal	3,702	62			1.04	12.1%
Total	4,525	92			1.03	9.8%

There is no clear pattern to the RR with respect to geographic region or size. It is notable that the larger projects – those that exceeded 1,000,000 in annual program-reported kWh savings and were more likely to require M&V²³ – were equally likely to have a significantly low (less than 0.80) RR similar to the smaller projects. Specifically, 27% of the sampled smaller projects and 30% of the sampled larger projects were found to have RRs below 0.80. One might expect those projects with program-required site-specific M&V to have RRs closer to 1.0 than projects without that requirement. This was not the case. Evaluators speculate that the greater certainty gained from program M&V is offset by the greater complexity and volatility in larger projects.

Error ratio measures the amount of scatter in the point distribution. The higher the error ratio, the greater the amount of scatter between points. The sample design assumed a 0.5 error ratio. The calculated error ratio was 0.49.

Table 3-6 shows the RRs and relative precision for summer coincident peak demand savings.

Table 3-6. Realization Rate Results Summary, Summer Coincident Peak Demand Savings

Stratum	N	n	Sample Size Range (Annual kW)		RR	Relative Precision at 90% Confidence
Downstate						
0	455	0	-	-	1.00	
1	254	9	0	18	1.09	
2	74	9	26	288	0.77	
3	27	7	0	521	0.68	
4	13	5	116	1,390	0.92	
Subtotal	823	30			0.85	14.3%
Upstate						
0	1,771	0	-	-	1.00	
1	958	6	5	14	1.19	
2	442	7	22	35	0.71	
3	260	6	38	63	0.64	
4	155	5	76	98	0.65	
5	82	6	153	331	0.84	
6	34	32	0	1,756	0.81	
Subtotal	3,702	62			0.79	9.8%
Total	4,525	92			0.81	8.0%

The relative precision in the summer coincident peak demand result is higher than expected and indicates a high variation in the evaluated peak demand results. Evaluators expect that this variation stems from inconsistencies in the Program's approach to claiming and calculating peak demand savings.

3.7 OTHER RESULTS

As noted in the methodology, dual baseline considerations were not part of the impact evaluation. At the request of the DPS, the Impact Team assessed the potential influence of dual baseline principles on the results for energy efficiency projects. Nine percent of the reported savings would have been subject to dual baseline adjustment of savings in later years, had it been in effect for the evaluation period.

NYSERDA used the summer coincident demand definition to define the period for peak demand savings in this evaluation of 2006 through 2009 projects. This peak period definition differs from that described in the 2011 New York Technical Manual. The engineering team calculated savings using both methods. Had this evaluation been conducted using the New York Technical Manual definition, the realization rate and demand savings would have changed for 48 of the 92 evaluated projects. The net effect would have been a decrease in savings of 11%.

²³ Forty-six of the 92 sampled projects received program M&V.

METHOD AND RESULTS FOR DEMAND RESPONSE PROJECTS

Grid-level demand for electric energy varies constantly. In New York, as in much of the United States, the electric grid's load reaches its peak demand on hot summer weekday afternoons, when commercial air conditioning systems increase electricity use to its annual maximum. This peak need for power is met with power plants that run for just a few hours per year. These “peaker plants” tend to be suppliers' least efficient plants, since it is not economically reasonable to make them as efficient as base-loaded power plants, and consequently they are kept offline most of the year and have high associated capital costs due to low run hours. In short, these peak hour MW are extremely expensive for energy suppliers and for society.

DR programs were created to reduce the magnitude of the peak demand relative to the off-peak base load by paying customers to voluntarily shed load in times when the grid capacity is strained. In a large enough volume, DR participation can reduce the need to operate existing power plants or to construct new peaking plants. To this end, the NYISO (and some individual investor-owned utility companies) manage callable load reduction programs in New York.

NYSERDA funds LC, DG, and IM measures for DR projects and requires incentive recipients to enroll in the NYISO's callable DR programs. Participation requires an IM to track participant performance during tests and events in the DR program. All of the Program participants enrolled in the NYISO Installed Capacity-Special Case Resources (ICAP-SCR) program.

DR participants enrolled in the NYISO program through vendors or aggregators known as Responsible Interface Parties (RIPs) acting on their behalf. RIPs are responsible for enrolling customers in the NYISO programs and delivering the interval data and summary results to the NYISO to verify DR actions and enable participants to receive NYISO participation payments. NYSERDA pays the Program incentives directly to whomever the Program applicant was – in most cases, the RIP involved.

The approach to evaluating the DR performance was to request the IM data for a sample of participants from the RIPs and then to analyze the participants' response to calls using this data.²⁴ No on-site visits were conducted.

4.1 SAMPLING

As with efficiency, the site was used as the primary sampling unit. There were a total of 687 unique site-project combinations from 2006 through 2009. About 20% (142) accounted for just 3% of the program savings. These sites were removed from the sampling process as they, as a group, have little impact on the final RRs.

For the DR projects, the estimated kW reduction was used as the primary sampling variable. Stratified ratio sampling was used, and the stratum cut-offs were established according to the method described in *The California Evaluation Framework*. Stratified ratio sampling generally requires that the projects be sorted by size, then divided into between three and six strata, with each stratum representing approximately equal amounts of savings. A large quantity of small projects are in the first stratum, a moderate number of medium sized projects are in the middle strata, and a few very large projects are in the last stratum. Then an equal number of projects are sampled from each stratum. Variations in stratum breakpoints are made to accommodate the unique characteristics of a population, such as those with a significant number of projects with small savings or for those where the largest projects contribute more than 15% to 30% of program savings and other considerations.

For the downstate region, the sample frame included LC, DG, and IM projects. The upstate projects consisted only of IM projects. Table 4-1 shows the results of the sampling process.

²⁴ The NYISO did not share the data with NYSERDA due to confidentiality concerns.

Table 4-1. Demand Response Projects Sample and Population by Stratum

Stratum	Sampling Method	N # of Project Sites in Population	n # of Project Sites in Sample	MW Reduction in Population	% of MW Reduction in Population ¹
Downstate Region					
0	None	98	0	2.3	3%
1	Random	184	10	13.6	18%
2	Random	76	10	16.8	22%
3	Random	41	10	19.7	26%
4	Census	18	18	24.6	32%
Downstate Total		417	48	77.0	
Upstate Region					
0	None	44	0	2.6	3%
1	Random	119	10	15.0	17%
2	Random	62	10	17.7	20%
3	Random	35	10	20.2	23%
4	Census	10	10	32.3	37%
Upstate Total		270	40	87.8	
¹ Percentages may not add up to 100% due to rounding.					

4.1.1 Demand Response Sample Disposition

The recruitment of customers and collection of data ultimately deviated substantially from the original evaluation plan. Evaluators ultimately collected sufficient data from RIPs associated with 71 projects compared to the goal of 88 projects. Sample data collection required over six months of outreach through multiple channels and mediums to collect the batches of data finally received. Calendar constraints limited the Impact Team's ability to collect additional data.

As is discussed in Section 4.2, evaluators calculated DR evaluated gross savings using three different methods. While it was not possible to achieve the target sample size for all three methods, the data necessary to calculate the savings using one of the three techniques - the APMD-baseline-based method - was particularly problematic, and the Impact Team received sufficient data for only 11 of the sites. A single large RIP representing over half of the sampled participants could not deliver the necessary data to calculate the savings using the APMD baseline for their sampled sites. Evaluators and program staff worked with the RIP to try and collect the data. The primary motivation for the RIP did not appear to be the attempt to hide any results, but rather the desire to avoid doing a large amount of unpaid work associated with a group of projects that received relatively small NYSERDA incentives. Comparing this RIP's results with those of the other RIPs when using the two other techniques did not reveal a pattern of substantial differences. Comparing the APMD-baseline results between this evaluation sample and that of the NYISO population also revealed less than a 10% difference. For these reasons, the Impact Team expects that the lack of data needed to apply this method is unlikely to introduce undue bias to the overall DR results.

4.2 APPROACH

DR savings is measured as the difference between the facility's actual demand at the time of an event or test and the demand defined by a baseline. The demand during the events or tests is defined as the average metered demand during the one- to six-hour event or test. The variation in the resource performance is due to differences in the methods for defining the baseline demand. These methods are as follows:

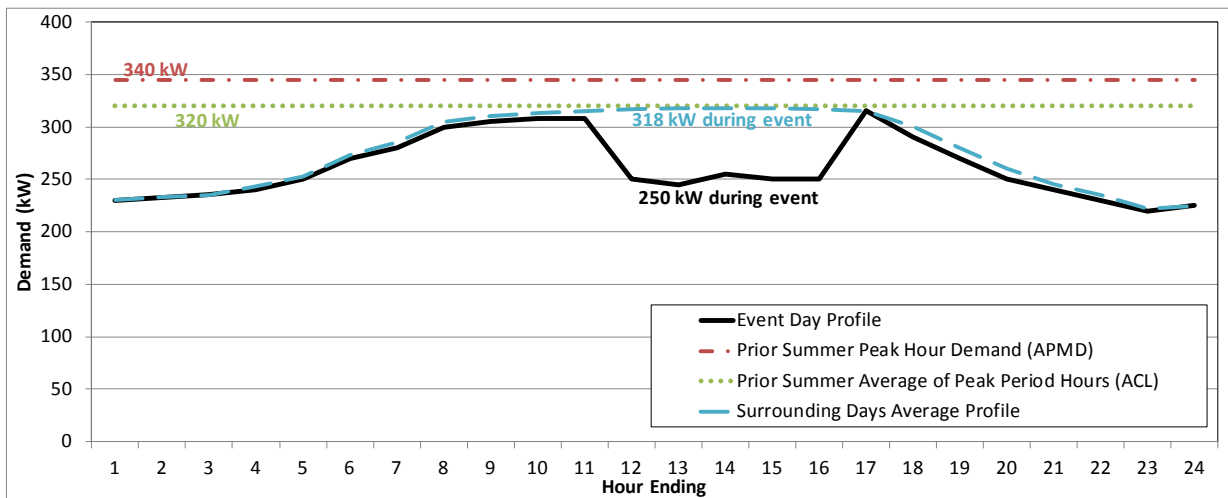
- **APMD** – Until the summer of 2011, the NYISO SCR program defined the baseline kW demand using the APMD method. This method defines baseline as the participant's average of the maximum peak

demand from each of the middle four months of the prior capability period.²⁵ Thus, the NYISO ICAP-SCR demand reduction is the participant’s APMD minus their demand during the event or test. Because this was the definition used by the NYISO during the period being evaluated, this is the baseline definition used when participants reported their enrollment kW to NYSERDA.

- **ACL** – The NYISO changed its baseline methodology for the summer of 2011. The new and current definition of baseline demand for the ICAP-SCR program is the average coincident load (ACL) method. The ACL method is similar to APMD, as it uses the prior year’s data to establish the baseline for simplicity of administration. First, the NYISO publishes the top 40 coincident peak hours falling between 1:00 p.m. and 7:00 p.m. for each load zone in the prior “like” capability period. With these peak hours defined, the ACL is a facility’s average demand during its top 20 hours within these 40 defined hours.
- **Profile** – To estimate the actual peak load reduction of participants during a DR event requires examination of interval data during the days and hours prior to the event to construct the baseline. There is no single standard method used throughout the United States to define such a profile-based baseline demand. The Impact Team chose to use the method similar to that described in the NYISO Emergency DR Program (EDRP) Manual.²⁶ With this method, a 24-hour baseline daily profile is built using interval data from the 5 highest days within the preceding 10 “eligible” days preceding the test/event. The average load during the DR period (e.g., noon to 5 p.m.) is considered the baseline. The method also incorporates a morning adjustment factor to account for weather variation and characteristic facility features.

The Impact Team believes that using the Profile-based baseline is the best approach for estimating actual customer response and is the basis for savings calculations. Figure 4-1 illustrates the concept behind the three methods for a hypothetical project, as described below.

Figure 4-1. Demand Response Savings Calculation Methods



- The black solid line indicates the customers demand over the course of the event day.
- On the event day the customer reduced the demand to an average of 250 kW during the event period of noon to 5 p.m. The highest line (red dash-dot) is flat and represents the APMD baseline. It shows that the participant average of their peak demands during each of the prior summer’s middle months was 340 kW;

²⁵ Specifically, the following three steps are required to calculate the APMD baseline: (1) identify the middle four months in the prior “like” capability period (“like” means summer or winter seasons, per the NYISO definitions, and for this evaluation NYSERDA is concerned only with the summer period), (2) consider only the hours between noon and 8 p.m. and identify a single hour in each of the four months that had the highest average demand over the one-hour interval, (3) average the four monthly peak demands.

²⁶ *Emergency Demand Response Program Manual*, New York Independent System Operator, December 2010.

thus APMD-based demand reduction is the difference between the red and black lines, $340 - 250 = 90 \text{ kW}$.

- The flat, green dotted line at 320 kW represents the ACL baseline, the facility’s top 20 average demands that occurred during the defined 40 grid-coincident peak hour windows of the prior summer. Thus the ACL-based demand reduction is the difference between the green and black lines, $320 - 250 = 70 \text{ kW}$.
- Finally the blue dashed curve represents the participant’s average profile during the days preceding the event. The baseline profile’s average demand during the event period was 318 kW. The profile-based demand reduction is the difference between the blue and black lines, $318 - 250 = 68 \text{ kW}$.

4.2.1 Evaluation Data Collection

Evaluators approached the end-use customers and RIPs individually with little success. After enlisting program staff assistance with one-on-one recruitment the data collection still was not effective. Finally, after bringing all the RIPs together for a conference call the Program and Impact Teams were able to garner substantial support and ultimately data delivery.

4.2.2 Evaluation Analysis

The Impact Team calculated the demand reduction for each facility and each event using all three methods discussed above, to the extent the data allowed. Evaluators believe that the profile baseline-based method most directly reflects actual response, i.e., reduction and impact on grid capacity, and is the basis of the program demand reduction estimates in this report. The RIPs provided evaluators with sufficient hourly data from 2010 and 2011 events and tests for the sampled projects to calculate the demand reduction using all three methods. This enabled evaluators to compare the Program’s performance with goals at the time (APMD) against the revised NYISO standard (ACL) and to calculate the actual NYSERDA participant response and savings at the meter.

The RIPs provided APMD- and ACL-baseline demand values directly. Evaluators constructed the event and test-day profiles and the profile-based baseline demand for each participant and each method to the extent data allowed.

Evaluators divided the calculated DR savings by NYSERDA’s tracked APMD-baseline-based kW for each project. The effective RRs for the three methods were weighted and combined using the same technique as described for EE measures in the prior section.

4.3 RESULTS

Engineers performed site-specific evaluation of short-term callable DR by customers that hosted projects for LC technologies, DG, and IM projects that enabled enrollment in the NYISO’s callable DR programs.

Table 4-2 shows by load zone the eight SCR and SCR/EDRP events in 2010 and 2011 that the NYISO called and evaluators analyzed. As the table shows, every zone was subject to at least one call each year. The zone maps are provided in Appendix F.

Table 4-2. 2010 NYISO SCR Demand Response Tests and Events

Event / Test	Start		End		Zones											
	Date	Time	Date	Time	A	B	C	D	E	F	G	H	I	J	K	
Event	07/06/10	13:00	07/06/10	19:00											Yes	
Event	07/07/10	13:00	07/07/10	19:00											Yes	
Test	08/03/10	10:00	08/03/10	11:00	Yes											
Test	08/03/10	11:00	08/03/10	12:00		Yes	Yes									
Test	08/03/10	12:00	08/03/10	13:00				Yes								
Test	08/03/10	13:00	08/03/10	14:00					Yes	Yes	Yes	Yes	Yes			
Test	08/03/10	14:00	08/03/10	15:00										Yes	Yes	
Test	09/28/10	11:00	09/28/10	12:00	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Test	07/19/11	12:00	07/19/11	13:00	Yes											
Test	07/19/11	13:00	07/19/11	14:00		Yes	Yes									
Test	07/19/11	14:00	07/19/11	15:00				Yes								

Event / Test	Start		End		Zones										
	Date	Time	Date	Time	A	B	C	D	E	F	G	H	I	J	K
Test	07/19/11	15:00	07/19/11	16:00					Yes	Yes	Yes	Yes	Yes		
Test	07/19/11	16:00	07/19/11	17:00											Yes
Event	07/21/11	13:00	07/21/11	18:00							Yes	Yes	Yes	Yes	Yes
Event	07/22/11	12:00	07/22/11	18:00										Yes	
Event	07/22/11	13:00	07/22/11	18:00	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes

The NYISO measured 2010 performance using the APMD baseline. The RIPs thus were able to provide the Impact Team with APMD-baseline data in 2010. Figure 4-2 compares the program-reported DR savings from the time of enrollment with the actual performance during 2010. Because the program in place at the time of incentive payment between 2006 and 2009 was also APMD and performance data for 2010 used the APMD baseline, the graph in Figure 4-2 represents a comparison of like values.

Ideally, the evaluated savings would always match the program savings resulting in an RR of one. This ideal is shown as a solid black line on the reported versus evaluated charts. Actual findings are plotted as points on the scatter graph, with program reported savings range on the x-axis and evaluated gross savings range on the y-axis. A pattern of points below the ideal line suggests an RR of less than 1; more points above the line suggest an RR greater than 1. The weighted average RR for 2010 was 90%.

As can be seen in Figure 4-2, the APMD-baseline data was available for only ten sites.²⁷

Figure 4-2. Program Reported Demand Reduction (APMD basis) Compared to 2010 Demand Reduction (APMD basis)

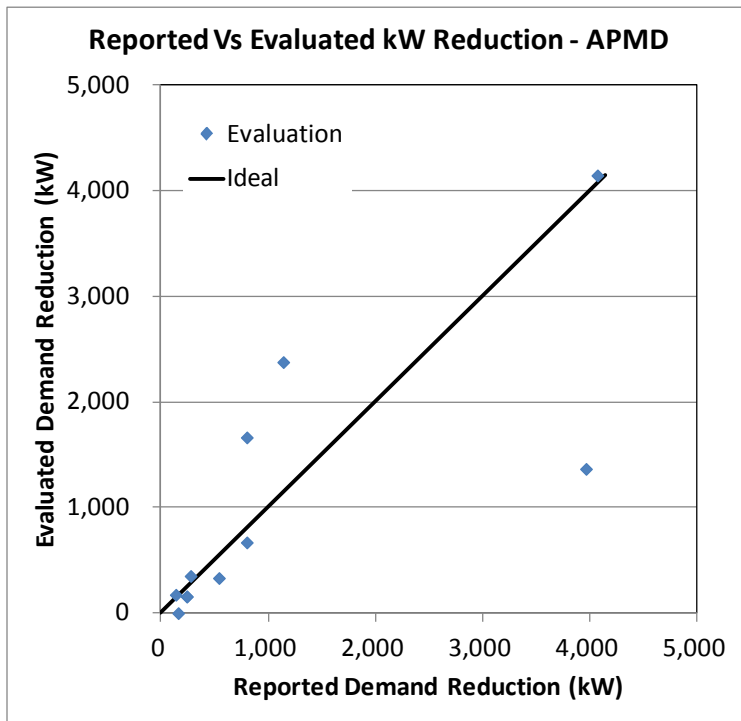


Figure 4-3 compares the APMD-based program-reported demand reduction from the time of incentive receipt to the 2011 performance. Unlike 2010, the 2011 baseline used the ACL (average of 20 peak hours from the prior summer) as basis. This means that the data in the figure, while informative, should not necessarily be considered a reflection of system underperformance. The weighted average ratio of the evaluated demand reduction divided by

²⁷ A RIP that represented more than half of the participants could extract and supply ACL data for 2011 but could not unarchive and supply APMD data from 2010.

the program reported demand reduction was 63%. The 2010 analysis reveals about 10% underperformance. If 2011 is similar to 2010 regarding underperformance, then the changing definition of baseline from APMD to ACL is responsible for an additional 23% reduction in the ratio.

Figure 4-3. Program Reported Demand Reduction (APMD basis) Compared to 2011 Demand Reduction (ACL basis)

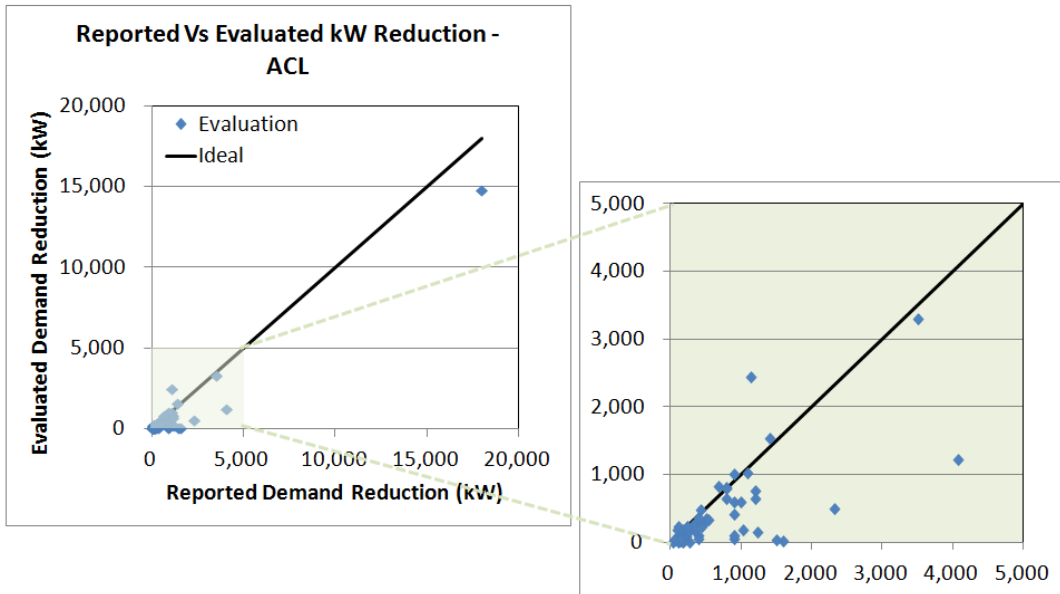


Figure 4-4 compares the APMD-based program-reported demand reduction from the time of incentive receipt to the 2010 and 2011 performance using the profile baseline approach. The weighted average ratio of the evaluated demand reduction divided by the program reported demand reduction was 66%. Evaluators believe that this comparison gives the best translation between tracking values of demand reduction and the actual reduction caused by changes in behavior of participants.

Figure 4-4. Program Reported Demand Reduction (APMD basis) Compared to 2010 and 2011 Profile-Based Demand Reduction

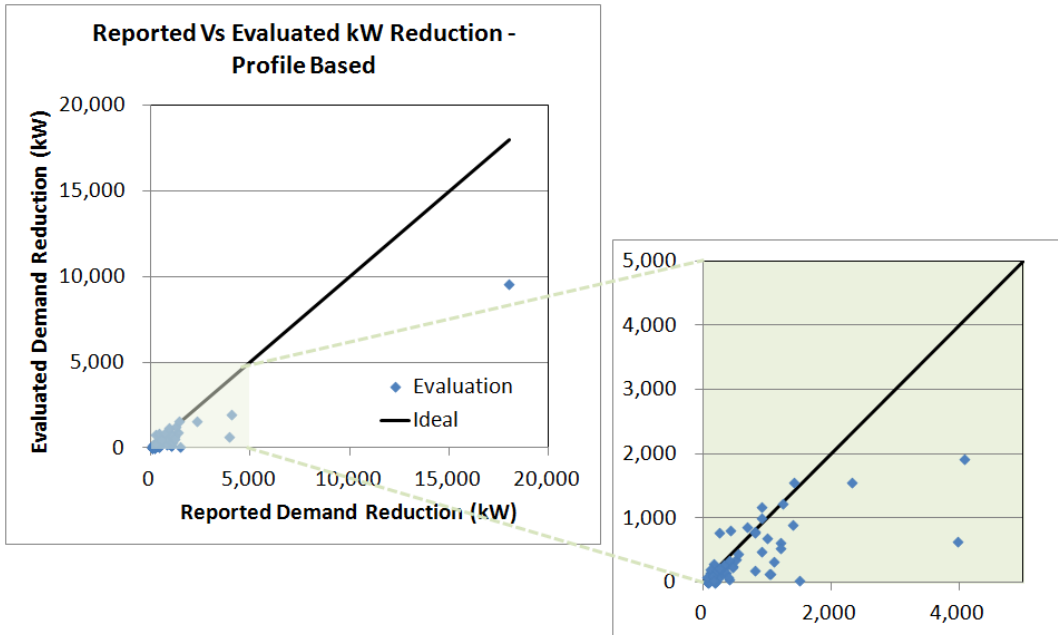


Table 4-3 summarizes the findings and includes the relative precision associated with each ratio’s estimate, by upstate or downstate and by stratum. The relative precision on the estimates is slightly higher than both because the sample was smaller than the design called for and the variance was greater, ranging from 0.50 to 0.76 depending on the method.

Evaluators estimate that the DR-based load reduction on the electric grid during 2011 events was 66% of the reported demand. This estimate is based on application of the profile method and its effective RR of 0.66. Using consistent metrics the Program’s evaluated gross savings is 90% of the program reported savings. This is similar to the NYISO’s findings regarding 2010 performance for all of their participants.²⁸ This ratio does not measure the Program’s impact on the grid, but indicates that the program funding led to enrollment of 90% of the load reduction that it paid to enroll and thus is an important indicator of program performance.

²⁸ EDRP/SCR resources in Load Zone J reduced 90.6% of the total enrolled MW on July 6, 2010 and 96.2% on July 7, 2010. *NYISO Supplemental Report on Demand Response Programs, 2010 Event Performance, Attachment I, New York Independent System Operator, 1/25/11.*

Table 4-3. Demand Response Realization Rate Results

Stratum	Project Size	Population		2010 APMD		2011 ACL		2011 Profile	
		Program Reported Demand (kW)	Sites (N)	Sample Sites (n)	RR	Sample Sites (n)	RR	Sample Sites (n)	RR
Downstate									
D0	XS	2,303	98	0	100%	0	100%	0	100%
D1	S	13,550	184	1	127%	9	48%	12	39%
D2	M	16,817	76	2	81%	7	29%	5	126%
D3	L	19,699	41	1	84%	3	58%	2	60%
D4	XL	24,626	18	3	92%	10	52%	7	32%
Subtotal		76,995	417	7	96%	29	49%	26	56%
Upstate									
U0	XS	2,625	44		100%		100%		100%
U1	S	15,053	119	0	na	4	71%	8	73%
U2	M	17,711	62	2	66%	11	69%	8	63%
U3	L	20,249	35	1	62%	9	86%	8	110%
U4	XL	32,258	10	1	102%	8	71%	8	56%
Subtotal		87,896	270	4	84%	32	74%	32	73%
Total		164,891	687	11	90%	61	63%	58	66%
Relative precision on total at 90% confidence					14%		13%		14%

Comparing the results by stratum is more revealing for the lack of patterns than for the emergence of them. There is no significant pattern with respect to RRs as a function of size or region of the state.

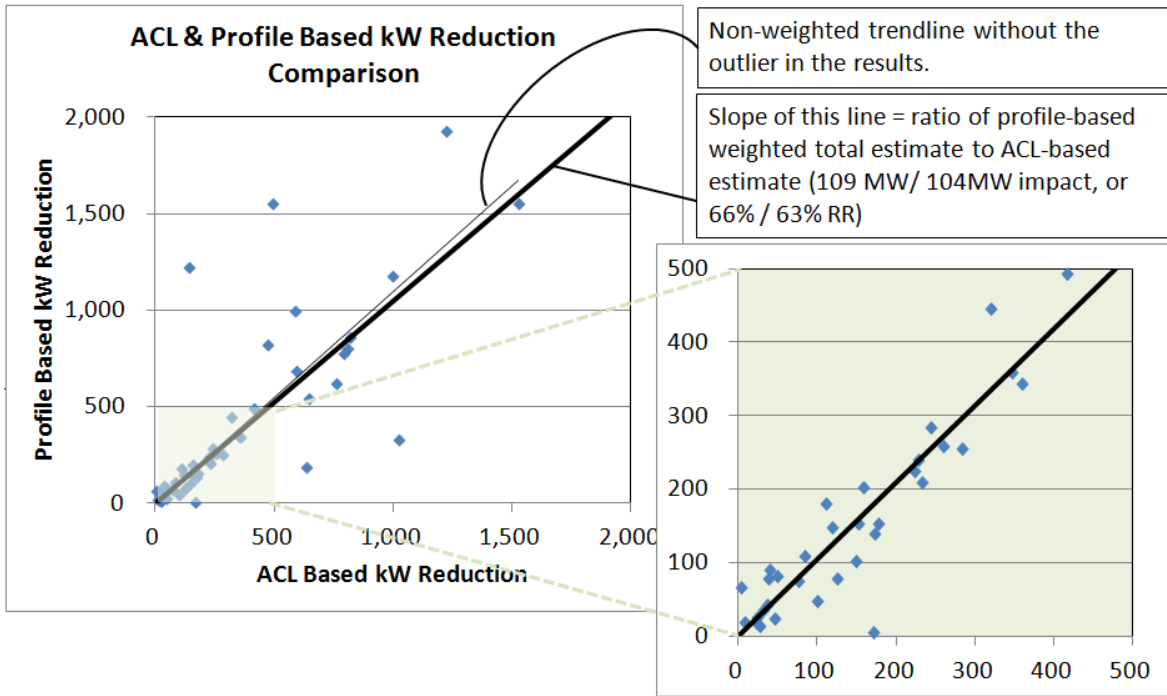
The ACL-based RRs are consistently lower than the APMD-based RRs as they must be, since the ACL numerator is based on the average of the 20 highest load hours, and the APMD numerator is based on the average of the 4 highest load hours.

Evaluators did find one significant pattern. The profile-baseline-based total RR is within 5% of the ACL-baseline-based RR. Not every stratum's RR is within 5%, but correlation definitely is suggested in Table 4-3 above. Taking into account the dissimilar origins of the estimates – prior year peak loads for ACL baseline compared to preceding day loads during the same year for profile baseline – it is not a given that the results will correlate well.

Evaluators compared the results for each site and found that it was not just a coincidence. There is moderately strong correlation in results between the two methods, as shown in Figure 4-5. Evaluators found that there is approximately 1.05 kW of customer-activated demand reduction for every 1.00 kW of difference between the ACL-baseline-based kW. The square of the Pearson correlation coefficient is approximately 0.62 for this relationship.²⁹ The correlation appears particularly strong for projects with less than 500 kW of callable demand. This finding of correlation is significant for future evaluations.

²⁹ Based on a linear curve fit that forces the intercept through 0, 0, and that excludes one extreme outlier project.

Figure 4-5. Comparison of ACL & Profile-Based Demand Reduction



Evaluators believed using the profile method was important because this approach defensibly demonstrates direct savings and response to NYISO calls. Furthermore, this DR component of the Program had not previously been evaluated. However the profile-baseline-based demand reduction estimates demanded significantly more data and gratis cooperation from the RIPS that in many cases received relatively small incentives than did the ACL baseline data approach.

The correlation means that in the future a simpler approach that uses less data can reasonably be considered for use as a proxy to estimate savings for a component of the Program that contributes a relatively small percentage of demand savings to NYSERDA’s portfolio, contributes negligible energy savings, and pays relatively low incentives to RIPS with whom cooperation is needed.

Section 5:

NET-TO-GROSS EFFECTS

Attribution analysis assessed FR and SO rates, which are combined to produce a NTGR that is applied to evaluated gross savings to produce evaluated net savings. Separate analysis was completed for each of efficiency and DR projects.

5.1 SAMPLING

The NTG participating building owner and vendor surveys used the samples for the gross savings evaluations and the vendors associated with these projects.

5.2 METHODOLOGY FOR ESTIMATING FREE RIDERSHIP AND SPILLOVER RATES

The NTGR, the adjustment factor to derive the evaluated net savings of the Program, is comprised of two estimates:

1. **Free ridership** - The Program-supported measures (or the proportion of the savings) that participants would have adopted within the same time frame in absence of the Program.
2. **Spillover** - Additional efficiency actions that are taken outside the program, but are due to the influence of the program, create spillover savings. There are three types of spillover: two different types due to participant's actions taken outside the program and one due to actions taken by nonparticipants as a result of the program. The three spillover types are as follows:
 - Inside spillover (ISO) occurs when energy saving actions are taken at the participating site but are not done as part of the Program.
 - Outside spillover (OSO) occurs when energy saving actions are taken by participating owners or vendors at sites that are not part of program participation.
 - Nonparticipant spillover (NPSO) occurs when energy saving actions are taken due to the program's influence but are not part of the program, through formerly participating vendors as well as those that have never participated in the Program.

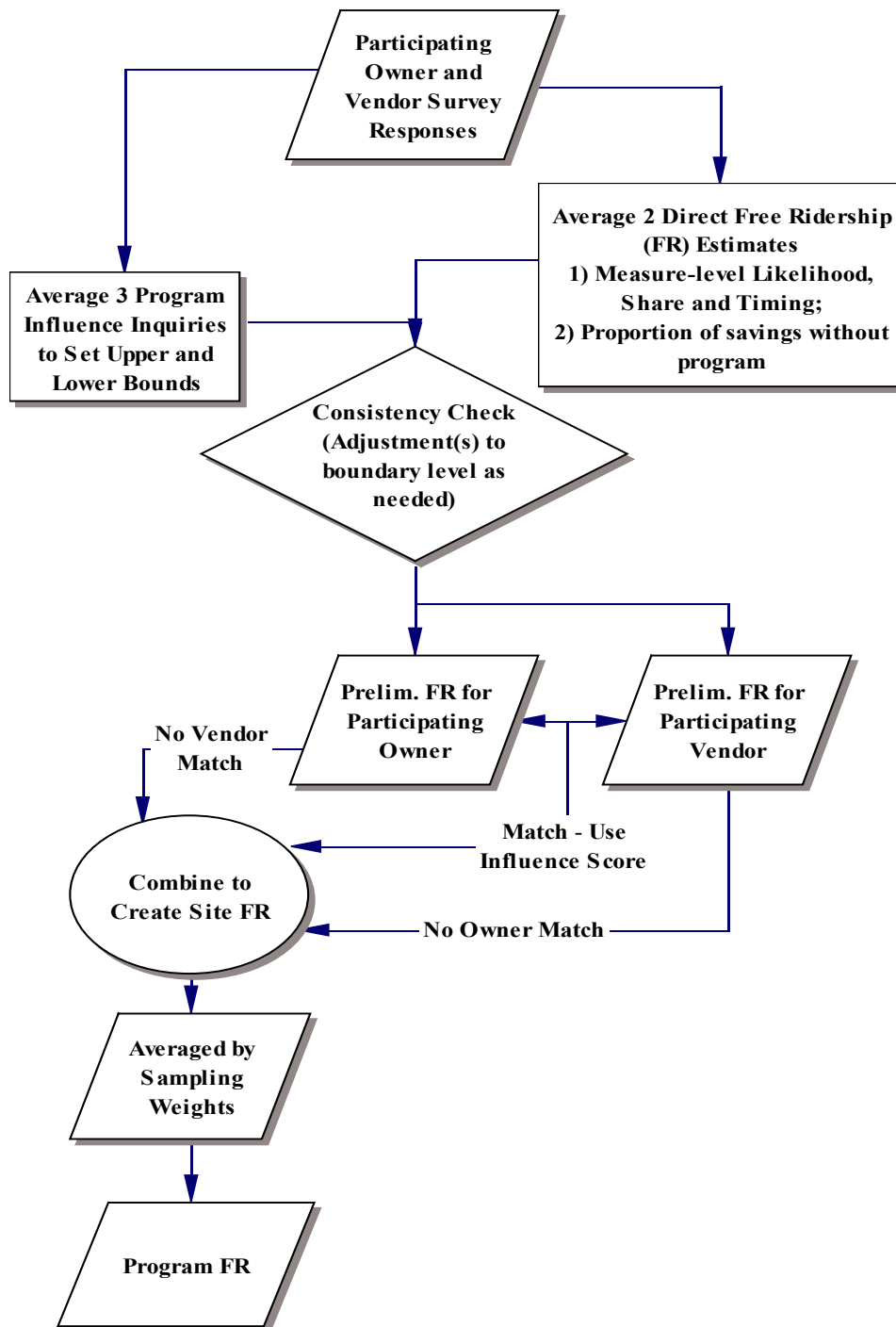
Participant FR and SO data were collected through telephone surveys with participating building owners and participating vendors.

A schematic providing the steps within the enhanced self-report algorithm and process flow to estimate FR in this evaluation is provided in Figure 5-1. Appendix E provides a step-by-step walk-through of the algorithm using two actual evaluation cases.

There are two initial FR estimates (direct estimates) developed for each participating building owner and by site for the participating vendor referred to as the direct FR measurements. The two direct FR estimates are within the first rectangle on the right of the schematic in Figure 5-1. One of the direct FR estimates is based upon asking the participants about the likelihood of each measure being installed and the proportion of that equipment (such as lighting) that would have been adopted without the Program. Then they are asked when they would have taken action without the Program and this information is applied to the direct FR measurement.

The second FR estimate asks the participant to estimate, across all measures, the proportion of the total savings that would have been achieved without the Program. These two estimates are averaged to develop a preliminary FR estimate for each participating site per respondent.

Figure 5-1. Schematic of the Enhanced Self-Report Components and How They Are Combined to Estimate Free Ridership for the Program



A consistency check is performed by comparing the preliminary FR estimates developed through the above process to an average of responses to three questions regarding the influence of the Program.³⁰ The three survey questions that comprise the consistency check inquire about plans for high efficiency prior to participation in the Program, influence of the Program, and the respondents' stated importance of the Program. This overall program-influence score is converted into an upper and lower bound range of plausible FR values. If the participant's direct FR estimate falls below the lower or above the upper bounds of FR based on the program influence questions, the final FR estimate for that site is adjusted upward or downward to the edge of those bounds according to the influence score.

One significant improvement in the FR method was made in this evaluation as compared to prior NYSERDA evaluations. Previously the building owner FR rates were averaged (savings weighted), and the vendor FR was averaged. Then these two figures were averaged to produce the program's FR rate. In reality the relationships between building owner and vendors vary significantly. At one extreme, there may not be a vendor, *i.e.*, the customer chooses what they want and just orders it; at the other end, the vendor may sell the customer on specific technology, potentially using the Program to help sell the idea of making the changes, and the customer relies totally on the vendor.

This evaluation asked a survey question regarding this relationship in the decision-making. Sites with building owner and vendor FR estimates were combined individually for each site by weighting the building owner and vendor FR factors based upon a proportional influence score derived from the survey inquiry. This approach should result in a higher level of rigor for the FR estimate as compared to the one in the prior evaluation.

SO is defined as energy efficiency savings that were induced by the Program but had not directly been part of the Program. The building owner survey included questions to estimate participant ISO and OSO, including whether additional actions were taken due to the Program and, if so, what energy savings were expected from those actions as compared to the savings the participant achieved through the Program. The participating vendors were asked about the Program's influence on their practice with other customers to estimate the participating vendors OSO.

Recall that ISO derives from energy usage changes made at the participating site due to the Program but not as part of the Program. DR is measured at the meter for participating sites. Changes at the meter are already in the evaluated DR estimate so no other changes on site could exist. This means that any ISO at the site already is accounted for in the evaluated gross savings and additional SO should not be accounted for in the evaluated net savings. Therefore the DR ISO is assigned to zero.

Double counting is a concern when estimating OSO from two separate sources (participating building owners and participating vendors). For example, it is possible that some of the OSO from building owners could also be projects reported as OSO by participating vendors. To the extent that this occurs, using both building owner and vendor estimates would overestimate SO. To ensure this does not occur, ISO is estimated from the building owner surveys, and OSO is based only on the vendor responses. The vendor OSO would be expected to be significantly larger than the building owner OSO. Some building owners may not have a vendor but vendors have multiple customers and many more buildings eligible for SO than building owners have additional buildings that were not part of the program. NYSERDA's C&I impact evaluations have found building owner OSO to be from 3% to 24% and averaging 9%. NYSERDA's C&I vendor OSO has varied from 3% to 40%, but most programs obtain a vendor OSO around 20%, and the average vendor OSO is 24%, which is two-and-a-half times that of the average building owner OSO.³¹

³⁰ Over 20 years of experience in estimating self-report FR for energy efficiency program evaluation has set standards for quality FR measurement. One of these is to include additional inquiries and perform consistency checks across the inquiries. The FR calculation also needs to measure what would have occurred in the absence of the Program, not what the participant "intended" to occur (as many good intentions do not actually become results). Estimating the hypothetical construct of FR based upon a decision that the participant might never have faced is quite difficult. This enhances the importance of the measurement method to be designed for construct validity. This is more important in obtaining a rigorous FR estimate than sampling precision.

³¹ Megdal & Associates, LLC, *Impact Evaluation: NYSERDA 2007-2009 FlexTech Program, March 2012.*, NYSERDA. *Commercial & Industrial Performance Program (CIPP): Market Characterization, Market Assessment and Causality Evaluation*, submitted by Summit Blue Consulting, Inc., May 2007, NYSERDA. *Commercial & Industrial Performance Program (CIPP): Market Characterization, Market Assessment and Causality Evaluation*, submitted by Summit Blue Consulting, Inc., April 2006, NYSERDA. *New Commercial Construction Program (NCP): Market Characterization, Market Assessment and Causality Evaluation*, submitted by Summit Blue Consulting, Inc., May 2006, NYSERDA. *New Commercial*

Estimates of OSO are calculated on responses by vendors in the telephone interviews. Past research has found that response to direct query regarding savings magnitude (*e.g.* kWh) is unreliable. Therefore this evaluation asked the vendor to estimate savings for the spillover project(s) in relative magnitude to the funded project on a percentage basis. In the event the vendor identified natural gas as the spillover energy savings the vendor was prompted to consider the relative savings in dollars. As additional quality control, confirmation was required if the vendor reported multiple OSO facilities and the number was extreme (over 40). OSO estimation also required that the vendor response to questions regarding attribution of the potential OSO activity to their experience with the program.

The OSO battery did not probe the vendor with contextual questions about the types of OSO measures installed, reasons for the knowledge transfer, or why the OSO projects did not receive program funding. These questions collectively would have buttressed the case that the described OSO was real and would be valuable additions to the next survey design, especially if it includes a spillover-only survey. In this evaluation the interview scope included FR, decisionmaking influence, ISO, OSO, NPSO, and firmographics. Interview duration was a serious concern. As it turned out, 37% of the respondents reported OSO, which meant that extending the interview duration to probe more deeply in a single interview would have been a factor for a significant percentage of the respondents.

The influence of NYSERDA's EF Program on the C&I sectors can easily overlap with the influence of NYSERDA's other major C&I non-new construction FlexTech Program. Recognizing this, NYSERDA conducted a C&I NPSO study applicable to C&I programs in 2005 and 2007, and an updated C&I NPSO study is currently underway. The C&I NPSO rate from this prior study is 15% and was used to complete this evaluation's NTGR.³²

5.3 SURVEY METHOD FOR NTG DATA COLLECTION AND SAMPLE DISPOSITION FOR THE SURVEYS

As previously mentioned, there were two surveys that provided data for the NTGR estimation described in the prior subsection. The first was a participant building owner survey (Appendix A) fielded by the lead engineers along with the inquiries needed for the gross savings analysis. The second was a participating vendor survey (Appendix B) conducted by APPRISE, NYSERDA's survey contractor.

As shown in Table 5-1, 47 of 92 building owners were successfully surveyed, and 56 of 79 vendors were successfully surveyed. This results in response rates of 54% and 81%, respectively. The surveyed vendors were interviewed regarding 84 participating sites. The vendor dataset supplied by NYSERDA's survey contractor was organized per vendor interview rather than by site and this is the way that their sample dispositions were calculated. The unit of analysis for determining FR and SO is conducted by site. Consequently, data set preparation for FR and SO analysis included deriving datasets by site, proper identification and matching for program savings estimates, and examination of which responses included data for the FR analysis and then the SO analysis. Final sample sizes for FR and SO estimation are included in the tables reporting the FR and SO results.

Construction Program (NCP): Market Characterization, Market Assessment and Causality Evaluation, submitted by Summit Blue Consulting, Inc. and Quantec, LLC, April 2005, Megdal & Associates, LLC. *Technical Assistance Program, Market Characterization, Market Assessment and Causality Evaluation*, submitted by Quantec Consulting, Inc. and Summit Blue Consulting, Inc., May 2007, NYSERDA. *Technical Assistance Program, Market Characterization, Market Assessment, and Causality Evaluation*, submitted by Quantec Consulting, Inc., Summit Blue Consulting, Inc., and Skumatz Economic Research Associates, Inc. February 2005, NYSERDA. *Smart Equipment Choices (SEC) Program, Market Characterization, Market Assessment, and Causality Evaluation*, submitted by Quantec Consulting, Inc., Summit Blue Consulting, Inc., and Skumatz Economic Research Associates, Inc. March 2005, NYSERDA. *Peak Load Reduction Program (PLRP), Market Characterization, Market Assessment and Causality Evaluation*, submitted by Summit Blue Consulting, Inc. April 2005.

³² NYSERDA *Commercial and Industrial Market Effects Evaluation, Final Report*, Submitted by Summit Blue Consulting LLC and Quantec, LLC., October 2007.; NYSERDA. *Business and Institutional Sector-Wide Nonparticipant Market Characterization, Market Assessment and Causality Evaluation Report*, prepared for NYSERDA by Summit Blue Consulting, 2005.

Table 5-1. Sample Disposition for the Net-To-Gross Survey of Participating Building Owners and Vendors

		Number of Participating Building Owners	Percent of Participating Building Owners	Number of Participating Vendors	Percent of Participating Vendor Interviews
Total Sample Size		92	100.0%	79	100%
Excluded sample	Not working/unusable number	0	0%	10	13%
Not contacte	Respondent never available	19	21%	5	6%
	Answer machine	18	20%	6	8%
	Call back/left 800#	0	0%	0	0%
	Never contacted	0	0%	0	0%
Unknown eligibility	No answer/busy	0	0%	0	0%
	Records not yet called/scr. not complete	0	0%		
Not eligible	Not eligible/not qualified	3	3%	0	0%
Refused/break-off	Refused	5	5%	2	3%
	Break-off	0	0%	0	0%
Completed interview ¹		47	51%	56	71%
Contact rate ²			58%		73%
Cooperation rate ³			90%		97%
Response rate ⁴			54%		81%

*See the Glossary for definitions of “contact rate,” “cooperation rate,” and “response rate” as defined by AAPOR.

¹ These counts are by interviewee and not by site. Some interviewees responded about multiple sites. The counts do not include effects of transforming these into site level data and matching program data, tasks that had to be completed before deriving FR and SO results. The vendor dispositions are a combination of the EE and DR survey totals.

² Contact rate = connection made and interview attempted / Total eligible sample attempted. For the building owner survey, the contact rate = (47+5)/(47+5+19+18) = 52/89 = 58%

³ Cooperation rate = completes / (completes + refusals and break-offs). For the building owner survey, the cooperation rate = 47 / (47+5) = 90%

⁴ Response rate = completes / eligible sample = completes / (completes+refusals+break-offs+not contacted+(eligibility rate from screen × unknown eligibility)). For the building owner survey, eligibility rate from screen = (47+5)/(47+5+3) = 95%. Not contacted and unknown eligibility = 19+18 = 37, therefore the response rate = 47 / (47 + 5 + (95%*37)) = 54%

The telephone surveys asked the FR inquiries for up to three sites per vendor.³³ The final analysis dataset included 43 vendor interviews that worked on energy efficiency projects.³⁴ These resulted in FR inquiries concerning 58 sites from vendor interviews. The survey of IM vendors was a census attempt. Eleven IM vendors were interviewed. The 11 IM vendors represented 79 sites of the 97 participating IM sites or 81% of the IM participating sites, reflecting considerable concentration of projects among relatively few vendors. Normally a sample size of 11 would call into question whether the results could be reliable or representative. The concentration of sites and the

³³ There were 2 efficiency vendors of the 45 vendor completes with more than 3 sites that completed the survey. The sites selected for FR inquiry were selected at random. These 2 vendors had 9 participating sites for the evaluated program years.

Of the 19 IM vendors in the sample frame, 5 had more than 3 sites. The top 2 had 45 and 12 sites, respectively. Those 2 completed surveys as well as 2 of the other 3 vendors with more than 3 sites.

³⁴ The final counts in each survey analysis depends upon whether all questions in that analysis had other than “Don’t know” or “Refused” and complete data for any elements used in weighting or processing the respondent data.

fact that many of the vendors with several sites did complete interviews makes this less of a concern. Coverage of 81% of participating sites is a strong rate of coverage.

5.4 RESULTS

5.4.1 Free Ridership Rates

Survey responses were used to estimate FR according to the algorithms and procedures described above in the FR and SO methods section. These methods are based on multiple inquiries and consistency checks in order to support construct validity for measuring this concept of what would have occurred without the Program, a circumstance that individuals do not actually experience.

Free Ridership Rate for Energy Efficiency Projects

Two of the primary inputs for an FR rate are the two direct FR measurements at the site level by market actors (building owners and vendors). These are the estimates in the first portion of the algorithm graphic (Figure 5-2), referred to as Direct FR-1 and Direct FR-2, using survey inquiries as described above. As previously mentioned, Direct FR-1 attempts to capture the likelihood and timing of measure installation as well as the proportion of equipment that would have been adopted without the Program, while Direct FR-2 attempts to capture the respondent’s estimate of the proportion of total energy savings that would have been achieved without the Program. The average across sites of energy efficient projects’ Direct FR-1 from building owners is 29% and from vendors is 20%, as shown in Table 5-2. The building owners’ average Direct FR-2 is 45% and the vendor Direct FR-2 is 31%.

Figure 5-2. First Steps in the Free Ridership Algorithm

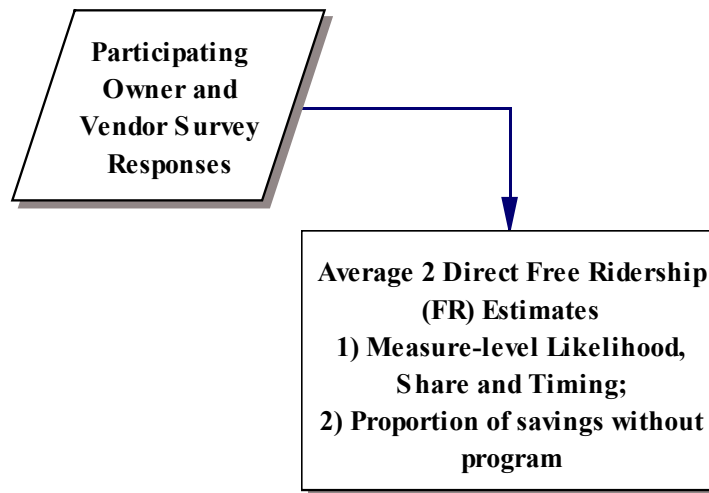


Table 5-2. Average Direct Free Ridership 1 and Direct Free Ridership 2 for Building Owners and Vendors of Energy Efficiency Projects

	Direct FR-1 (Likelihood & share & timing)	Direct FR-2 (Best estimate)
Building owners (n = 41)	29%	45%
Vendors (58 sites)	20%	31%

The distributions for these primary FR estimates have clusters at 0% and 100% FR and then a range of FR rates between these two extremes. Direct FR-1 has a median of 7% for building owners and 5% for vendors with 41% and 38% of 0% FR and 17% and 9% of 100% FR for building owners and vendors, respectively. This is shown in Table 5-3 along with the same statistics for Direct FR-2. Direct FR-2 has a median of 40% for building owners and

20% for vendors with 22% and 38% of 0% FR and 20% and 16% of 100% FR for building owners and vendors, respectively. This type of distribution, as opposed to normal distribution, can increase the effect of the consistency checks and importance in weighting the responses.

Table 5-3. Free Ridership Distribution for Energy Efficiency’s Direct Free Ridership 1 and Direct Free Ridership 2 for Building Owners and Vendors

	Direct FR-1 Median (Likelihood & share & timing)	Direct FR-1 0% FR (Likelihood & share & timing)	Direct FR-1 100% FR (Likelihood & share & timing)	Direct FR-2 Median (Best estimate)	Direct FR-2 0% FR (Best estimate)	Direct FR-2 100% FR (Best estimate)
Building owners (n = 41)	7%	41%	17%	40%	22%	20%
Vendors (58 sites)	5%	38%	9%	20%	38%	16%

Direct FR-1 and Direct FR-2 are averaged by site and by market actor. This estimate is then compared to the site average by market actor for the three program influence questions. This provides a preliminary site FR by market actors adjusted for consistency checks (the application of FR bounds based upon program influence scores). The last half of the FR algorithm, as shown in Figure 5-3, is combining the preliminary FR estimates of sites from which data and estimates came from both building owners and vendors, those with only building owner respondents, and those with only vendor input. The energy efficiency preliminary FR rates from these three groups are 22%, 42%, and 35%, respectively. The FR from combining these estimates is 31% derived from FR rates from participating energy efficiency sites, as shown in Table 5-4.

Figure 5-3. Last Half of the Free Ridership Algorithm (from Figure 5-1)

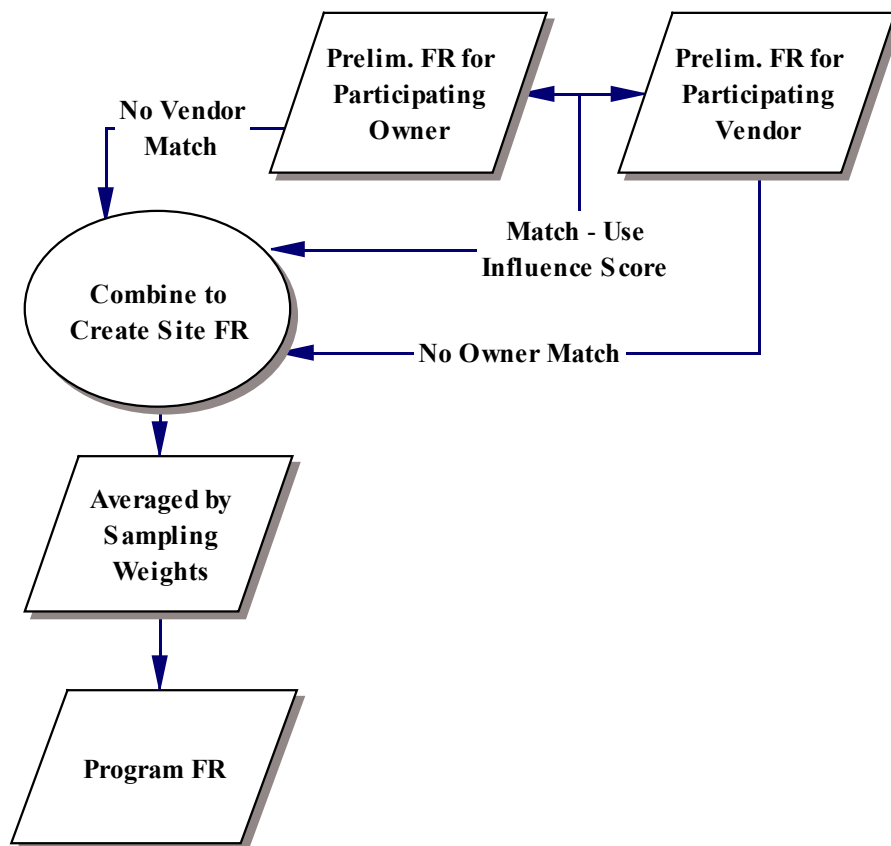


Table 5-4. Existing Facilities Program Energy Efficiency Free Ridership Rate

Actor Group(s)	FR Estimate	Number of Sites
Building owner only	42%	17
Both (match sites with information from building owner and vendor)	22%	24
Sites with only vendor interviews	35%	34
Overall program	31%	75

Free Ridership Rate for Demand Response Projects

The IM vendors provided FR responses for a total of 26 sites. The two direct FR estimates, as described above, for the IM sites were 29% for Direct FR-1 and 43% for Direct FR-2 (see Table 5-5).

Table 5-5. Average Direct Free Ridership 1 and Direct Free Ridership 2 from IM Vendors

	Direct FR-1 (Likelihood & share & timing)	Direct FR-2 (Best estimate)
Vendors (26 sites)	29%	43%

The distributions for these primary FR estimates again have clusters at 0% and 100% FR and then a range of FR rates between these two extremes. Direct FR-1 has a median of 20% with 38% of the sites having 0% FR and 15% having 100% FR. The cluster at the extremes is even greater for Direct FR-2 with a median of 30% and 31% at 0% FR and 27% at 100% FR. These are presented in Table 5-6.

Table 5-6. Free Ridership Distribution for Demand Responses' Direct Free Ridership 1 and Direct Free Ridership 2

	Direct FR-1 Median (Likelihood & share & timing)	Direct FR-1 0% FR (Likelihood & share & timing)	Direct FR-1 100% FR (Likelihood & share & timing)	Direct FR-2 Median (Best estimate)	Direct FR-2 0% FR (Best estimate)	Direct FR-2 100% FR (Best estimate)
Vendors (26 sites)	20%	38%	15%	30%	31%	27%

Direct FR-1 and Direct FR-2 are averaged by site to create the unadjusted preliminary site FR. The consistency check step is to compare this estimate to the average of the three program influence scores. The IM FR consistency adjustment was only 2 percentage points, 43% before the consistency adjustment and 41% after. There were 8 sites with downward adjustments for consistency, 3 with upward adjustments and 15 whose responses across the many inquiries were consistent. The final FR for DR was 41% as shown in Table 5-7.

Table 5-7. Existing Facilities Program Demand Response Free Ridership Rate

	FR Estimate	Number of Sites
Demand response (vendor interviews)	41%	26

5.4.2 Energy Efficiency Inside and Outside Spillover

ISO is the program-induced energy efficiency savings that were at the same site/building as the Program savings, but not part of the Program project. The ISO estimate from this evaluation is based on responses to the building owner survey. Of the 40 building owner respondents answering the ISO inquiry, 16 (40%) have ISO. Of those with ISO, 6 have ISO with less energy savings than their Program project, 6 have savings around the same as their Program project, and 4 have energy savings greater than their Program project. Table 5-8 presents this summary of the ISO inquiry.

Using the building owner estimates of energy savings from their SO project at that site compared to their Program project, the calculated participant ISO rate is 12%.

Table 5-8. Inside Spillover Responses from Participating Building Owners Concerning Their Energy Efficiency Program Sites

ISO Response	# Survey Respondents ¹	% of Survey Respondents with ISO	% of All Survey Respondents
No ISO	22		55%
Answered “don’t know” if ISO	2		5%
Yes, savings less than that in EFP project	6	37.5%	15%
Yes, savings about the same as that in EFP project	6	37.5%	15%
Yes, savings greater than that in EFP project	4	25.0%	10%
Building owners with ISO	16		40%¹

¹ Two respondents were found to mistakenly claim ISO when the projects were at other sites (would be OSO instead). These respondents are not included in this table.

Participant OSO is energy savings achieved through the adoption of energy efficient equipment and actions taken at nonparticipating sites but due to the influence of the Program. The building owners can have OSO for actions taken outside the Program at their firm’s other sites. Participating vendors create OSO to the extent that the Program influences their actions at nonparticipating sites. As described in the methods section, to avoid double counting, the estimate of participating OSO is derived only from the participating vendor responses.

The SO section of the vendor questionnaire started with a screening question, asking the vendor whether their experience with the Program influenced their firm’s incorporation of efficiency or demand measures at other facilities. Based on the response to this screening question, 21 of 56 vendors reported that their firm had OSO for a non-weighted percentage of 37.5% with SO; the response to this question is statistically significant at the 1% confidence level. There is 95% confidence that the proportion of energy efficiency vendors with SO is at least 27%. An assumption of energy efficiency OSO of zero for the Program is very unlikely and is not a defensible outcome of this evaluation.

The EE spillover estimate is then derived from the remaining questions in the spillover series. Of the 21 vendors claiming spillover, 15 vendors answered the series questions such that spillover estimates could be derived for them. Of these 15 respondents, 7 had OSO savings per project that were less than in the Program project, 5 had savings about the same, and 3 had savings in their OSO projects that were greater than their Program project. There is one vendor with OSO that is treated as an outlier for the estimation of Program’s SO rate. This vendor had 50 buildings with OSO while the average number of buildings with OSO among the other vendors with SO was 4. Certain of the individual responses were of concern³⁵ and adding depth of inquiry would have enhanced the response reliability regarding magnitude of OSO savings per respondent. While acknowledging these limitations, the Impact team believes that the relatively high proportion of positive OSO responses combined with analysts’ tempered treatment of the vendor OSO outlier savings estimates produce sufficiently reliable results for use in this evaluation. The resulting participant OSO was 32%. Table 5-9 provides the next set of OSO responses from participating vendors.

³⁵ There were two participating vendor interviews that stated their firm generated outside spillover that was not included in the OSO estimates. One could not estimate how many buildings were affected and the other estimated 30 buildings but could not estimate the magnitude of savings compared to the average savings per participating building. Full information was not available to create savings estimates for these vendors and the uncertainty added if assumptions were made led to not including any savings estimate from these vendors. The impact evaluation recognizes, however, that this creates a downward bias of unknown magnitude in the energy efficiency OSO estimate for EFP.

Table 5-9. Outside Spillover Responses from Participating Energy Efficiency Vendors

Outside Electricity Energy Efficiency SO Response ¹	# Survey Respondents	% of Survey Respondents with OSO	% of All Survey Respondents	Average Number of Buildings per Vendor with Electric Energy Efficiency OSO
Yes, savings per project less than that in EFP project	7	47%	18%	6
Yes, savings per project about the same as that in EFP project	5	33%	12%	2a
Yes, savings per project greater than that in EFP project	3	20%	8%	5

¹ Spillover savings is estimated using the project savings as a benchmark. The EFP Program did not include natural gas savings in its program tracking data prior to 2010 and was not available for this evaluation. A method was developed to attempt to measure natural gas savings but it was not successful; it did not produce reliable results.

^a One vendor reported 50 OSO buildings. This vendor's result was used in the aggregate analysis as an outlier, without statistical weighting of the results.

The last SO component is NPSO, which has been estimated for all NYSERDA C&I programs in past evaluations. The most recent such evaluation produced an estimate of 15%.³⁶

5.4.3 Demand Response Outside Spillover

Vendor OSO is for the firm, not the measure or project; therefore the telephone survey only asked the SO questions once per vendor and did not repeat the SO battery. There are 11 responses for the DR OSO estimate. These 11 vendors represent 81% of the participating IM sites and were the result of a census attempt. Over one-third of the IM vendors report having OSO. This provides possible OSO information from four vendors and half of the responses are “don’t know.” Based upon the data available, the DR OSO rate is 4%.

5.4.4 Nonparticipant Spillover

The last SO component is NPSO. The influence of NYSERDA’s EFP on the C/I sectors can easily overlap with the influence of NYSERDA’s other major C/I non-new construction program, the FlexTech Program. Recognizing this, NYSERDA conducted a C/I NPSO study applicable to C/I programs in 2005 and 2007. The most recent such evaluation in 2007 produced an estimate of 15%.³⁷

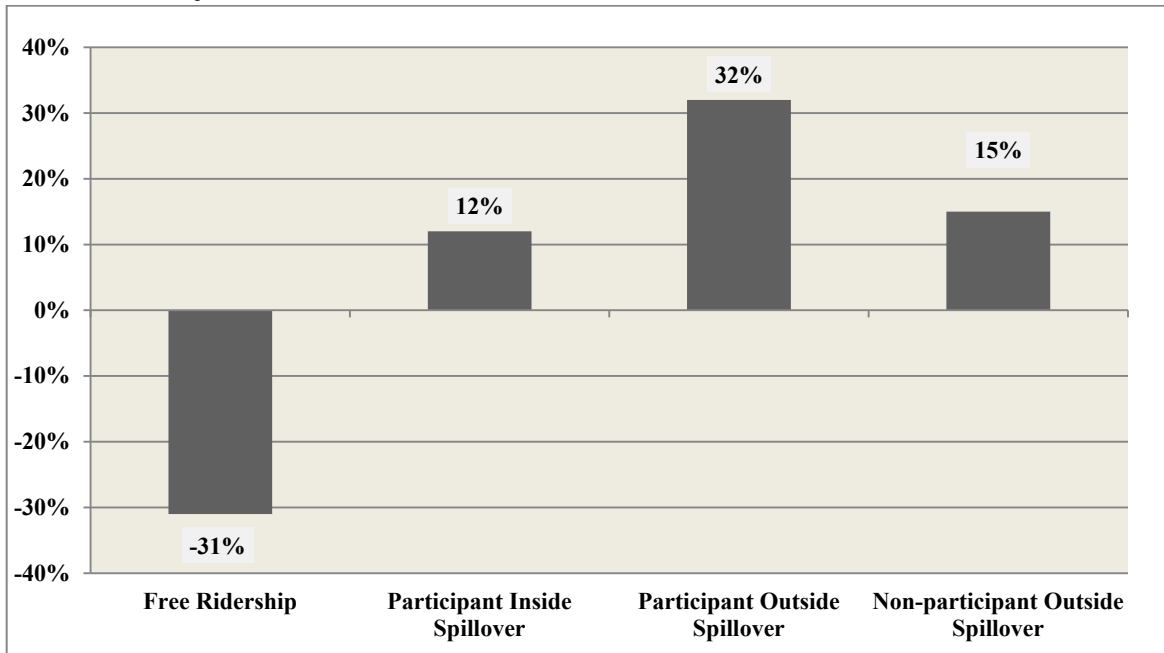
5.5 NET-TO-GROSS RATIO

The FR and SO rates for energy efficiency are combined to produce an energy efficiency NTGR. Figure 5-4 graphically depicts the four components of the NTGR for energy efficiency projects. FR has a rate of -31%, while participant ISO, participant OSO, and nonparticipant OSO have rates of 12%, 32%, and 15%, respectively.

³⁶ NYSERDA *Commercial and Industrial Market Effects Evaluation, Final Report*, submitted by Summit Blue Consulting LLC and Quantec, LLC., October 2007.

³⁷ NYSERDA *Commercial and Industrial Market Effects Evaluation, Final Report*, submitted by Summit Blue Consulting LLC and Quantec, LLC., October 2007.

Figure 5-4. Bar Graph Depicting the Rates within Program’s Net-To-Gross Ratio for Energy Efficiency Projects



The energy efficiency NTGR is calculated as one minus the FR rate plus the SO rates (participant ISO, participant OSO and NPSO). The NTGR for the Program is 1.28.

$$\text{Energy efficiency NTGR} = 1 - FR + ISO + OSO + NPSO$$

$$\text{Energy efficiency NTGR} = 1 - 0.31 + 0.12 + 0.32 + 0.15 = 1.28$$

The FR rate for IM sites is 41%.

Since DR is measured at the site’s meter, additional ISO at the participating site is not appropriate to include as any ISO effect already is accounted for in the RR analysis. The ISO was assumed to be zero. OSO was measured to be 4%.

There is only one NPSO estimate available for all existing C/I programs, for energy or demand and all fuel types. NPSO could be expected to occur and assuming zero would likely create a downward bias in the DR NTGR. So the overall C/I NPSO was used in the DR NTGR.

The DR NTGR is calculated as one minus the FR rate plus OSO plus the most closely related relevant NPSO rate (the most recent C&I NPSO). The NTGR for EFP’s DR effort is 0.78.

$$\text{Demand response NTGR} = 1 - FR + ISO + OSO + NPSO$$

$$\text{Demand response NTGR} = 1 - 0.41 + 0.00 + 0.04 + 0.15 = 0.78$$

5.6 EVALUATED NET SAVINGS

Evaluated net savings measures the program savings after adjusting program reported savings for the RR and the NTGR. The formula is:

$$\text{Evaluated net savings} = \text{Program reported savings} \times \text{Evaluated gross RR} \times \text{NTGR}$$

Tables 5-10 and 5-11 show the Program’s overall gross and evaluated net savings for EE and DR projects completed between January 1, 2006 and September 30, 2009.

Table 5-10. Net Savings Summary – Energy Efficiency Projects

Net Savings Parameter and Project Type	Program Reported Savings	RR	Evaluated Gross Savings	NTGR	Evaluated Net Savings
Electric energy for efficiency projects	577,787 MWh/yr	1.03	595,121 MWh/yr	1.28	761,755 MWh/yr
Summer coincident peak demand efficiency projects	116 MW	0.81	94 MW	1.28	120 MW

Table 5-11. Net Savings Summary – Demand Response Projects

Net Savings Parameter and Project Type	Program Reported Savings	RR	Evaluated Gross Savings	NTGR	Evaluated Net Savings
DR (APMD-baseline basis) projects	165 MW	0.90	149 MW	0.78	116 MW
DR (profile-baseline basis) projects	165 MW	0.66	109 MW	0.78	85 MW

As described previously, the two demand response rows have different purposes. They are not summative. The row with the APMD-baseline basis best reflects the demand savings using the same metric in place at the time the Program funded the projects and most fairly represents the program performance against goals. The row with the profile-baseline basis best reflects the Impact Team’s judgment of actual demand reduction at customers’ meters and reductions to the power grid during NYISO events. Goals and actual load reduction should more closely align with one another in the future as the program enrolls customers using the ACL instead of the APMD-baseline basis.

LONG-TERM RETENTION OF DEMAND RESPONSE MEASURES

Duration of savings is an important consideration when assessing the long-term impact of energy efficiency (EE) and demand response (DR) measures. A measure that saves 1 kW for 1 year is less valuable than one that saves 1 kW for 10 years. Benefit-cost calculations such as the Total Resource Cost (TRC) ratio that NYSERDA uses take savings duration into account. Parameters that affect savings duration such as measure technical life, retention, and persistence have long been researched and are readily available from secondary data for many energy efficiency measures.³⁸ Less information is available on duration of savings for DR measures. NYSERDA recognized the high degree of uncertainty in the assumed measure life used for DR measures and commissioned the Impact Team to investigate the long-term retention of DR measures in NYSERDA's programs as part of this evaluation. While this research scope was not sufficiently rigorous to be considered a formal measure life study - neither engineering analysis of performance degradation nor assessment of technology meantime to failure, for example, were included - the telephone survey response data gave a reasonable indication of DR measure persistence.

To determine whether the DR measures were still in place and operational, the Impact Team conducted telephone interviews with a sample of PLRP participants that completed load curtailment (LC), distributed generation (DG), and interval meter (IM)-only projects and received NYSERDA funding for them between 2001 and 2005. The following section describes the sample design.

6.1 SAMPLING

The retention study was a telephone survey (Appendix C) designed to determine the percentage of kW reduction capacity associated with load management measures installed before or during 2006 that are still in place and available. A sample of the Program projects with load management measures installed before or during 2006 was selected from the completed projects recorded in NYSERDA's program database. The sample did not include any 2006 projects, which constituted less than 1.5% of population.

The program has three distinct measure groups for promoting load management – IM, DG, and LC – in which other enabling technologies are provided along with the IMs. Interval meters are the primary source of savings, with 63% of the estimated summer peak kW curtailment associated with this measure group.

The sample design was based on stratified ratio estimation (SRE). The primary sampling unit for the verification survey was the project. The sample was stratified first by measure - IM, DG, or LC - and then by region (upstate and downstate). Distributed Generation measures were installed solely in the downstate region since they are only eligible in Con Edison territory. Since the LC measures installed in the downstate region were only 10% of the LC summer peak kW reduction and 3% of the total kW reduction for the entire period, this measure group was not stratified by region.

Table 6-1 shows the distribution of projects and savings into the size strata. The sample sizes were allocated proportionally to the measure groups based on the magnitude of the claimed kW reduction. Break points between size strata were defined using the SRE method as described in *The California Evaluation Framework*.³⁹ The sample was allocated evenly to the size strata. Strata with fewer projects than the allocated sample size were designated as census, i.e., all of the projects in the stratum are included in the sample. Projects with the lowest savings representing less than 3% of the total measure group savings in aggregate were removed from the sample frame.

³⁸ Additional detail on the NYSERDA Impact Team's interpretation and use of effective useful life (EUL) and its basis can be found in *Measure Retention and Life Policy*, memorandum from Jon Maxwell to Judeen Byrne, October 28, 2011.

³⁹ TecMarket Works, et. al, *The California Evaluation Framework*, project number K2033910. Prepared for the California Public Utilities Commission and the Project Advisory Group, June 2004, 327–339 and 361–384.

Table 6-1. Sites and Summer Demand Reduction by Measure Group and Size Stratum

Measure Group	Region	Stratum	Sampling Method	# of Projects	Summer MW Peak Reduction	% of Total MW Peak Reduction	Sample Size
IM	Upstate	0	None	221	4.2	1%	0
IM	Upstate	1	Random	412	54.7	12%	11
IM	Upstate	2	Random	90	82.4	19%	11
IM	Downstate	0	None	156	2.9	1%	0
IM	Downstate	1	Random	146	38.3	9%	8
IM	Downstate	2	Random	36	55.3	12%	8
DG	Downstate	0	None	24	2.5	1%	0
DG	Downstate	1	Random	52	32.4	7%	6
DG	Downstate	2	Random	16	40.3	9%	6
LC	All	0	None	157	3.9	1%	0
LC	All	1	Random	133	44.6	10%	11
LC	All	2	Census	10	83.4	19%	10
Total				1,453	444.9	100%	71

All of the projects included in this survey were five or more years old. Almost 80% of the kW reduction was associated with projects completed in program years 2001 through 2003.

The sample size of 71 sites (approximately 28 downstate and 43 upstate) was set to meet the 90/10 confidence/precision at the program level, using an error ratio of 0.5. Sample sizes were not designed to be sufficient to estimate the percentage of kW reduction capacity still in place by region or by measure group at the 90/10 confidence/precision level.

As shown in the disposition Table 6-2 below, 47 of 71 DR participants were successfully surveyed. This results in response rates of 66%.

Table 6-2. Sample Disposition for Persistence Surveys

		Number of Participants	Percent of Participants
Total Sample Used		71	100.0%
Excluded sample	Not working/unusable number	0	0.0%
Not contacted	Respondent never available	5	7.0%
	Answer machine	15	21.1%
	Call back/left 800#	4	5.6%
Unknown eligibility	No answer/busy	0	0.0%
	Records not yet called/scr. not complete	0	0.0%
Not eligible	Not eligible/not qualified	0	0.0%
Refused	Refused	0	0.0%
Break-off	Break-off	0	0.0%
Completed interviews		47	66.2%
Contact rate			66%
Cooperation rate			100%
Response rate			66%

6.2 APPROACH

The technologies were diverse, complex, and sometimes unique. They ranged from energy management system software upgrades to installation of new power generation equipment. In some cases the participant only received an incentive for installing an IM.

The Program’s market structure is also complex. NYSERDA’s DR programs actively and directly engage RIPs, sometimes paying incentives directly to them without any contact with building owners. The use of RIPs to find and enroll participants in NYISO’s Installed Capacity-Special Case Resources (ICAP-SCR) program⁴⁰ results in a tenuous connection between NYSERDA and the equipment owners.

Given the complexity of the technologies and markets, the Impact Team designed the data collection process using engineers to conduct the interviews.

NYSERDA sent email advance letters to sampled customers, and the team completed interviews over the course of two weeks. Since the survey addressed projects completed at least six years prior to the interview and RIPs, not building owners, were NYSERDA’s primary contacts, considerable effort was necessary to reach the appropriate individuals. As expected, the survey required more frequent use of back-up replacement participants than many C&I surveys. Interviewers engaged NYSERDA to aid in recruitment.

The interviewer asked quantitative questions regarding levels of participation and dates of change in participation as well as qualitative questions about customer satisfaction and why changes were made. Questions covered the following topics:

- Current NYISO or Con Edison DR program⁴¹ enrollment and participation status
- Original NYISO or Con Edison DR program enrolled in, if different
- Current RIP, if different from that at the time of original enrollment
- Current participation level compared to original enrollment (% kW)
- Equipment performance compared to post-commissioning
- Use of originally funded or different DR equipment to participate; if different, whether or not the newer equipment was funded in part by NYSERDA
- The year the program participation level changed and why, if applicable
- Reason for terminating participation, if applicable
- The possibility of re-enrollment for those that stopped entirely

Constructing persistence curves for measure savings was beyond the scope of the evaluation. Instead, evaluators interviewed participants from prior years and estimated the retention rate for each year.

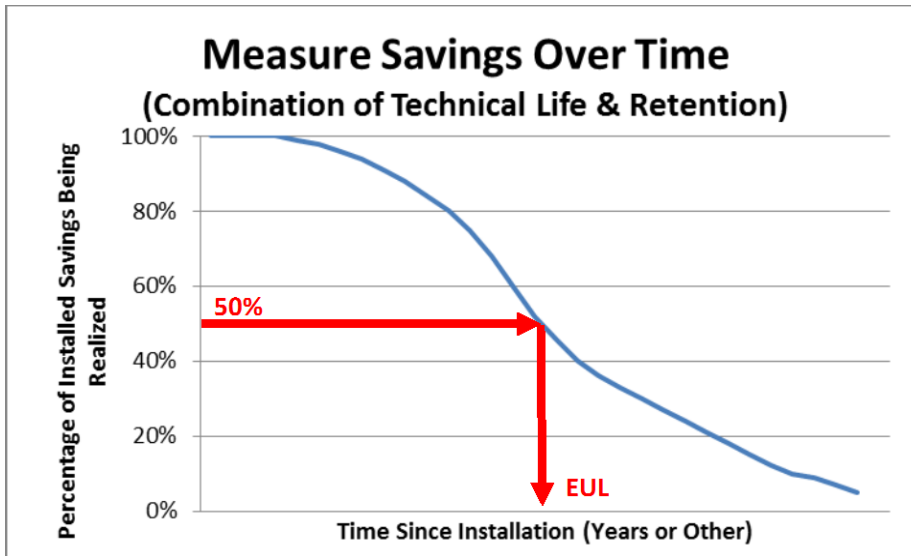
Figure 6-1 illustrates a generalized savings duration curve. As the curve shows, savings typically persist at a high level initially then decline relatively rapidly before the drop in persistence slows again. The decline is due to a combination of technical and retention factors. Evaluators consider the point at which savings decreases from more than 50% to less than 50% of that originally being realized as a rough estimate of the measure persistence.⁴²

⁴⁰ The NYISO has four Demand Response programs, one of which is the ICAP-SCR program. The SCR program can be deployed in energy shortage situations to maintain the reliability of the bulk power grid. Companies are paid by the NYISO for reducing energy consumption when asked to do so by the NYISO. SCR participants are required to reduce power usage and as part of their agreement are paid in advance for agreeing to cut power usage upon request.

⁴¹ Con Edison’s DR program is similar to the NYISO programs.

⁴² One respondent indicated that they never actually participated. This customer’s responses were excluded from the persistence analysis because the reduced impact would be expected to be incorporated in realization rate analysis. Accounting for it in persistence analysis would inappropriately penalize the program twice.

Figure 6-1. Generalized Savings Persistence Curve



Participants from 2001 through 2005 were sampled to allow for sufficient time to elapse to assess retention rates. Evaluators calculated the sample-weighted average savings retention⁴³ for the sample and the sample-weighted average time elapsed between project funding and the interview date. These two calculations resulted in a point estimate (x =average years since funding, y =% DR kW still enrolled) known to be on the savings duration curve. Knowing this point and the characteristic shape of the savings curve, evaluators estimated the elapsed time in years at which the savings declined to 50%.

6.3 RESULTS

Interviewers collected data for a sample of 51 participants. After data cleaning, 47 were sufficiently complete for use in the analysis. The substantial majority of the 47 respondents (86%) completed installations between 2001 and 2003 and all so installations were completed by 2005. The sample enrollment dates reflect that of the program population overall. Over 86% of participants in the population frame completed installations in 2001 to 2003 and almost 99% did so before 2006. Participants were a mixture of the LC (10), DG (14), and IM (23) components of the Program.

Twenty of the respondents continue to participate at approximately the same level as originally enrolled. Twenty-seven of them no longer participate with their originally enrolled system at all (either with the original or replacement equipment). While the questionnaire included multiple questions and response options to accommodate partial measure retention or elevated participation in the question battery, only one respondent reported partial retention.

Table 6-3 shows the weighted results by stratum. Overall the percentage of savings still being delivered to the NYISO and Con Edison programs is 44% of the enrolled DR kW. This estimate has 28% relative precision at 90% confidence. The weighted average period of time elapsed between project completion and the interview date was 8.9 years.

⁴³ The persistence calculation considers two primary factors: whether the site is still participating in the DR program and whether the same equipment is still in place and used. Other factors considered in the calculation include whether the kW performance of the equipment changed and, if so, if it was better or worse. In cases where some of the information was missing, the analyst looked at other responses to determine the persistence value. The basic calculation starts as:

$$A = \% \text{ portion of equipment still installed} \left(1 + \% \text{ better or worse performance} \left(1 + \frac{\text{Change in kW capacity}}{\text{Reported capacity}} \right) \right)$$

Table 6-3. Demand Response Long-Term Persistence by Stratum

Measure Group	Region	Project Size	Enrolled DR (MW)	Population Count	Target Sample	Final Sample	% Installed DR Still Active
IM	Upstate	S	4	221	0	0	0%
IM	Upstate	M	55	412	11	5	18%
IM	Upstate	L	82	90	11	9	64%
IM	Downstate	S	3	156	0	0	0%
IM	Downstate	M	38	146	8	5	6%
IM	Downstate	L	55	36	8	4	62%
DG	Downstate	S	2	24	0	0	0%
DG	Downstate	M	32	52	6	5	0%
DG	Downstate	L	40	16	6	9	48%
LC	All	S	4	157	0	0	0%
LC	All	M	45	133	11	4	91%
LC	All	L	83	10	10	6	39%
Total			443	1,453	71	47	44%

While the IM and DG program results indicate dramatically higher persistence for larger projects, the LC results indicate the reverse trend.

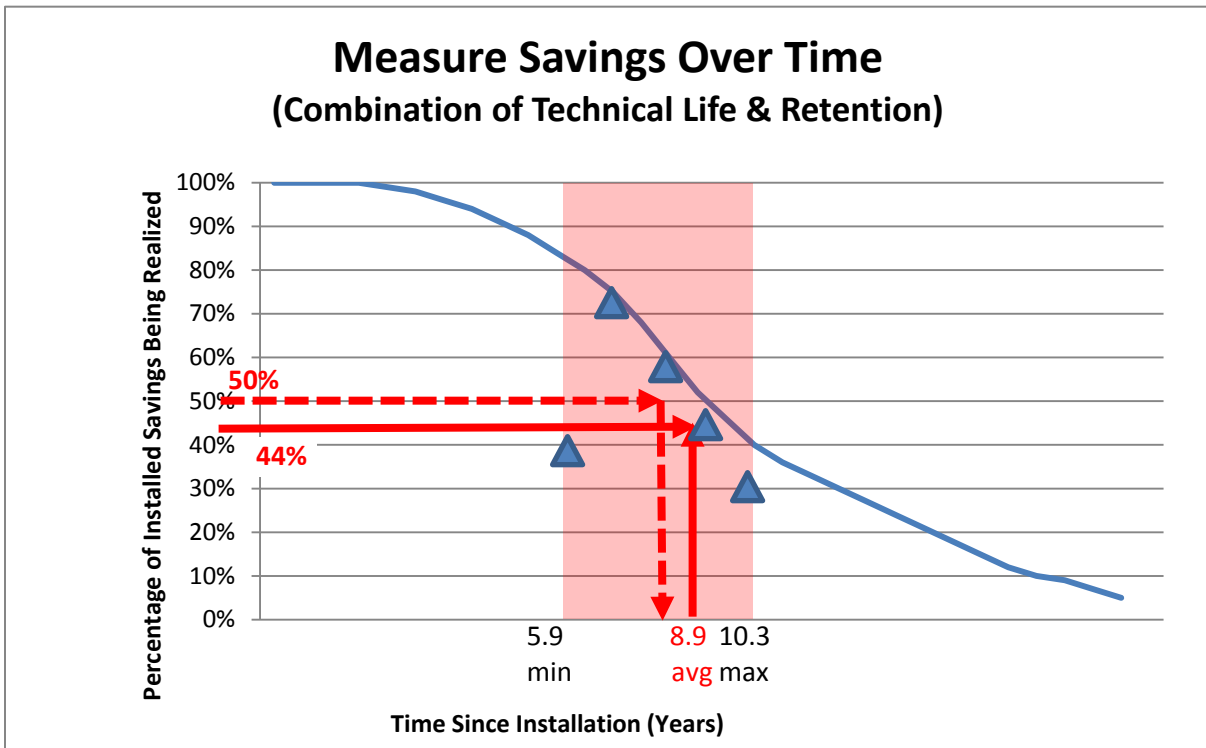
The persistence by measure group was 53% for IM, 36% for DG, and 41% for LC. As is consistent with the work plan, these values are provided for informational purposes only as the sample sizes within individual categories are small.

Table 6-4 shows the weighted average retained savings by project year, and Figure 6-2 plots these results with the generalized curve repeated from the methodology. The shaded range of time since installation illustrates the range of times for the survey overall. The solid red lines with arrow heads indicate the survey’s key weighted average finding of 44% persistence at 8.9 years. The dashed lines with arrowheads indicate the persistence, i.e., the number of years at which 50% of the originally installed savings remains.

Table 6-4. Demand Response Long-Term Persistence by Year

Project Year	Number of Surveys Conducted	Nominal Elapsed Time Between Project Enrollment and Interview (Years)	Measure Persistence (% of Originally Installed and Functioning DR)
2001	15	10	30%
2002	14	9	44%
2003	10	8	58%
2004	8	7	71%
2005	4	6	40%
All / average	51	8.9	44%

Figure 6-2. Demand Response Long-Term Persistence by Year



Measure persistence is not calculated directly. Based on the results above, one can make a rough estimate that the persistence for DR measures is between 7.5 and 8.5 years. While this analysis does not estimate the DR measure persistence with a high degree of rigor, 8 years seems to be a reasonable rough estimate.

Those that continued to participate have had substantial equipment attrition. Forty-one percent of the respondents now use different equipment than they used when they originally enrolled in 2001–2005.

Those that no longer participate in the DR programs gave no single predominant reason for termination. Responses given for the attrition included:

- Not economical to shut down equipment or too difficult to shift load (11)
- Disruptive to day-to-day operations (1)
- Not seeing actual demand reduction (1)
- Change in management (3)
- Equipment never installed (2)
- Out of business (1)

When asked if there was anything that might get the organization to re-enroll, responses indicated that there may be some possibility of doing so. Of the eight former participants that responded to the query, five of them sounded at least open to the possibility of re-engagement. Their responses were as follows:

- Need better controls that make it transparent to customers (2)
- Need better education on the program (1)
- Yes, new tenant would like to participate (1)
- Facility ownership should be contacted (1)
- Don't know (1)

Others were not interested because of store closure (1) or other unspecified reasons (2).

CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

Engineers performed verification-, basic-, and enhanced-level on-site M&V to determine the realization rates for 92 sampled sites. During on-site visits, surveyors completed 47 interviews to determine participant FR and SO. Separately, telephone interviews were conducted with 56 vendors covering 137 sites to estimate free ridership and spillover. Outside spillover is measured at the vendor level and calculated for energy efficiency and demand response independently. The NTGR for energy efficiency and the NTGR for demand response are then used to derive net savings. Based on these surveys and site M&V, the Impact Team offers the following conclusions:

- The Program electric energy savings RR is 1.03 and the electric demand savings RR is 0.81 for efficiency measures.
- Efficiency projects that received program mandated M&V showed deviations in savings greater than +/- 10% in 25 out of 46 projects. Projects receiving program M&V were moderately more accurate in estimating actual savings than those not receiving program M&V.
- Equipment quantities, type, make, and model were consistent between program documents and evaluation inspection, reflecting a high level of rigor on the part of program staff and technical assistance providers during post-installation review.
- The energy efficiency rates for the NTG components were calculated to be 0.31 for free ridership, 0.12 for participant ISO, and 0.32 for participant OSO, and the NPSO from the most recent study was 0.15, resulting in a total NTGR of 1.28 for the energy efficiency projects.
- The RR for DR measures is 0.90 if one compares NYSEERDA's APMD-based tracking system estimate of DR against the APMD-based evaluated performance. Customers' actual change in behavior on DR event/test days results in demand reduction of about 66% of NYSEERDA's tracked DR kW.
- The DR free ridership rate is 41%. There is no expected participant ISO since DR is measured at the meter level. The DR OSO is 4%. The most recent C&I NPSO rate was assumed. This resulted in a demand response NTGR of 0.78.
- Participation in DR programs persists at 50% or greater than the originally performing level for 7.5 to 8.5 years after enrollment. Eight years is a reasonable point estimate.

7.2 RECOMMENDATIONS

The principal goal of the assessment was to analyze the energy savings associated with the Program projects completed between January 1, 2006 and September 30, 2009. During this effort, the Impact Team also observed opportunities to improve operations and savings estimation in the future to hopefully narrow the variation in RRs. Recommendations are as follows:

7.2.1 Program Recommendations

- **Disallow like-replacement incentives** – Multiple projects funded VFD installations that replaced pre-existing drives. Current program rules do not allow such funding but either earlier rules, oversight, or charitable interpretation of existing conditions (“the drive had been broken for a while”) allowed the incentives. Disallowing like-replacement incentives for VFDs and other equipment will prevent the use of either an incorrect baseline or a regressive baseline likely associated with high FR.
- **Apply a common algorithm for tracking demand savings** – The high variance in the peak demand savings realized by the Program stems from inconsistencies in algorithms and requirements regarding peak demand calculations. Evaluators recommend that program staff consider requiring that peak demand be calculated in a consistent fashion across projects. Tracking demand savings using algorithms similar to those applied in the evaluation would ensure more consistent peak demand RRs in future evaluations.

- **Incorporate heating, ventilation, and air conditioning (HVAC) into lighting analysis** – The evaluation results showed that the heating and cooling effects of reduced lighting load and run-time hours can be significant, especially in facilities such as data centers with high cooling loads. Such interactive effects were not consistently incorporated into program savings analysis. Evaluators recommend that the Program consider including these impacts in future project savings estimates. The choice to do so for tracking purposes does not necessarily mean that the same choice must be made for the purposes of demand-based incentive calculations.
- **Set up a data request mechanism from RIPs for future DR evaluations** – Acquiring the DR measure data was challenging and required a lot of calendar time and an unexpected level of “volunteer” work by RIPs. It likely would save effort for all if NYSERDA could persuade the RIPs to deliver to NYSERDA the same baseline and performance data they deliver to the NYISO at the time they send it to the NYISO. Alternately, evaluators and program staff could work with RIPs to establish a different data set and template for routine delivery.
- **Systematically collect supporting spreadsheets, models, and metered data from technical assistance providers** – The evaluation benefited greatly from the receipt of technical assistance provider spreadsheets and metered data on a number of projects. Much of this data was collected by program staff on behalf of the Impact Team as needs were noted for specific projects. During this process both program and evaluation staff agreed that having program staff routinely gather and retain this data in its native format would facilitate program staff review of projects as well as future evaluations.
- **Create and track premise IDs** – During the evaluator’s population frame development process, time was required to manually screen the population for recent marketing department, FlexTech impact evaluation, process evaluation, and market characterization research contacts with Program representatives, to check for multiple staged projects at a single site and to identify multi-site projects. Site names, addresses, and contact names were used in lieu of a common premise identifier. While this was a manageable exercise for the Phase 1 population size of 70 projects, the exercise will be more daunting as the program expands in the future. To help evaluators and likely aid program administrators as well, evaluators recommend that NYSERDA establish unique premise IDs that are constant across programs and that remain constant for a facility in the event of name changes or other turnover. The use of premise IDs is not uncommon in the utility environment, whereby a portion of each customer’s account number can be the unique premise ID number, and the suffix of the number is the only thing that changes with alterations in account ownership. It is conceivable that NYSERDA could use the utility companies’ premise IDs.

7.2.2 Evaluation Recommendations

- **Aggressively involve the program staff in site recruitment** – Recruitment for participation in evaluation activities was more difficult than for EFP than for other NYSERDA C&I impact evaluations (FlexTech, Industrial and Process Efficiency, New Construction). Including 10% to 20% backups from the non-census strata in the initial recruitment will help eliminate the late scramble to recruit the backup sites and increase the evaluation participation rate.
- **Use a 0.50 error ratio in the next sample design** – The sample design for this evaluation assumed an error ratio of 0.50 on the electric energy savings realization rate. The final calculated error ratios were 0.58 downstate, 0.46 upstate, and 0.49 overall. The error ratio on the permanent demand savings rates was 0.58 for the same projects. Presuming energy savings remains the primary focus and basis of sample designs, 0.50 remains a valid assumption to use for electric projects.
- **Involve the program staff in site-specific plan reviews** – There were evaluation M&V approach issues identified during the site-specific report review phase that could have been addressed earlier in the evaluation if the program staff had been involved in the review of the site-specific evaluation plans. Involving the staff in the plans will help resolve conceptual differences that need to be considered early in the analysis process. It also may prompt delivery of additional site data or contact information from program staff.
- **Use the ACL method to estimate the kW reduction for the DR component** – The APMD-baseline method overstates DR, and the profile-baseline method is expensive and requires a great deal of vendor

cooperation to execute. The ACL-baseline approach, while not a direct measurement of response, is almost as easy to execute as the APMD-baseline method and correlates reasonably well with actual DR indicated by the profile-baseline method and thus is a good compromise.

- **Investigate and develop a more reliable method for the estimation of participant ISO and OSO for energy efficiency and OSO for demand response** - The SO rates derived in this evaluation use the same method and survey questions as those in past evaluations. The final ISO and OSO estimates end up being based upon a small number of respondents (after dropping those that report no OSO). The NTGR can have a substantial effect on net savings and additional evaluation efforts are needed to reduce the uncertainty in many of its components, particularly in measuring spillover. Surveys used to gather data for SO estimation need to include SO-respondent quotas when possible. Additional validity checks need to be included regarding items that act as multipliers within the calculation formulas.
- **Perform SO estimation work within a design that gives full consideration to conducting related market effects studies and follow-up verification studies for SO surveys** - This may mean a timeline with staging of different research elements relating to participant ISO, participating vendor SO, and NPSO, all within a context of market change and program-induced market effects. Significantly more resources will be needed to conduct this level of research into SO and market effects.
- **Investigate alternative methods for estimating FR** – The Program has recently initiated a more concentrated approach to fostering lasting relationships with large key account customers. Consequently, future evaluations could benefit from research into other potential methods for determining FR that better consider program long-term engagement with key account customers.

Appendix A

Participating Owner Survey

NYSERDA Existing Facilities Program
Participating Owner Survey
FIELD VERSION FOR ENGINEERS (Draft)

INTRODUCTIONS

Respondent Name: _____

Address: _____

City/State/ZIP: _____

Phone: _____

CustomerID: _____ Interview Date: _____ Interviewer Initials: _____

ASK TO SPEAK WITH NAMED SAMPLE CONTACT. WHEN PERSON COMES TO THE PHONE OR IF PERSON ANSWERING PHONE ASKS WHAT THIS IS ABOUT, READ:

Hello my name is _____ and I'm calling on behalf of the New York State Energy Research and Development Authority or NYSERDA. Our records indicate that the project at **[DESCRIPTION AND LOCATION]** participated in the NYSERDA Enhanced Commercial and Industrial Performance Program (ECIPP), the Peak Load Management Program (PLMP), or the Existing Facilities Program. All of these programs have been collapsed into a single program called the Existing Facilities Program (EFP) and reference to EFP in this survey includes projects from all the collapsed programs. We are researching to assess the program's accomplishments and to improve services. NYSERDA sent you a letter recently telling you that we would be calling and explaining the research we are doing. Your firm was selected as part of a small carefully designed sample of participating customers and your feedback is very important to this research. Your responses to this survey will be kept confidential to the extent permitted by law.

SCR1. Our records show that your company installed energy efficiency measures sometime during [year]. Do you recall your company having participated in NYSERDA's Existing Facilities Program?

1 YES [CONTINUE]

2 NO [ASK FOR KNOWLEDGEABLE CONTACT]

[IF STILL NOT AWARE THANK AND TERMINATE]

-96 REFUSED [THANK AND TERMINATE]

-97 DON'T KNOW → [ASK FOR KNOWLEDGEABLE CONTACT]

[IF STILL NOT AWARE THANK AND TERMINATE]

SCR2. I'd like to speak to the person in the company who was responsible for selecting the energy efficiency measures that were installed. Would that be you?

1 YES [CONTINUE]

2 NO [ASK FOR ALTERNATIVE KNOWLEDGEABLE CONTACT]

-96 REFUSED [THANK AND TERMINATE]

-97 DON'T KNOW [ASK FOR ALTERNATIVE KNOWLEDGEABLE CONTACT]

[IF NO] Who at your company can best speak about the energy efficiency measures that were installed with your participation in the Existing Facilities program?

Existing Facilities Participating Owner Survey

[RECORD THE NAME AND NUMBER OF THE NEW CONTACT PERSON BELOW, AND THEN FOLLOW UP WITH HIM OR HER.]

1. NEW CONTACT NAME AND PHONE NUMBER:

Name: _____

Phone: (____) _____ Extension: _____

[ONCE CORRECT PERSON IS CONTACTED, REINTRODUCE AND CONTINUE.]

[PLEASE DOCUMENT CONTACTS. LOG IN CONTACTS DATABASE AS APPROPRIATE.]

As a part of this study, we will be conducting a site visit to collect additional data for the installed energy efficiency measures.

During the site visit we will verify the installed equipment, understand the current and pre-retrofit operation, and install loggers to get the usage profiles.

The data we collect will be used to calculate the energy savings for the installed measures. These savings values will be compared with the pre-installation (pre-retrofit) estimated to assess the amount of actual savings realized. These results along with all the results from all the other sampled sites will be projected for the entire program to assess how the overall program is doing.

PROJECT SPECIFIC REVIEW

[ENGINEER DELETES ROWS THAT ARE NOT APPLICABLE GIVEN PROJECT REVIEW PRIOR TO INITIAL CALL.]

ASK QUESTION Q1 FOR ALL THE MEASURES INCLUDED IN THE PROJECT AND RECORD THE ANSWERS IN TABLE PROVIDED AFTER QUESTION Q2.

Q1. Our records indicate that this project included [MEASURE]. Are these records correct?

- 1. YES [ASK Q1 FOR NEXT MEASURE]
- 2. NO [ASK Q1 FOR NEXT MEASURE]
- 96. Don't know [ASK Q1 FOR NEXT MEASURE]
- 97. Refused [ASK Q1 FOR NEXT MEASURE]

Q2. Were there other measures installed through the program that I have not listed?

- 1. YES [Record the measures in the following table]
- 2. NO [SKIP TO REP1.]
- 96. Don't know [SKIP TO REP1.]
- 97. Refused [SKIP TO REP1.]

[DATABASE] Program Savings Estimates

Measure Name	Program Energy Savings Estimates (kWh or Therms)	Q1 1=yes 2=no 96=don't know 97=refused
Gas Measures		
Boiler upgrades/improvements (a)		
Demand control ventilation (DCV) (b)		
EMS/temperature resets /DDC/Programmable thermostats (c)		
Insulation (d)		
Building envelop upgrades (e)		
Economizers and other heat recovery systems (f)		
VFDs on pumps/fans (g)		
Low-flow fixtures/faucets (h)		
Furnace upgrades/improvements (i)		
Efficient absorption chillers (j)		
Efficient laundry equipment (washers/dryers) (k)		
Efficient ovens/process improvements (l)		
Efficient cooking equipment (m)		
Gas Measures with Electric Savings		
Demand control ventilation (DCV) (n)		
EMS/temperature resets /DDC/Programmable thermostats (o)		
Insulation (p)		
Building envelop upgrades (q)		
VFDs on pumps/fans (r)		
Electric Savings Measures		
High efficiency lighting technologies (s)		
NEMA Premium-efficiency motors /VSDs (t)		
Electric high efficiency cooling measures (packaged air conditioning and chillers) (u)		
Custom measures (v)		

Existing Facilities Participating Owner Survey

Measure Name		Q2 1=yes 2=no 96=don't know 97=refused
Other Measures Installed through the Program		

[INCLUDE THESE MEASURES IN ALL FUTURE MEASURE-SPECIFIC QUESTIONS: REP1, REP2, FR2, FR3, FR7, AND FR8]

EARLY REPLACEMENT versus RETROFIT

[ENGINEER DELETES ROWS THAT ARE NOT APPLICABLE GIVEN PROJECT REVIEW PRIOR TO INITIAL CALL, THEN ADD ANY MEASURES DISCOVERED IN Q2.]

[FOR EACH RECOMMENDED MEASURE FROM SAMPLE FILE AND Q2, ASK REP1 AND REP2 IN SEQUENCE THEN GO TO NEXT MEASURE AND ASK REP1 AND REP2 IN SEQUENCE]

[FORMAT FOR REP2 INSTALLED DATE RESPONSE SHOULD BE MMY.]

[IF MORE THAN 5 MEASURES, PRIORITIZE BY *EX ANTE* SAVINGS AND ONLY ASK ABOUT THE 1ST 5 MEASURES.]

[DO NOT ASK REP1-REP2 FOR PROCESS IMPROVEMENT.]

REP1. To the best of your recollection, how old was [MEASURE] that you replaced through the program? [FOR EACH APPLICABLE MEASURE, RECORD 1 AGE IN YEARS OR 2 ORIGINAL INSTALL DATE]

Prior Equipment for Measure	Age (Years) -	OR	Original Install Date	Reasons for Replacement
Gas Measures				
Boiler upgrades/improvements	REP1_a1		REP1_a2	REP2_a
Demand control ventilation (DCV)	REP1_b1		REP1_b2	REP2_b
EMS/Temperature resets /DDC/Programmable thermostats	REP1_c1		REP1_c2	REP2_c
Insulation	REP1_d1		REP1_d2	REP2_d
Building envelop upgrades	REP1_e1		REP1_e2	REP2_e
Economizers and other heat recovery systems	REP1_f1		REP1_f2	REP2_f
VFDs on pumps/fans	REP1_g1		REP1_g2	REP2_g
Low flow fixtures/faucets	REP1_h1		REP1_h2	REP2_h
Furnace upgrades/improvements	REP1_i1		REP1_i2	REP2_i
Efficient absorption chillers	REP1_j1		REP1_j2	REP2_j
Efficient laundry equipment (washers/dryers)	REP1_k1		REP1_k2	REP2_k
Efficient ovens/process improvements	REP1_l1		REP1_l2	REP2_l
Efficient cooking equipment	REP1_m1		REP1_m2	REP2_m

Existing Facilities Participating Owner Survey

Gas And Electric Savings Measures				
Demand control ventilation (DCV)	REP1_n1		REP1_n2	REP2_n
EMS/Temperature resets /DDC/Programmable thermostats	REP1_o1		REP1_o2	REP2_o
Insulation	REP1_p1		REP1_p2	REP2_p
Building envelop upgrades	REP1_q1		REP1_q2	REP2_q
VFDs on pumps/fans	REP1_r1		REP1_r2	REP2_r
Electric Saving Measures				
High efficiency lighting technologies	REP1_s1		REP1_s2	REP2_s
NEMA Premium-efficiency motors /VSDs	REP1_t1		REP1_t2	REP2_t
Electric high efficiency cooling measures (packaged air conditioning and chillers)	REP1_u1		REP1_u2	REP2_u
Custom measures	REP1_v1		REP1_v2	REP2_v
Other Measures Installed through the Program				

REP2. Which of the following BEST describes your decision to replace [MEASURE]?

1. It was working but not as efficiently as newer models.
 2. It was working but we needed a larger/smaller system.
 3. It was working but old and would probably need to be replaced in the next couple of years anyway.
 4. It required frequent maintenance.
 5. It was not working.
- 96. Don't know
- 97. Refused

FREE-RIDERSHIP

FR1. In your opinion, did the financial and/or technical assistance that you received through the program cause you to undertake this project earlier than you would have without the Program?

1. NO → [SKIP TO FR2]
 2. YES, EARLIER → [SKIP TO FR1a]
- 96. Don't know → [SKIP TO FR2]
- 97. Refused → [SKIP TO FR2]

FR1a. About how much earlier?

_____ (number of years)

- 96. Don't know
- 97. Refused

[ENGINEER DELETES ROWS THAT ARE NOT APPLICABLE GIVEN PROJECT REVIEW PRIOR TO INITIAL CALL, THEN ADD ANY MEASURES DISCOVERED IN Q2.]

[ASK THE FOLLOWING FOR EACH MEASURE MENTIONED IN Q1 OR Q2]

FR2. Prior to participating in the Existing Facilities Program, were you planning to incorporate [MEASURE]?

1. NO → [ASK FR2 FOR NEXT MEASURE]
 2. YES → [ASK FR2 FOR NEXT MEASURE]
- 96. Don't know → [ASK FR2 FOR NEXT MEASURE]
- 97. Refused → [ASK FR2 FOR NEXT MEASURE]

[IF "YES" TO ANY FR2 THEN ASK FR3. IF ALL FR2 ARE "NO" SKIP TO FR4]

Existing Facilities Participating Owner Survey

Measure		FR2 Response Code
Boiler upgrades/improvements	FR2_a	
Demand control ventilation (DCV)	FR2_b	
EMS/Temperature resets /DDC/Programmable thermostats	FR2_c	
Insulation	FR2_d	
Building envelop upgrades	FR2_e	
Economizers and other heat recovery systems	FR2_f	
VFDs on pumps/fans	FR2_g	
Low flow fixtures/faucets	FR2_h	
Furnace upgrades/improvements	FR2_i	
Efficient absorption chillers	FR2_j	
Efficient laundry equipment (washers/dryers)	FR2_k	
Efficient ovens/process improvements	FR2_l	
Efficient cooking equipment	FR2_m	
Gas Measures with Electricity Savings		
Demand control ventilation (DCV)	FR2_n	
EMS/Temperature resets /DDC/Programmable thermostats	FR2_o	
Insulation	FR2_p	
Building envelop upgrades	FR2_q	
VFDs on pumps/fans	FR2_r	
Electric Measures		
High efficiency lighting technologies	FR2_s	
NEMA Premium-efficiency motors /VSDs	FR2_t	
Electric high efficiency cooling measures (packaged air conditioning and chillers)	FR2_u	
Custom measures	FR2_v	

Existing Facilities Participating Owner Survey

-97. Refused → **[SKIP TO FR6]**

FR5. Please briefly describe how the Existing Facilities Program influenced your decision to incorporate high efficiency measures at this site. Include which part or feature of the Existing Facilities Program (if any) had the greatest impact on your decision to incorporate the high efficiency measures at the site. **[PROBE FOR SPECIFIC MEASURES.]**

[IF THIS QUESTION HAS BEEN ANSWERED IN QUESTION FR3 (REGARDING PRIOR PLANS), THEN PROBE FOR ADDITIONAL DETAILS ON THE PROGRAM’S INFLUENCE ON QUANTITY AND EFFICIENCY LEVEL.]

[BASED ON RESPONSE TO FR5 FILL IN A “0 TO 4” SCORE INDICATING THE EXTENT TO WHICH THE PROGRAM INFLUENCED THE DECISION TO INCORPORATE HIGH EFFICIENCY MEASURES. DO NOT ASK RESPONDENT DIRECTLY. “0” INDICATES THAT THE PROGRAM HAD NO INFLUENCE; “4” INDICATES THAT THE PROGRAM WAS THE PRIMARY REASON THAT HIGH EFFICIENCY MEASURES WERE INCORPORATED.]

(No program influence)

(Program was primary influence)

0 1 2 3 4

[GUIDELINES FOR ASSIGNING PROGRAM INFLUENCE SCORE]

Score	Characterization of Program Influence
0	No influence on the decision to install high efficiency equipment. All equipment would have been installed at the same efficiencies even without the program.
1	Program helped in making final decision on equipment that had already been thoroughly considered.
2	Program lent credibility to the decision to invest in high efficiency and/or it provided information that helped expand the quantity, scope, or efficiency of the equipment.
3	Program identified a significant number of specific high efficiency options that were installed but that had not previously been considered and/or program was a major driver behind a significant increase in the quantity, scope, or efficiency of high efficiency equipment.
4	Program was the primary reason that high efficiency equipment was installed in the project.

FR6. On a scale of 0 to 4, where 0 = “not at all important” and 4 = “very important”... Please indicate how important the EF Program (including its financial and technical assistance) was in the decision to incorporate high efficiency measures at this site.

(Not at all important)

(Very important)

0 1 2 3 4

[ASK THE FOLLOWING QUESTIONS FOR EACH MEASURE CATEGORY BELOW. IF PREVIOUS OPEN-ENDED QUESTIONS HAVE PROVIDED THE NECESSARY INFORMATION, INTERVIEWER MAY SKIP THE QUESTION. BY THE END OF THE INTERVIEW, INTERVIEWER SHOULD BE ABLE TO POPULATE THE TABLE

BELOW WITH EITHER A “LIKELIHOOD” OR “SHARE OF MEASURES” FOR EACH RELEVANT MEASURE CATEGORY]

Next I'd like to try to quantify the impact of the Existing Facilities Program. You've already provided [SOME/MOST] of the information that I'm looking for. Let me ask about the [MEASURE].

- **[BASED ON EARLIER RESPONSES, ASK EITHER THE “LIKELIHOOD” QUESTION OR THE “SHARE OF MEASURES” QUESTION, WHICHEVER IS MORE APPROPRIATE.**
- **FOR EXAMPLE, IF RESPONDENT INCORPORATED A SINGLE CHILLER, THEN THE “LIKELIHOOD” QUESTION MAY BE MOST APPROPRIATE; IF THEY INCORPORATED MULTIPLE MEASURES OF VARIOUS TYPES/SIZES, THEN THE “SHARE OF MEASURES” MAY BE MORE APPROPRIATE. SOME RESPONDENTS MAY BE ABLE TO OFFER VALID RESPONSES TO BOTH QUESTIONS.**
- **IF YOU ARE UNCERTAIN, ASK BOTH QUESTIONS. IF RESPONDENT CAN PROVIDE A RESPONSE TO EACH, THEN RECORD BOTH RESPONSES]**

- FR7. **[LIKELIHOOD]** What is the likelihood that you would have incorporated [MEASURE] with the same high level of efficiency if it you had not received financial/technical assistance from the program?
1. Definitely would NOT have incorporated measure of the same high level of efficiency
 2. MAY HAVE incorporated measure of the same high level of efficiency, even without the program → about what percent likelihood? _____%
 3. Definitely WOULD have incorporated measure of the same high level of efficiency anyway
- 96. Don't know
-97. Refused

- FR8. **[SHARE OF MEASURES] [ASK IF RECEIVED SUPPORT FOR MULTIPLE MEASURES/DESIGNS AND MIGHT HAVE DONE SOME BUT NOT ALL.]**

What percentage of this high efficiency [MEASURE] would you have incorporated if you had not received financial/technical assistance from the EF Program? **[IF NECESSARY, OR IF THE FLOW OF THE INTERVIEW DICTATES, YOU MAY DERIVE THIS VALUE BY ASKING 1) THE SHARE OF MEASURES THAT WOULD HAVE BEEN INCORPORATED (AT ANY EFFICIENCY) AND 2) THE SHARE OF INCORPORATED MEASURES THAT WOULD HAVE BEEN HIGH EFFICIENCY. THE VALUE IN THE TABLE BELOW FOR QUESTION FR WOULD BE THE PRODUCT OF THESE TWO VALUES.]**

Existing Facilities Participating Owner Survey

[FILL IN EITHER THE “LIKELIHOOD” VALUE OR THE “SHARE OF MEASURES” VALUE OR BOTH VALUES FOR EACH RELEVANT MEASURE CATEGORY. THAT WOULD HAVE BEEN INCORPORATED (AT HIGH EFFICIENCY) WITHOUT THE COMMERCIAL AND INDUSTRIAL PROGRAM				
Measure Name	Likelihood FR7		Share FR8	
Gas Measures				
Boiler upgrades/improvements	FR7 a %	and/or	FR8 a %	
Demand control ventilation (DCV)	FR7 b %	and/or	FR8 b %	
EMS/Temperature resets /DDC/Programmable thermostats	FR7 c %	and/or	FR8 c %	
Insulation	FR7 d %	and/or	FR8 d %	
Building envelop upgrades	FR7 e %	and/or	FR8 e %	
Economizers and other heat recovery systems	FR7 f %	and/or	FR8 f %	
VFDs on pumps/fans	FR7 g %	and/or	FR8 g %	
Low flow fixtures/faucets	FR7 h %	and/or	FR8 h %	
Furnace upgrades/improvements	FR7 i %	and/or	FR8 i %	
Efficient absorption chillers	FR7 j %	and/or	FR8 j %	
Efficient laundry equipment (washers/dryers)	FR7 k %	and/or	FR8 k %	
Efficient ovens/process improvements	FR7 l %	and/or	FR8 l %	
Efficient cooking equipment	FR7 m %	and/or	FR8 m %	
Gas Measures with Electric Savings				
Demand control ventilation (DCV)	FR7 n %	and/or	FR8 n %	
EMS/Temperature resets /DDC/Programmable thermostats	FR7 o %	and/or	FR8 o %	
Insulation	FR7 p %	and/or	FR8 p %	
Building envelop upgrades	FR7 q %	and/or	FR8 q %	
VFDs on pumps/fans	FR7 r %	and/or	FR8 r %	
Electric Savings Measures				
High efficiency lighting technologies	FR7 s %	and/or	FR8 s %	
NEMA Premium-efficiency motors /VSDs	FR7 t %	and/or	FR8 t %	
Electric high efficiency cooling measures (packaged air conditioning and chillers)	FR7 u %	and/or	FR8 u %	
Custom measures	FR7 v %	and/or	FR8 v %	
Other Measures Installed Through the Program				

FR9. Most new equipment and design strategies have to meet current energy standards.

But let's just focus on the fact that some of your new equipment strategies have even higher efficiencies than standard new equipment, and this new higher efficiency equipment provides extra energy savings...

Overall, across all efficient measures, such as heat recovery, what percent of these extra energy savings would have been achieved anyway, even if the Existing Facilities Program did not exist? Please provide a lower and upper bound, and then your best estimate.

[IF NEEDED FOR CLARIFICATION] For example, 50% means that half of the extra savings from the high efficiency equipment would have been achieved anyway. Remember, I'm asking only about the extra savings from incorporating high efficiency equipment instead of standard efficiency equipment.

Lower bound → ____ % Upper bound → ____ % Best estimate → ____ %

FR10. Overall what percent of the generation would have been achieved anyway, even if the Existing Facilities or its predecessor programs did not exist? Again, please provide a lower and upper bound, and then your best estimate.

[IF NEEDED FOR CLARIFICATION] For example, 50% means that half of the extra savings from the high efficiency equipment would have been achieved anyway. Remember, I'm asking only about the extra savings from incorporating high efficiency equipment instead of standard efficiency equipment.

Lower bound → ____ % Upper bound → ____ % Best estimate → ____ %

INSIDE SPILLOVER

ISO1. Did your experience with the program in any way influence you to incorporate additional electric or natural gas energy efficiency measures at this site that did not receive support from the Existing Facilities Program or any other NYSERDA programs? (*i.e.*, measures that would not have been happened without the influence of the program)?

1. NO → [SKIP TO OSO1]
2. YES

-96. Don't know → [SKIP TO OSO1]

-97. Refused → [SKIP TO OSO1]

ISO2. The program estimated your **electricity** energy savings from the project we have been discussing that was assisted by EFP to be ____ **[program ex ante electric savings]**. Would you estimate the **electricity** energy savings from these extra measures/designs to be less than, similar to, or more than the energy savings from the energy efficiency **electric** measures/designs incorporated through the EFP.

Existing Facilities Participating Owner Survey

1. Less than the EFP project → About what percentage of the savings from the EFP Project? **[Enter a number less than 100%]** ____%
2. About the same savings as the EFP project
3. More than the EFP project → About what percentage of savings from the EFP project? **[Enter a number less than 100%]** ____%

ISO3. To the best of your knowledge, what share of the savings from these extra measures/designs can reasonably be attributed to the influence of the Existing Facilities Program?

[INTERVIEWER MAY BE ABLE TO COMPLETE THIS BASED ON RESPONSE TO ISO2-4, OR AT LEAST USE ISO2-4 TO CHECK FOR CONSISTENCY. PROBE IF INCONSISTENT TO ENSURE THAT RESPONDENT IS CORRECTLY INTERPRETING THE QUESTION]

_____ % of electric savings **[100% or less]**

_____ % of natural gas savings **[100% or less]**

OUTSIDE SPILLOVER

OSO1. Did your company implement any additional energy efficiency (electric or natural gas) measures at other facilities in New York (excluding Long Island)?

1. NO → **[SKIP TO N1]**
 2. YES
- 96. Don't know → **[SKIP TO N1]**
- 97. Refused → **[SKIP TO N1]**

OSO2. Did your experience with the Existing Facilities Program influence you to incorporate additional energy efficiency measures or designs at other facilities in New York (excluding Long Island) that did not participate in the EFP beyond what you would have done otherwise? (Don't include projects that participated in any NYSERDA program)

1. NO → **[SKIP TO N1]**
 2. YES → **[IF 'YES']** About how many other facilities were influenced (that did not participate in NYSERDA programs)? _____
- 96. Don't know → **[SKIP TO N1]**
- 97. Refused → **[SKIP TO N1]**

OSO3. On average, would you estimate the **electricity** energy savings from these other non-program facilities to be less than, similar to, or more than the _____ *[program ex ante savings]* **electricity** energy savings from the energy efficiency measures/designs incorporated through the EFP project?

[e.g., IF THE SAME MEASURES WERE IMPLEMENTED IN A FACILITY TWICE AS BIG, THEN SAVINGS WOULD BE 200%. BE SURE TO EMPHASIZE THAT THIS IS SAVINGS "ON AVERAGE" NOT IN AGGREGATE ACROSS THE MANY BUILDINGS THAT MIGHT BE AFFECTED]

1. Less than the EFP project → About what percentage of the savings from the EFP Project? **[Enter a number less than 100%]** ____%
2. About the same savings as the EFP Program project

3. More than the EFP Program project → About what percentage of savings from the EFP project? **[Enter a number greater than 100%]** _____%

OSO4. To the best of your knowledge, what share of the electricity savings measures at these non-program facilities can reasonably be attributed to the influence of the Existing Facilities Program?

[INTERVIEWER MAY BE ABLE TO COMPLETE THIS BASED ON RESPONSE TO OSO1, OR AT LEAST USE OSO1 TO CHECK FOR CONSISTENCY. PROBE IF INCONSISTENT TO ENSURE THAT RESPONDENT IS CORRECTLY INTERPRETING THE QUESTION]

_____ % of electric savings **[100% or less]**

_____ % of natural gas savings **[100% or less]**

N. NON-ENERGY IMPACTS

SKIP THE NEI SECTION IF A CIPP/ECIPP PARTICIPANT. ONLY ASK FOR PLM PROJECTS.

[FOR HIGH EFFICIENCY LIGHTING TECHNOLOGIES]

[CHANGE IN LIGHTING SERVICING COSTS ARE A TRANSFER PAYMENT FOR B/C BUT A BENEFIT TO CUSTOMER WHOSE MEASUREMENT COULD BE USEFUL FOR PROGRAM IMPLEMENTATION]

N1. Do you pay for a service that maintains your lighting equipment?

1. YES

2. NO → **[SKIP TO N5]**

-96. Don't know → **[SKIP TO N5]**

-97. Refused → **[SKIP TO N5]**

N2. Has what you are paying to maintain your lighting equipment changed because of this project?

1. YES

2. NO **[SKIP TO N8]**

-98 Don't know **[SKIP TO N8]**

-99 Refused **[SKIP TO N8]**

N3. Are you being charged more or less now?

1. MORE

2. SAME **[SKIP TO N8]**

3. LESS

-98 Don't know **[SKIP TO N8]**

-99 Refused **[SKIP TO N8]**

N4. How much [MORE/LESS] in dollars per month? _____ **[SKIP TO N8]**

-98 Don't know **[SKIP TO N8]**

-99 Refused **[SKIP TO N8]**

N5. Has the number of hours needed to maintain the lighting equipment changed due to the project?

Existing Facilities Participating Owner Survey

- 1. YES
- 2. NO → [SKIP TO N8]
- 96. Don't know → [SKIP TO N8]
- 97. Refused → [SKIP TO N8]

N6. Is the number of hours more or fewer than before this project?

- 1. MORE
- 2. SAME → [SKIP TO N8]
- 3. FEWER
- 96. Don't know → [SKIP TO N8]
- 97. Refused → [SKIP TO N8]

N7. About how many [MORE/FEWER] hours per month? _____

- 96. Don't know
- 97. Refused

N8. What does your organization use as an hourly labor rate for O&M staff for internal budgeting?

\$ _____ /hr

- 96. Don't know
- 97. Refused

OVERALL OPERATIONS & MAINTENANCE EXPENSES (excluding lighting)

N9. Have the number of hours for operations and maintenance (O&M), excluding lighting, changed because of this project?

- 1. YES
- 2. NO → [SKIP TO N11]
- 96. Don't know → [SKIP TO N11]
- 97. Refused → [SKIP TO N11]

N10. Are you spending more or fewer hours per month for O&M than you spent before this project?

- 1. MORE
- 2. SAME [SKIP TO N11]
- 3. FEWER
- 96. Don't know [SKIP TO N11]
- 97. Refused [SKIP TO N11]

N11. About how many [MORE/FEWER] hours are you spending per month than before the project?

- 96. Don't know
- 97. Refused

Existing Facilities Participating Owner Survey

If responses are for individual measures, record the responses in the table below:

Measure Name	Response for N9	Response for N10	Response for N11
Gas Measures			
Boiler upgrades/improvements (a)			
Demand control ventilation (DCV) (b)			
EMS/Temperature resets /DDC/Programmable thermostats (c)			
Insulation (d)			
Building envelop upgrades (e)			
Economizers and other heat recovery systems (f)			
VFDs on pumps/fans (g)			
Low flow fixtures/faucets (h)			
Furnace upgrades/improvements (i)			
Efficient absorption chillers (j)			
Efficient laundry equipment (washers/dryers) (k)			
Efficient ovens/process improvements (l)			
Efficient cooking equipment (m)			
Demand control ventilation (DCV) (n)			
EMS/Temperature resets /DDC/Programmable thermostats (o)			
Insulation (p)			
Building envelop upgrades (q)			
VFDs on pumps/fans (r)			
Electric Savings Measures			
High efficiency lighting technologies (s)			
NEMA Premium-efficiency motors /VSDs (t)			
Electric high efficiency cooling measures (packaged air conditioning and chillers) (u)			
Custom measures (v)			
Other Measures Installed Through the Program			

Existing Facilities Participating Owner Survey

N12. SKIP THIS QUESTION IF ANSWERED IN N8.

What does your organization use as an hourly labor rate for O&M staff for internal budgeting?

\$ _____ /hr

-96. Don't know

-97. Refused

PRODUCTIVITY

N13. Has throughput changed because of this project? Throughput is defined as a measure of output per unit of labor input.

1. YES

2. NO → [SKIP TO N15]

-96. Don't know → [SKIP TO N15]

-97. Refused → [SKIP TO N15]

N14. Is your throughput higher or lower than before this project?

1. HIGHER

2. SAME → [SKIP TO N15]

3. LOWER

-96. Don't know → [SKIP TO N15]

-97. Refused → [SKIP TO N15]

N15. Has this change in throughput due to the efficiency project changed your firm's net revenues?

1. YES
2. NO → [SKIP TO N15]
- 96. Don't know → [SKIP TO N15]
- 97. Refused → [SKIP TO N15]

N16. Approximately how much has your revenue [INCREASED/DECREASED] per month due to the throughput changes induced from your program participation? _____

- 96. Don't know
- 97. Refused

WASTE AND WASTE HANDLING (NON-WATER OR WASTEWATER) EXPENSES

N17. Have your monthly costs for handling waste, not including that for water and wastewater, changed because of this project?

1. YES
2. NO → [SKIP TO N18]
- 96. Don't know → [SKIP TO N18]
- 97. Refused → [SKIP TO N18]

N18. Are you spending more or less per month for waste handling than you were before this project?

1. MORE
2. SAME [SKIP TO N18]
3. LESS
- 96. Don't know → [SKIP TO N18]
- 97. Refused → [SKIP TO N18]

N19. About how much [MORE/LESS] are you spending in dollars per month than you were before this project? _____

- 96. Don't know
- 97. Refused

EFFECT ON PROFIT FROM IMPACTS THROUGH RENTAL REVENUE

[CHANGE IN RENTAL PROFITS ARE A TRANSFER PAYMENT FOR B/C BUT A BENEFIT TO CUSTOMER WHOSE MEASUREMENT COULD BE USEFUL FOR PROGRAM IMPLEMENTATION]

N20. Does your firm generate rental income from the facility where you undertook the EFP Project?

1. YES
2. NO → [SKIP TO N21]
- 96. Don't know → [SKIP TO N21]
- 97. Refused → [SKIP TO N21]

N21. Is your rental income more or less per month due to this project?

Existing Facilities Participating Owner Survey

- 1. MORE
- 2. SAME [SKIP TO N21]
- 3. LESS
- 96. Don't know → [SKIP TO N21]
- 97. Refused → [SKIP TO N21]

N22. Approximately how many [MORE/LESS] dollars per month in net rental income does your firm achieve due to this project? _____

- 96. Don't know
- 97. Refused

IMPACTS THROUGH INDUCED CHANGES IN ELECTRIC RATE

[CHANGE IN ENERGY PAYMENTS DUE TO CHANGES IN ELECTRIC RATES ARE A TRANSFER PAYMENT FOR B/C BUT A BENEFIT TO CUSTOMER WHOSE MEASUREMENT COULD BE USEFUL FOR PROGRAM IMPLEMENTATION)]

N23. Did your firm change its electric rate, the rate at which the firm pays for each energy and demand used because of the EFP Project?

- 1. YES
- 2. NO → [SKIP TO D1]
- 96. Don't know → [SKIP TO D1]
- 97. Refused → [SKIP TO D1]

N24. Did what you pay in electricity costs increase or decrease?

- 1. INCREASE
- 2. DECREASE

N25. Approximately how many [MORE/LESS] dollars does your firm pay in electricity charges per month due to just this change in electric rate (*i.e.*, the change in the rate caused by your participation but not the change in usage due to the project)? _____

(This could be the dollars per month or year)

- 96. Don't know
- 97. Refused

DECISION MAKING PROCESS QUESTIONS

I now would like to ask you about the decision-making process your organization uses to select new equipment during capital improvement projects.

D1. What criteria did your organization's management use when deciding to undertake this particular project that participated in the EF Program? **[DO NOT READ LIST; CHECK ALL THAT APPLY]**

- 1. ____ Payback
- 2. ____ Return on investment
- 3. ____ Keeping pace with competitors

- 4. ___ Energy costs/operating costs
- 5. ___ Availability of rebates and/or other outside co-funding
- 6. ___ Changes in maintenance costs
- 7. ___ Ability to take advantage of federal tax credits
- 8. ___ Other (Note down the details)
- 96. ___ Don't know
- 97. ___ Refused

[IF MORE THAN ONE ANSWER TO D1]

D2. Which, if any, of these criteria are the “make-or-break” determinants in deciding whether or not the project would go forward? **[CHECK ALL THAT APPLY]**

- 1. ___ Payback
- 2. ___ Keeping pace with competitors
- 3. ___ Energy price forecasts
- 4. ___ Availability of rebates and/or other outside co-funding
- 96. ___ Don't know
- 97. ___ Refused

D3. Does your organization have a formal policy or procedure for requiring the purchase of energy-efficient equipment? For example, when purchasing new lighting equipment, you may be required to purchase super T-8 lamps; when purchasing a new motor, you may be required to purchase a NEMA premium-efficiency motor, or when purchasing new HVAC equipment you may be required to purchase equipment that exceeds the New York State Energy Code.

- 1. ___ Yes
- 2. ___ NO **[SKIP TO NEXT SECTION]**
- 96. ___ Don't know **[SKIP TO NEXT SECTION]**
- 97. ___ Refused **[SKIP TO NEXT SECTION]**

D4. Please describe all applicable policies:

D5. How and why were these policies developed?

D6. Were these policies put into place before or after participating in the EF Program?

- 1. ___ Before participating in the EFP **[SKIP TO NEXT SECTION]**
- 2. ___ After participating in the EFP
- 96. ___ Don't Know **[SKIP TO NEXT SECTION]**
- 97. ___ Refused **[SKIP TO NEXT SECTION]**

Existing Facilities Participating Owner Survey

- D7. Did your firm's participation in the Existing Facilities Program positively influence the adoption of the policy or influence the efficiency levels required in the policy?
1. ___ Yes
 2. ___ No **[SKIP TO NEXT SECTION]**
 - 96. ___ Don't know **[SKIP TO NEXT SECTION]**
 - 97. ___ Refused **[SKIP TO NEXT SECTION]**
- D8. Please tell me how much influence your firm's participation in the EFP had on your adoption of a policy regarding the energy efficiency of equipment being purchased. Would you say "No influence", "Very little", "Some", "A fair amount", or "a lot of influence"?
- 0 NO INFLUENCE
 - 1 VERY LITTLE
 - 2 SOME
 - 3 A FAIR AMOUNT
 - 4 A LOT OF INFLUENCE
 - 96 REFUSED
 - 97 DON'T KNOW

DECISION-MAKERS (FOR ADDITIONAL INTERVIEWS)

[IF PROJECT IS IN CENSUS STRATUM ASK DM9 – DM11, OTHERWISE PROCEED TO NEXT SECTION.]

- DM9a. Generally, how are decisions made at your firm? I'm going to read a list of decision descriptions, and I would like to know which statement best describes how each decision is made at your firm.
1. A committee which I chair has final say in the decision. **[SKIP TO DM10.]**
 2. The decision is completely a committee decision. **[SKIP TO DM10.]**
 3. Someone else makes the technical recommendations but I have the final financial or contracting authority. **[SKIP TO DM10.]**
 4. I make the recommendations but others have the financial or contracting authority. **[SKIP TO DM10.]**
 5. I make recommendations and the corporate office elsewhere makes the decision, but my recommendations are normally followed. **[SKIP TO DM10.]**
 6. I make recommendations but the corporate office always makes their own decisions, sometimes with little regard to my recommendations. **[SKIP TO DM10.]**
 7. There are multiple groups and decision points that must be passed that are more complicated than these other statements. → *Ask DM9b*

DM9b. Describe the decision-making process. *[Open-ended]*

DM10. Who played key roles in the decision-making process?

[Obtain titles, names, phone numbers, email addresses][Ensure you have all the people that correspond to the response in DM1. Inquire who is on the committee for committee decisions, who in the corporate office if they have input into the decisions, who is/are the financial and contracting authorities if they are involved.]

<i>Title</i>	<i>Name</i>	<i>Phone</i>	<i>Email</i>	<i>DM11 Score</i>
<i>Title</i>	<i>Name</i>	<i>Phone</i>	<i>Email</i>	<i>DM11 Score</i>
<i>Title</i>	<i>Name</i>	<i>Phone</i>	<i>Email</i>	<i>DM11 Score</i>
<i>Title</i>	<i>Name</i>	<i>Phone</i>	<i>Email</i>	<i>DM11 Score</i>

DM11. On the scale of 0 to 4, with 0 being no influence and 4 being very influential, how influential was each person in the decision making process? ***[Recite the name(s) obtained in the previous question. Enter score above as indicated.]***

PERSISTENCE QUESTIONS

[IF PROJECT IS A LOAD CURTAILMENT (LC) OR INTERVAL METER (IM) PROJECT ASK P0 – P3, OTHERWISE PROCEED TO NEXT SECTION.]

P0. Is your facility currently a participant in an NYISO (New York Independent System Operator) program?

- 1. Yes
- 2. No
- 96. ___ Don't know
- 97. ___ Refused

P1. The EF Program funded installation of <Measures>. How much of it is still installed in the facility, in percentage (%) terms?

- _____ % **IF 0% SKIP TO P6.**
- 96. ___ Don't know
 - 97. ___ Refused

P2. Are you still using the load control equipment to reduce your peak demand?

- 1. Yes

Existing Facilities Participating Owner Survey

2. No [**SKIP TO P6**]

-96. ___ Don't know

-97. ___ Refused

P3. Is the system now working as well, better, or worse than it did right after installation and commissioning?

1. As well [**SKIP TO NEXT SECTION**]

2. Better. How much better? _____ %.

3. Worse. How much worse? _____ %

-96. ___ Don't know

-97. ___ Refused

P4. The measure was installed in the year 20___. In what year did the performance most change?

Year of change _____.

-96. ___ Don't know

-97. ___ Refused

P5. Why did the performance change? [**Open ended question**]

[SKIP TO NEXT SECTION AFTER P5 ANSWER]

P6. When did you stop using the equipment?

Year/month _____.

-96. ___ Don't know

-97. ___ Refused

P7. Before you stopped using the equipment, did it work as well, better, or worse than it did the first year of operation (not counting commissioning)?

1. Better. How much better? _____ %.

2. Worse. How much worse? _____ %

-96. ___ Don't know

-97. ___ Refused

P8. Why did you stop using the equipment? [**Open ended question**]

P9. Have you replaced the incentivized equipment with anything else that performs a similar function?

1. Yes
 2. No [**SKIP TO NEXT SECTION**]
- 96. ___ Don't know
-97. ___ Refused

P10. Did you receive NYSERDA funding for the new equipment?

1. Yes [**SKIP TO NEXT SECTION**]
 2. No
- 96. ___ Don't know
-97. ___ Refused

P11. Did the originally installed equipment influence the installation of the replacement equipment?

1. Yes
 2. No [**SKIP TO NEXT SECTION**]
- 96. ___ Don't know
-97. ___ Refused

P12. [*If yes*] How did the originally installed equipment influence the installation of replacement equipment? [**Open ended**]

FIRMOGRAPHICS

ST1. What is the Principal Activity of the building in which the equipment was installed? [**DO NOT READ. RECORD ALL THAT APPLY**]

1. Education
2. Food Sales
3. Food Service
4. Health Care
5. Lodging
6. Retail/Mercantile
7. Office
8. Public Assembly
9. Public Order and Safety
10. Religious Worship
11. Service

Existing Facilities Participating Owner Survey

12. Warehouse and Storage
 13. Manufacturing (Identify Industry Type e.g., chemical, food, paper, etc.)
 14. Vacant
 - 96. Don't know
 - 97. Refused
- ST2. Approximately, when was this building built? Please stop me when I get to the appropriate category.
1. Before 1960
 2. 1961-1970
 3. 1971-1990
 4. 1991-2000
 5. 2001-2005
 6. After 2005
 - 96. Don't know
 - 97. Refused
- ST3. What is the approximate square footage of the building where the equipment was installed?
1. Less than 1,000 square feet
 2. 1,000 to 4,999
 3. 5,000 to 14,999
 4. 15,000 to 24,999
 5. 25,000 to 49,999
 6. 50,000 to 99,999
 7. 100,000 to 199,999
 8. 200,000 to 499,999
 9. 500,000 or more
 - 96. Don't know
 - 97. Refused
- ST4. How many employees does your firm have?
1. Fewer than 5
 2. 5 to 9
 3. 10 to 19
 4. 20 to 49
 5. 50 to 99
 6. 100 to 249
 7. 250 or More
 - 96. Don't know
 - 97. Refused
- ST5. Is your company independent, or part of a larger company?
1. Independent

- 2. Part of a larger company
- 96. Don't know
- 97. Refused

ST6. How many locations/establishments does your firm have?

- 1. One
- 2. to 5
- 3. 6 to 10
- 4. 11 to 20
- 5. More than 20
- 96. Don't know
- 97. Refused

THANK YOU FOR YOUR TIME!

Appendix B

Participating Vendor Survey

**NYSERDA Existing Facilities Program
Impact Evaluation 2011 Participating Vendor Survey
FORMATTED FOR CATI PROGRAMMING
09/30/11 Update 10/26/11**

Hello may I please speak to [NAME1]? I'm calling on behalf of the New York State Energy Research and Development Authority (or NYSERDA). We are conducting research for NYSERDA's Existing Facilities Program (EFP).

**[IF INTRO = INTRO 1, READ INTRO1, ELSE SKIP TO INSTRUCTIONS BEFORE INTRO2]
INTRO 1**

Our records have [COMPANY] listed as the vendor for the Program's project at [SITE] and indicate that you may be the best contact at your firm for this project. I'd like to ask you some questions regarding the decision-making process for this project or projects similar to this one. **[READ IF ALTINTRO=1:** "Our records show that you participated recently in another survey about the Existing Facilities program and the current market for retrofit projects. This study is a separate research effort specifically about the projects I just mentioned, and we are researching a small carefully designed sample of projects. Because we are only talking to a few people, your participation in this evaluation is very important to us, and we would greatly appreciate your further participation."]

[READ IF NECESSARY: We are researching a small carefully designed sample of projects that participated in the NYSERDA Existing Facilities Program. Because we are only talking to a few people, your participation in this evaluation is very important to us. The information you provide will be used to assess program accomplishments and improve NYSERDA's programs. Your responses will be kept confidential to the extent permitted by law.]

[GO TO Q1]

**[IF INTRO = INTRO 2, READ INTRO 2]
INTRO 2**

We would like to conduct interviews regarding the decision-making process for the following projects:

[READ MULTIPLE SITE LISTINGS]

Our records have [COMPANY] listed as the vendor for these projects and indicate that you may be the best contact at your firm regarding these projects. I'd like to ask you some questions regarding the decision-making process for these projects or projects similar to these. **[READ IF ALTINTRO=1:** "Our records show that you participated recently in another survey about the Existing Facilities program and the current market for retrofit projects. This study is a separate research effort specifically about the projects I just mentioned, and we are researching a small carefully designed sample of projects. Because we are only talking to a few people, your participation in this evaluation is very important to us, and we would greatly appreciate your further participation."]

[READ IF NECESSARY: We are researching a small carefully designed sample of projects that participated in the NYSERDA Existing Facilities Program. Because we are only talking to a few people, your participation in this evaluation is very important to us. The information you provide will be used to assess program accomplishments and improve NYSERDA's programs. Your responses will be kept confidential to the extent permitted by law.]

[GO TO Q1]

SECTION: SCR – SCREENER QUESTIONS

Q1. Are you the appropriate person to discuss issues related to the Existing Facilities project at **[IF INTRO = INTRO 1 INSERT “this site”, IF INTRO = INTRO 2 INSERT “these sites”]**?

1. YES **[SKIP TO SCR1]**
2. NO, NOT CORRECT RESPONDENT
96. REFUSED
97. DON’T KNOW

Q2. Can you provide me with a contact name and phone number for a person who can speak about the project at **[SITE]**? **[REPEAT FOR ALL MULTIPLE SITES]**

1. YES **[RECORD NAME AND PHONE NUMBER]**
2. NO **[TERMINATE]**
96. REFUSED **[TERMINATE]**
97. DON’T KNOW **[TERMINATE]**

[IF Q2=1. CONTACT THIS PERSON, REPEAT INITIAL INTRODUCTION]

SCR1. This survey will take about **[IF VENDOR HAS ONLY 1 SITE, INSERT “15”; IF VENDOR HAS 2 SITES, INSERT “15 to 20”; IF VENDOR HAS 3 SITES, INSERT “20”]** minutes to complete. Can we discuss **[IF INTRO = INTRO 1 INSERT “this project”, IF INTRO = INTRO 2 INSERT “these projects”]** now, or can we schedule a time when I can call you back?

1. CAN DISCUSS NOW **[GO TO SECTION FR]**
2. SCHEDULE CALL BACK **[RECORD CALLBACK DATE AND TIME]**
96. REFUSED **[READ: “Because we are only talking to a few people, your participation in this evaluation is very important to us. The information you provide will be used to assess program accomplishments and improve NYSERDA’s programs. Can we continue?” IF RESPONDENT REFUSES, THANK AND TERMINATE]**

[CONDUCT AN ENTIRE SURVEY FOR THE FIRST SITE, OR ONLY SITE, FOR A VENDOR]

[CONDUCT SURVEY FR1-FR10c, INF1, AND OSO1 FOR EACH ADDITIONAL SITE]

SECTION: FR – FREE RIDERSHIP

Our records indicate that this Program project at **[SITE]** included the following measures: **[READ MEASURE NAMES]**

	IF KWHType = 1	IF KWHType = 0
[INSERT 1]	ELECTRICITY SAVINGS	DEMAND REDUCTION
[INSERT 2]	ENERGY EFFICIENCY MEASURES	DEMAND REDUCTION MEASURES
[INSERT 3]	SAVE ENERGY	REDUCE ELECTRIC DEMAND
[INSERT 4]	SAVE	REDUCE
[INSERT 5]	HIGH EFFICIENCY	DEMAND REDUCTION CAPABILITY
[INSERT 6]	SAVE ELECTRICITY	REDUCE ELECTRIC DEMAND CAPABILITY

FR1. Prior to participating in the Existing Facilities Program, were there plans to install any of the adopted **[INSERT 2]** at this customer’s facility?

- 1. YES
- 2. NO **[SKIP TO FR3]**
- 96. REFUSED **[SKIP TO FR3]**
- 97. DON’T KNOW **[SKIP TO FR3]**

FR2. Could you please describe any plans that your customer had to incorporate the adopted measures prior to participating in the Existing Facilities Program?

- 1. **[RECORD VERBATIM]**
- 96. REFUSED
- 97. DON’T KNOW

[IF RESPONDENT PROVIDED VERBATIM ANSWER FOR FR2, BASED ON RESPONSE FILL IN FR2a WITH A “0 TO 4” SCORE INDICATING THE EXTENT TO WHICH RESPONDENT WAS ALREADY PLANNING TO INCORPORATE THE MEASURES. DO NOT ASK RESPONDENT TO SCORE DIRECTLY. “0” INDICATES THAT RESPONDENT HAD NO PLANS AT ALL; “4” INDICATES THAT RESPONDENT HAD DOCUMENTED PLANS AND HAD BUDGETED FOR ALL OF THE MEASURES.]

FR2a

[NO PLANS] **[DOCUMENTED PLANS/BUDGET]**

0 1 2 3 4

[FULL GUIDELINES FOR ASSIGNING HIGH-EFFICIENCY/DEMAND REDUCTION PROJECT PLANNING SCORE]

SCORE	EXTENT OF PLANNING
0	NO PLANS FOR HIGH EFFICIENCY/DEMAND REDUCTION EQUIPMENT; RESPONDENT MAY HAVE CONSIDERED ALTERNATIVE TECHNOLOGY OPTIONS, BUT DID NOT EXPLICITLY CONSIDER HIGH EFFICIENCY.
1	INITIAL STEPS TOWARD CONSIDERATION OF HIGH EFFICIENCY/DEMAND REDUCTION SUCH AS REQUESTING INFORMATION ON OR DISCUSSING, IN GENERAL, HIGH EFFICIENCY/DEMAND REDUCTION OPTIONS WITH VENDORS OR CONTRACTORS.
2	IN-DEPTH DISCUSSION OR CONSIDERATION OF SPECIFIC TYPES OF HIGH EFFICIENCY/DEMAND REDUCTION EQUIPMENT (<i>E.G.</i> , LIGHTING, HVAC, APPLIANCES, INTERVAL METER), INCLUDING THEIR POSITIVE AND NEGATIVE ATTRIBUTES AND COSTS.
3	IDENTIFICATION OF SPECIFIC EQUIPMENT MANUFACTURERS AND MODELS, INCLUDING ASSESSMENT OF THEIR RELATIVE COSTS AND PERFORMANCE CHARACTERISTICS.
4	HIGH EFFICIENCY/DEMAND REDUCTION EQUIPMENT AND DESIGNS FULLY SPECIFIED AND EXPLICITLY SELECTED OR INCORPORATED INTO PROJECT BUDGET.

Existing Facilities Participating Vendor Survey 2011

- FR3. Do you think the Existing Facilities Program or its assistance caused the customer to undertake this project earlier than they would have without the program?
1. YES
 2. NO **[SKIP TO FR5]**
 96. REFUSED **[SKIP TO FR5]**
 97. DON'T KNOW **[SKIP TO FR5]**
- FR4. How much earlier?
1. **[RECORD NUMBER OF MONTHS]**
 2. **[RECORD NUMBER OF YEARS]**
 96. REFUSED
 97. DON'T KNOW
- FR5. Did the project's participation in the Existing Facilities Program in any way influence the type of equipment, the ability of the equipment to **[INSERT 3]**, or the amount of measures that were incorporated?
1. YES
 2. NO (ALL EQUIPMENT WOULD HAVE BEEN INCORPORATED AT THE SAME HIGH EFFICIENCIES) **[SKIP TO FR7]**
 96. REFUSED **[SKIP TO FR7]**
 97. DON'T KNOW **[SKIP TO FR7]**
- FR6. Please briefly describe how you think the Existing Facilities Program influenced the decision to incorporate **[INSERT 2]** at **[SITE]**.
1. **[RECORD VERBATIM]**
 96. REFUSED
 97. DON'T KNOW

[IF RESPONDENT PROVIDED VERBATIM ANSWER FOR FR4, FILL IN A “0 TO 4” SCORE INDICATING THE EXTENT TO WHICH THE PROGRAM INFLUENCED THE DECISION TO INCORPORATE HIGH EFFICIENCY/DEMAND REDUCTION MEASURES. DO NOT ASK RESPONDENT TO SCORE DIRECTLY. “0” INDICATES THAT THE PROGRAM HAD NO INFLUENCE; “4” INDICATES THAT THE PROGRAM WAS THE PRIMARY REASON THAT HIGH EFFICIENCY/DEMAND REDUCTION MEASURES WERE INCORPORATED.]

FR6a.

[NO PROGRAM INFLUENCE]

[PROGRAM PRIMARY INFLUENCE]

0

1

2

3

4

[FULL GUIDELINES FOR ASSIGNING PROGRAM INFLUENCE SCORE]

SCORE	CHARACTERIZATION OF PROGRAM INFLUENCE
0	NO INFLUENCE ON THE DECISION TO INSTALL HIGH EFFICIENCY/DEMAND REDUCTION EQUIPMENT. ALL EQUIPMENT WOULD HAVE BEEN INSTALLED AT THE SAME EFFICIENCIES/CAPABILITIES EVEN WITHOUT THE PROGRAM.
1	PROGRAM HELPED IN MAKING FINAL DECISION ON EQUIPMENT THAT HAD ALREADY BEEN THOROUGHLY CONSIDERED.
2	PROGRAM LENT CREDIBILITY TO THE DECISION TO INVEST IN HIGH EFFICIENCY/DEMAND REDUCTION AND/OR IT PROVIDED INFORMATION THAT HELPED EXPAND THE QUANTITY, SCOPE, OR EFFICIENCY/CAPABILITY OF THE EQUIPMENT.
3	PROGRAM IDENTIFIED A SIGNIFICANT NUMBER OF SPECIFIC HIGH EFFICIENCY/DEMAND REDUCTION OPTIONS THAT WERE INSTALLED BUT THAT HAD NOT PREVIOUSLY BEEN CONSIDERED AND/OR PROGRAM WAS A MAJOR DRIVER BEHIND A SIGNIFICANT INCREASE IN THE QUANTITY, SCOPE, OR EFFICIENCY/CAPABILITY OF HIGH EFFICIENCY/DEMAND REDUCTION EQUIPMENT.
4	PROGRAM WAS THE PRIMARY REASON THAT HIGH EFFICIENCY/DEMAND REDUCTION EQUIPMENT WAS INSTALLED.

Existing Facilities Participating Vendor Survey 2011

FR7. On a scale of 0 to 4, where 0 equals “not at all important” and 4 equals “very important,” please indicate how important you think the Existing Facilities Program was in the decision to incorporate **[INSERT 2]** at this site?

- 0. NOT AT ALL IMPORTANT
- 1.
- 2.
- 3.
- 4. VERY IMPORTANT
- 96. REFUSED
- 97. DON'T KNOW

Next I'd like to try to quantify the impact of the Existing Facilities Program at **[SITE]**. Let me ask about the measures I listed previously.

[ASK FR8 AND FR9 IN SEQUENCE FOR A MEASURE THEN GO TO NEXT MEASURE AND ASK FR8 AND FR9]

FR8. What is the likelihood that **[MEASURE]** of the same **[INSERT 5]** would have been incorporated at this site if it had not been for the Existing Facilities Program and its assistance? Would you say it...**[READ]**

- 1. Definitely **would not** have incorporated measures of the same **[INSERT 5]** (0%) **[SKIP TO INSTRUCTIONS BEFORE FR9]**
- 2. **May have** incorporated measures of the same **[INSERT 5]**, even without the program.
- 3. Definitely **would** have incorporated measures of the same **[INSERT 5]** anyway (100%) **[SKIP TO INSTRUCTIONS BEFORE FR9]**
- 96. REFUSED **[SKIP TO INSTRUCTIONS BEFORE FR9]**
- 97. DON'T KNOW **[SKIP TO INSTRUCTIONS BEFORE FR9]**

FR8a. About what percent likelihood?

- 01 **[RECORD PERCENT [ACCEPT 0-100, EXCLUDING 0 AND 100]]**
- 96. REFUSED
- 97. DON'T KNOW

[PROGRAMMER: AUTOFILL FR8a = 0 IF FR8=1, FR8a = 100 IF FR8=3]

FR9. What percentage of these **[INSERT 5]** **[MEASURE]** would *the customer* have incorporated if they had not received the Existing Facilities Program's assistance?

- 1. **[RECORD PERCENT] [ACCEPT 0-100]**
- 96. REFUSED
- 97. DON'T KNOW

[READ IF NECESSARY: So, assuming that the customer had decided to incorporate **[MEASURE]**, what share or percent of the measures do you think the customer would have had you implement in the absence of the Existing Facilities Program and its incentives? That is, would they have made all of the changes or only part of them? And if part, what percent would you say the customer would have implemented?]

[FILL IN THE “LIKELIHOOD” VALUE AND THE “SHARE OF MEASURES” VALUE FOR EACH RELEVANT MEASURE CATEGORY.]			
MEASURE NAME & ABBREVIATION	... WOULD HAVE BEEN INCORPORATED (AT HIGH EFFICIENCY/DEMAND REDUCTION CAPABILITY)		
	WITHOUT THE Existing Facilities PROGRAM		
	LIKELIHOOD FR8		SHARE FR9
EMS/Temperature resets /DDC/Programmable thermostats (Mc)	FR8_c	AND	FR9_c
VFDs on pumps/fans (Mg)	FR8_g	AND	FR9_g
High efficiency lighting technologies (Mn)	FR8_n	AND	FR9_n
NEMA Premium-efficiency motors /VSDs (Mo)	FR8_o	AND	FR9_o
Electric high efficiency cooling measures (packaged air conditioning and chillers) (Mp)	FR8_p	AND	FR9_p
Custom measures (Mq)	FR8_q	AND	FR9_q
Interval Meter (IM), Direct Load Control, Generators (Mr)	FR8_r	AND	FR9_r
LED Traffic Lights (Ms)	FR8_s	AND	FR9_s

Existing Facilities Participating Vendor Survey 2011

FR10. Most new equipment and design strategies have to meet current energy standards. But let's just focus on the fact that some of the new equipment, incorporated as a result of the Existing Facilities Program are at a greater level of **[INSERT 5]** than standard new equipment, and these new **[INSERT 2]** provide extra **[INSERT 1]**.

Overall, across all measures, what percent of these extra **[INSERT 1]** at **[SITE]** would have been achieved anyway, even if the Existing Facilities Program did not exist? Please provide a lower and upper bound, and then your best estimate.

[READ IF NECESSARY: For example, 50% means that half of the extra **[INSERT 1]** from the **[INSERT 2]** would have been achieved anyway.]

FR10a. Lower bound

1. **[RECORD PERCENT [ACCEPT 0-100]]**
96. REFUSED
97. DON'T KNOW

FR10b. Upper bound

1. **[RECORD PERCENT [ACCEPT 0-100]]**
96. REFUSED
97. DON'T KNOW

FR10c. Best estimate

1. **[RECORD PERCENT. ACCEPT NUMBER BETWEEN FR10a and FR10b]**
96. REFUSED
97. DON'T KNOW

[FR10a ≤ FR10c ≤ FR10b]

SECTION: INFL – VENDOR VERSUS OWNER INFLUENCE

INF1. We are interested in knowing how influential the customer at **[SITE]** was in selecting the **[INSERT 2]** installed. Which of the following statements best describes the role of the customer for the decisions involving the greatest **[INSERT 1]**? **[READ RESPONSES]**

1. The customer knew what equipment they wanted, its price and planned for this equipment and then you agreed with the choice
2. The customer knew the equipment they wanted but wanted confirmation on their choice and the cost for obtaining and installing that equipment. You provided the information the customer still needed for the decision
3. The customer generally wanted **[INSERT 2]** and you provided information and recommendations that enabled this equipment to be installed.
4. You suggested the **[INSERT 2]** and then got a supporting opinion from the customer
5. You chose the **[INSERT 2]** without input from the customer and then the customer followed your recommendation.
96. REFUSED
97. DON'T KNOW

SECTION: NPS1 – INDICATOR OF NON-PARTICIPANT SPILLOVER

NPS1. Do you think that other firms such as yours that are **not** participating in the **Existing Facilities Program** have **increased, decreased** or **not changed** the extent to which they incorporate **[INSERT 2]** in their projects?

1. INCREASED
2. DECREASED
3. NOT CHANGED **[SKIP TO OSO1]**
96. REFUSED **[SKIP TO OSO1]**
97. DON'T KNOW **[SKIP TO OSO1]**

NPS2. Have they **[IF NPS1=1 INSERT “increased”, IF NPS1=2 INSERT “decreased”]** their incorporation of **[INSERT 2]** a lot or a little?

1. INCREASED A LOT
2. INCREASED A LITTLE
3. DECREASED A LITTLE **[SKIP TO OSO1]**
4. DECREASED A LOT **[SKIP TO OSO1]**
96. REFUSED **[SKIP TO OSO1]**
97. DON'T KNOW **[SKIP TO OSO1]**

NPS3. Was the Existing Facilities Program a **major, minor, or not a factor** in this increased incorporation of **[INSERT 2]** in non-program facilities? **[READ IF NECESSARY: “That is, was the Existing Facilities Program a major factor, minor factor or not a factor in increasing the use of [INSERT 2] by these other firms who are not participating in the Existing Facilities Program?”]**

1. MAJOR
2. MINOR
3. NOT A FACTOR
96. REFUSED
97. DON'T KNOW

SECTION: OSO – OUTSIDE SPILLOVER

OSO1. To your knowledge, did your customer on this project implement any additional **[INSERT 2]** at other facilities in New York State (excluding Long Island) that did not receive assistance from the Existing Facilities Program or any other NYSERDA Program?

1. YES
2. NO
96. REFUSED
97. DON'T KNOW

Existing Facilities Participating Vendor Survey 2011

Now, I'd like to ask some questions about your firm's experience and interaction with **[INSERT 2]** as a result of your participation in NYSERDA's Existing Facilities Program.

OSO2. Did your experience with the Existing Facilities Program influence **your firm** to incorporate additional **[INSERT 2]** at other facilities in New York State (excluding Long Island) that did not receive support from the Existing Facilities Program or any other NYSERDA program?

1. YES
2. NO **[SKIP TO ST1]**
96. REFUSED **[SKIP TO ST1]**
97. DON'T KNOW **[SKIP TO ST1]**

OSO2a. About how many other buildings were influenced (that did not participate in NYSERDA programs) over the last three years?

1. **[RECORD NUMBER OF BUILDINGS]**
96. REFUSED
97. DON'T KNOW

[IF NUMBER OF BUILDINGS OVER 40, CONFIRM]:

I have that you said there were **[NUMBER OF BUILDINGS]** buildings that did not participate in NYSERDA programs, but your experience with the Existing Facilities Program influenced **your firm** to incorporate additional **[INSERT 2]** at these facilities? Is that correct? **[CORRECT AS NECESSARY].**

[IF KWHType= 1, ASK OSO3; ELSE GO TO OSO4]

OSO3. Did the additional measures at these other buildings save natural gas?

1. YES
2. NO
96. REFUSED
97. DON'T KNOW

OSO4. Did the additional measures at these other buildings **[INSERT 6]**?

1. YES
2. NO
96. REFUSED
97. DON'T KNOW

[IF OSO3=01, READ SENTENCE BELOW AND ASK OSO5; ELSE SKIP TO INSTRUCTIONS BEFORE OSO8]

I am going to now ask a few questions about the buildings that save natural gas and did not participate in any NYSERDA programs.

OSO5. In how many buildings over the last three years did you or your firm provide these additional measures that saved natural gas?

1. [RECORD NUMBER OF BUILDINGS]
96. REFUSED
97. DON'T KNOW

[IF NUMBER OF BUILDINGS OVER 40, CONFIRM]:

I have that you said there were [NUMBER OF BUILDINGS] buildings that did not participate in NYSERDA programs that your firm aided with additional measures that saved natural gas over the last three years. Is that correct? **[CORRECT AS NECESSARY].**

For this series of questions we are looking for savings “on average” (not in aggregate) across the many facilities that might be affected.

OSO6a. On average, what is the approximate dollars per year saved on natural gas bills from these additional measures?

1. [RECORD DOLLAR ESTIMATE] **[GO TO OSO7]**
96. REFUSED **[GO TO OSO6c]**
97. DON'T KNOW **[GO TO OSO6c]**

[IF OSO6a = 97, ASK OSO6C, ELSE SKIP TO OSO7]

OSO6c. Can you please just provide us your best guess or I could give you some ranges and you let me know which one is your best guess at the dollars saved per year on natural gas bills from these additional measures?

1. YES, PROVIDE RANGES
2. DOLLAR ESTIMATE PROVIDED **[GO TO OSO6a AND ENTER ESTIMATE]**
96. REFUSED **[GO TO OSO7]**
97. DON'T KNOW

Existing Facilities Participating Vendor Survey 2011

OSO6d. OK, I will read a list of ranges and you can stop me when I've stated the range that would be your best guess. **[INTERVIEWER: STOP READING RESPONSES WHEN THEY GIVE A RESPONSE. IF THE RESPONDENT GIVES NO RESPONSE DURING READING OF LIST, ASK "So which of these ranges do you think might be correct? Do you need me to repeat a couple of them?"]**

1. Quite small or none
2. \$100 to \$499 annual natural gas bill savings
3. \$500 to \$999
4. \$1,000 to \$1,499
5. \$1,500 to \$1,999
6. \$2,000 to \$2,499
7. \$2,500 to \$2,999
8. \$3,000 to \$3,499
9. \$3,500 to \$4,999
10. \$5,000 or more per year in annual natural gas bill savings
96. REFUSED
97. DON'T KNOW

[IF OSO6d=10, ASK OSO6e, ELSE SKIP TO OSO7]

OSO6e. Can you please give me an approximate estimate within 5 to \$10,000?

1. [RECORD DOLLAR ESTIMATE]
96. REFUSED
97. DON'T KNOW

OSO7. To the best of your knowledge, over the last three years what percentage of these annual bill savings from natural gas measures at these non-program facilities would you say are due to your experience with the Existing Facilities Program?

1. [RECORD PERCENTAGE] **[ACCEPT 0-100]**
96. REFUSED
97. DON'T KNOW

[IF OSO4=01, READ SENTENCE BELOW AND ASK OSO8; ELSE SKIP TO ST1]

I am going to now ask a few questions about the buildings that **[INSERT 6]**.

OSO8. How many buildings over the last three years did you or your firm provide additional measures that **[INSERT 6]** due to your having participated in NYSERDA's Existing Facilities Program?

1. [RECORD NUMBER OF BUILDINGS]
96. REFUSED
97. DON'T KNOW

[IF NUMBER OF BUILDINGS OVER 40, CONFIRM]:

I have that you said there were **[NUMBER OF BUILDINGS]** buildings that did not participate in NYSERDA programs that your firm aided with additional measures that **[INSERT 3]** over the last three years. Is that correct? **[CORRECT AS NECESSARY]**.

- OSO9a. On average, would you estimate the **[INSERT 1]** from these other non-program facilities to be less than, similar to, or more than the **[IF KWHTYPE=1, INSERT AVG_KWH AND “Kilowatt hours”; IF KWHTYPE=0, INSERT AVG_KW AND “Kilowatts”]** **[INSERT 1]** from the **[INSERT 2]** incorporated through the Existing Facilities Program project?
1. LESS THAN
 2. SIMILAR TO **[READ TRANSITION SENTENCE BELOW THEN GO TO OSO10]**
 3. MORE THAN **[READ TRANSITION SENTENCE BELOW THEN GO TO INSTRUCTION BEFORE OSO9c]**
 96. REFUSED **[READ TRANSITION SENTENCE BELOW THEN GO TO OSO10]**
 97. DON'T KNOW **[READ TRANSITION SENTENCE BELOW THEN GO TO OSO10]**

For this series of questions we are looking for **[INSERT 1]** “on average” (not in aggregate) across the many facilities that might be affected.

- OSO9b. Of the non-program facilities that **[INSERT 3]**, what proportion of the **[INSERT 1]** seen in program facilities would have occurred? For example, if non-program facilities saved one fourth the amount of electricity compared to the facilities that participated in the Existing Facilities Program then the proportion of savings would be 25%.
1. **[RECORD PERCENT] [ACCEPT 0-99]**
 96. REFUSED
 97. DON'T KNOW

[ASK OSO9c IF OSO9a = 03, ELSE SKIP TO INSTRUCTIONS BEFORE OSO10]

- OSO9c. Of the non-program facilities that **[INSERT 3]**, what proportion of the **[INSERT 1]** seen in program facilities would have occurred? For example, if the same actions are taken in a non-program facility twice as big then savings would be 200%.
1. **[RECORD PERCENT]**
 96. REFUSED
 97. DON'T KNOW

- OSO10. To the best of your knowledge, what percentage of the **[INSERT 1]** from the measures at these non-program facilities over the last three years would you say are due to your experience with the Existing Facilities Program?
1. **[RECORD PERCENTAGE] [ACCEPT 0-100]**
 96. REFUSED
 97. DON'T KNOW

SECTION: ST – FIRMOGRAPHICS (STATISTICS)

Thank you for your time so far. I have a few more questions about your firm.

ST1. Is your firm a(n) . . . ? **[READ]**

1. Energy Services Company or ESCO
2. Architectural firm
3. Engineering firm
4. HVAC contractor
5. Lighting contractor
95. Or something else? (SPECIFY _____)
96. REFUSED
97. DON'T KNOW

ST2. What percentages of all your projects address the following areas? **[READ IF NECESSARY: "If half of all the projects your firm works on address lighting, then the response for lighting should be 50%. If all of your projects address lighting, then the response should be 100%."]**

- a. Lighting
- b. HVAC (Heating, Ventilation, Air Conditioning)
- c. Motors and drives
- d. Building Shell
- e. Load management/curtailment
- f. CHP (Combined Heat and Power)
- g. Process improvements (manufacturing, and/or water and wastewater)
- h. Other (Specify _____)

[PROGRAMMER NOTE: DOES NOT NEED TO ADD UP TO 100% AS PROJECTS CAN HAVE MULTIPLE AREAS ADDRESSED, SUCH AS LIGHTING AND HVAC]

1. [RECORD PERCENTAGES [ACCEPT 0-100]]
96. REFUSED
97. DON'T KNOW

ST6. Approximately how many full time employees or full time equivalents does your organization have at all your locations in New York State? **[READ IF NECESSARY: "In New York State, Excluding Long Island"]**

1. Fewer than 5
2. 5 to 9
3. 10 to 19
4. 20 to 49
5. 50 to 99
6. 100 to 249
7. 250 or More
96. REFUSED
97. DON'T KNOW

ST7. Is your company independent, or part of a larger company?

1. INDEPENDENT
2. PART OF A LARGER COMPANY
95. OTHER (SPECIFY: _____)
96. REFUSED
97. DON'T KNOW

ST8. How many locations/establishments does your firm have? **[READ IF NECESSARY: "In New York State, Excluding Long Island"]**

1. 1
2. 2 to 5
3. 6 to 10
4. 11 to 20
5. More than 20
6. NO LOCATIONS IN NY STATE
96. REFUSED
97. DON'T KNOW

[IF INTRO=INTRO2, SAY "NOW I'D LIKE TO ASK A SMALL SUBSET OF THESE QUESTIONS FOR THE PROJECTS AT [INSERT SITES]" AND ASK FR1-FR10C, INF1, AND OSO1 FOR EACH SITE.]

[IF INTRO=INTRO1 OR FR1-FR10C, INF1, AND OSO1 ASKED FOR EACH SITE, SAY "THAT COMPLETES THIS TELEPHONE SURVEY. THANK YOU VERY MUCH FOR YOUR ASSISTANCE!"]

Appendix C

Participant Persistence Survey

NYSERDA Existing Facilities Program
End-User for PLRP Program Participant Persistence Study Telephone Survey
Conducted by Impact Evaluation Team Engineers
Program Year 2001 to 2006

INTRODUCTIONS

Respondent Name: _____

Address: _____

City/State/ZIP: _____

Phone: _____

CustomerID: _____ Interview Date: _____ Interviewer Initials: _____

Targeted Demand Reduction: _____ kW Type: DG / LC / IM

Hello my name is _____ and I'm calling on behalf of the New York State Energy Research and Development Authority or NYSERDA. Our records indicate that the project at **[DESCRIPTION AND LOCATION]** participated in NYSERDA's Existing Facilities Program (EFP) and the demand response¹ program in **[YEAR]**. We are researching to assess the program's accomplishments and to improve services. Your firm was selected as part of a small carefully designed sample of participating customers and your feedback is very important to this research. Your responses to this survey will be kept confidential to the extent permitted by law.

SCR1. Our records show that your company participated in NYSERDA's Peak Load Reduction Program and a demand response or callable load program with NYISO (New York Independent System Operator) or Con Ed in **[YEAR]**. Do you recall your company having participated in either of these Programs?

1 YES

2 NO **[ASK FOR KNOWLEDGEABLE CONTACT]**

-96 REFUSED **[ASK FOR KNOWLEDGEABLE CONTACT]**

-97 DON'T KNOW → **[ASK FOR KNOWLEDGEABLE CONTACT]**

SCR2. I'd like to speak to the person in the company who was responsible for implementing equipment as part of participation in the Program. Would that be you?

1 YES

2 NO **[ASK FOR ALTERNATIVE KNOWLEDGEABLE CONTACT]**

¹ Demand Response (DR) or Callable Load Program: DR is essentially the reduction of electrical demand at the end-user level in response to high wholesale electricity prices, system resource capacity needs, or system reliability events.

Existing Facilities Persistence Study Survey

-96 REFUSED [ASK FOR ALTERNATIVE KNOWLEDGEABLE CONTACT]

-97 DON'T KNOW [ASK FOR ALTERNATIVE KNOWLEDGEABLE CONTACT]

[IF NO] Who at your company can best speak about the program participation in the program?

[RECORD THE NAME AND NUMBER OF THE NEW CONTACT PERSON BELOW, AND THEN FOLLOW UP WITH HIM OR HER.]

1. NEW CONTACT NAME AND PHONE NUMBER:

Name: _____

Phone: (____) _____ Extension: _____

[ONCE CORRECT PERSON IS CONTACTED, REINTRODUCE AND CONTINUE.]

P1. Is your facility currently a participant in a demand response or callable load program with NYISO (New York Independent System Operator) or Con Ed?

1. Yes

2. No

-96. REFUSED [ASK FOR ALTERNATIVE KNOWLEDGEABLE CONTACT]

-97. DON'T KNOW [ASK FOR ALTERNATIVE KNOWLEDGEABLE CONTACT]

[RECORD THE NAME AND NUMBER OF THE NEW CONTACT PERSON BELOW, AND THEN FOLLOW UP WITH HIM OR HER.]

1. NEW CONTACT NAME AND PHONE NUMBER:

Name: _____

Phone: (____) _____ Extension: _____

[ONCE CORRECT PERSON IS CONTACTED, REINTRODUCE AND CONTINUE.]

P2. According to our records your firm had participated in NYSERDA's Peak Load Reduction Program (now within the Existing Facilities Program). Then your firm would have also been part of a demand response or callable load program around the time of participation in the NYSERDA Program. This would have been in [YEAR] or shortly thereafter. Are you aware of your firm participating in a demand response or callable load program with NYISO (New York Independent System Operator) or Con Ed around that time?

1. Yes

2. No [AND IF P1=2, NO; -96 OR -97, DON'T KNOW GO TO P9]

-96. REFUSED [GO TO P9]

-97. DON'T KNOW [GO TO P9]

[ASK P3 IF P1 = 1, YES]

P3. Do you know the name of the demand response or callable load program?

1. Yes

- 2. No
- 96. REFUSED
- 97. DON'T KNOW

[ASK P4 IF P3 = 1, YES]

P4. What program is your firm participating in?

- 1. _____
- 96. REFUSED
- 97. DON'T KNOW

[ASK P5 IF P1 = 1, YES]

P5. Is the demand response or callable load program your firm is participating in one with NYISO (New York Independent System Operator) or with Con Ed?

- 1. NYISO **[GO TO P8]**
- 2. CON ED **[GO TO P8]**
- 96. REFUSED
- 97. DON'T KNOW

[ASK P6 IF P1 = 2, NO; AND P2 = 1, YES]

P6. Do you know why your firm discontinued participation in a demand response or callable load program?

- 1. Yes
- 2. No **[GO TO P9]**
- 96. REFUSED **[GO TO P9]**
- 97. DON'T KNOW **[GO TO P9]**

[ASK P7 IF P1 = 2, NO AND P6 = 1, YES]

P7. Why did your firm discontinue participation in the Program?

[GO TO P9]

[ASK P8 IF P1 = 1, YES AND P2 = 1, YES]

P8. Please describe the reason for continuing participation in the Program.

Existing Facilities Persistence Study Survey

[ASK P9 IF P2 = 1, YES AND P1 = 1, YES]

P9. Our record shows your service provider was **[SERVICE PROVIDER]** for the referenced project. Did you change the service provider since you registered with the Program in **[YEAR]**?

- 1. Yes
- 2. No **[GO TO P11]**
- 96. REFUSED
- 97. DON'T KNOW

[ASK P10 IF P9 = 1, YES]

P10. Why did you change the service provider?

[ASK P11 IF P9 = 2, NO; -96, or -97; CAN RESPOND DON'T KNOW OR NOT APPLICABLE]

P11. Please describe your experience with your old service provider and new service provider. (In terms of service, satisfaction, etc.)

Old Service Provider

New Service Provider

P12. The Program funded the installation of **equipment at [project location]**. What proportion of this is still installed in the facility, in percentage (%) terms?

_____ % **[IF 0% GO TO P15.]**

-96. REFUSED

-97. DON'T KNOW

P13. Are you still using this equipment to reduce your facility demand when requested to do so (by NYISO/Con-Ed)?

1. Yes

2. No **[GO TO P19]**

-96. REFUSED

-97. DON'T KNOW

P14. How is the demand reduced during the NYISO event?

1. Automatic through a programmed EMS, DR button, etc.

2. Manual

-96. REFUSED

-97. DON'T KNOW

P15. Is the system now working as well, better, or worse than it did right after installation and commissioning?

1. As well **[SKIP TO END OF SURVEY]**

2. Better. How much better? _____ %.

3. Worse. How much worse? _____ %

-96. REFUSED

-97. DON'T KNOW

P16. Did the demand reduction capacity change compared to the original registered demand reduction?

1. No **[SKIP TO QUESTION P22]**

2. Increased by _____ kW

3. Decreased by _____ kW

-96. REFUSED

-97. DON'T KNOW

P17. The measure was installed in **[YEAR]**. In what year did the performance change most?

Existing Facilities Persistence Study Survey

Year of change _____.

-96. REFUSED

-97 DON'T KNOW

P18. Why did the performance change?

[SKIP TO END OF SURVEY AFTER P18 ANSWER]

P19. When did you stop using the equipment funded by the Program?

Year/month _____.

-96. REFUSED

-97 DON'T KNOW

P20. Before you stopped using the equipment, did it work as well, better, or worse than it did the first year of operation (not counting commissioning)?

1. Better. How much better? _____ %.

2. Worse. How much worse? _____ %

-96. REFUSED

-97 DON'T KNOW

P21. Why did you stop using the equipment?

P21a. Is there anything that might get your company to resume participation?

- P22. Have you replaced the equipment installed through NYSERDA’s EFP with another device that performs a similar function?
 - 1. Yes
 - 2. No **[SKIP TO END OF SURVEY]**
 - 96. REFUSED
 - 97. DON’T KNOW

- P23. Did you receive funding for the new equipment? Who did you receive funding from?
 - 1. Yes **[SKIP TO END OF SURVEY]**
 - 2. No
 - 96. REFUSED
 - 97. DON’T KNOW

Please note down the organization funding the new equipment

- P24. Did the equipment initially implemented through the Program influence your decision to install a similar load curtailment device?
 - 1. Yes
 - 2. No **[SKIP TO END OF SURVEY]**
 - 96. REFUSED
 - 97. DON’T KNOW

[ASK P25 IF P24 = 1, YES]

- P25. How did the equipment provided through the NYSERDA’s EFP influence the installation of replacement equipment?

THANK YOU FOR YOUR TIME!

Appendix D
Memorandum: Level of Rigor
Assignment for On-Site M&V

Megdal & Associates **MEMORANDUM**

To: Judeen Byrne, NYSERDA Energy Analysis and the Evaluation Staff of the New York Department of Public Service (DPS)

From: Jon Maxwell, Satyen Moran (ERS), Kathryn Parlin (WHEC), and Lori Megdal (Megdal & Associates, LLC [M&A])

Subject: Rigor Assignment for the On-Site M&V

Date: November 16, 2010, revised February 21, 2011

This memorandum describes the process by which the engineering program evaluation “champion” assigns the “level of rigor” and IPMVP options to apply to each sampled project for site-specific measurement & verification.¹ The objective of the exercise is to maximize the value of engineering resources and deploy effort where evaluators can achieve the greatest reductions in measurement uncertainty in the final weighted results.

For quality control, consistency and ensuring maximum accuracy within the evaluation budget, a decision-making structure has been created for assigning rigor level for each site. These decision criteria are described in this memorandum. In assigning rigor, the champion is making decisions based on quantitative information from the program as well as consideration of qualitative factors. This combination makes the assignment process an art requiring an experienced evaluation engineer.

There are general steps that provide the logic for this decision-making process. The logic applies equally for all program evaluations with projects being evaluated at various levels of rigor. These include the program impact evaluations for Flexible Technical Assistance (FlexTech), Existing Facilities Program (EFP), and Industrial Process Efficiency (IPE)² Each bulleted step starts with a sentence or paragraph that generally describes the activity. Following the general description is an example of how this process is being conducted for the Existing Facilities evaluation.

1. Review the original estimates of the number of projects to be evaluated at each level of rigor. This is initially specified in the Work Plan but then is reviewed and revised after the program data for Existing Facilities is examined and the sample design is finalized.

¹ The enhanced, basic, and verification levels of rigor are defined in the *California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals*, April 2006. The impact evaluation team added a fourth level of rigor, “Verification with Spot Metering” that is between the levels of complexity of “Basic” and “Simple Verification.” The chief distinction between Basic and Verification with Spot Metering is that Basic includes logging of equipment performance over time and requires two site visits, whereas Verification with Spot Metering only requires instantaneous measurement or logging for a matter of hours during a single visit. Simple Verification typically does not involve any metering. The IPMVP Options are described in the *International Performance Measurement and Verification Protocol*.

² It does not apply to evaluation of NCP, an otherwise similar large commercial program with site-level M&V, because evaluators conducted all M&V for that project at the same highest level of rigor.

The Existing Facilities Work Plan specified the following levels of rigor, based on a preliminary required sample of 112:

<u>Level of Rigor</u>	<u>%Projects</u>
Enhanced / IPMVP Option B	50%
<i>For all large savings projects in the sample and for moderate savings projects that lacked prior evaluation-grade analysis through the Program. This level of rigor typically includes modeling of the process or building, calibrated against field measurement of specific equipment</i>	
Basic / IPMVP Option A	33%
<i>If the project delivers moderate savings and the evaluation engineer finds that the implementation-side M&V was conducted in a sufficiently rigorous and objective manner to permit leveraging the data. An analysis based on billing analysis would typically be in this level of rigor</i>	
Verification with Spot Metering / IPMVP Option A	17%
<i>Inspection or review-only verification, for the smallest savers or those whose savings were seasonally dependent and for which metering was not possible during the evaluation period</i>	
Total	100%

The final sampling design resulted in a sample of 105 and was expected to result in 90% confidence and 10% relative precision. The distribution planned after the sampling design was kept the same for the sampled sites.

2. Assign budgets equivalent to the lowest level of rigor for all projects that should not require vigorous M&V for “non-field” related reasons such as prior evaluation-grade M&V having been conducted.

In Existing Facilities evaluation this applies to the following projects:

- a. Projects that were analyzed in the prior Largest Energy Savers evaluation. The effort required to translate the results from that study to the needs of this study are low (but not negligible, due to multi-site sampling issues).*
- b. Projects that are also in the FlexTech sample and will be co-funded by the two evaluations with most of the evaluation funds provided by the EFP evaluation.*
- c. Projects that were evaluated during the prior round of evaluations.*

3. Assign “enhanced” level of rigor to the largest savings projects.

All the large projects with savings greater than 2 million kWh were checked to see if they would be a good candidate for the enhanced level rigor. Then a total of 50% projects were assigned the enhanced level rigor.

4. Assign the remaining enhanced rigor sites in the budget based on consideration of project size, technological complexity, and presence of multiple types of measures.

In Existing Facilities, the projects targeted for enhanced rigor included measures with central cooling, lighting, motors, and VFDs.

5. Split the remainder of the sample sites between Basic and Verification with Spot Metering primarily based the technological complexity for measurement. The second consideration is the measure reported savings.

6. Fine tune the allocations as lead engineers work through development of the site-specific M&V plans and budgets.

Occasionally, depending on initial discussion with the site staff, the level of rigor could be adjusted to accommodate the actual site condition. Overall the mix of adjustments to the assigned rigor level needs to be budget neutral, requiring some to go down as others are assigned a higher rigor level.

Appendix E
Presenting Two Examples of Cases
Working Through the
Free Ridership Algorithm

This appendix provides tables with actual survey responses and algorithm outputs for two cases to demonstrate the application of the FR (FR) algorithm discussed and presented graphically in the report's section on net-to-gross (NTG) methodology. To aid in the reading of this appendix, the next page repeats the graphic of the algorithm in Figure E-1. The remainder of the appendix details the results of the Program FR analysis. More descriptions of the variables and algorithm can be found in the main body of the report.

One of the two example cases selected illustrates adjustment due to a consistency check and the other does not. One has a matched building owner and vendor and the other has only data from a vendor. These are two of the major algorithm decision points.

Step 1: First Direct Free Ridership Estimate

There are two initial FR estimates (direct estimates) developed by site for each participating building owner and participating vendor referred to as the direct FR measurements. The first element of the first estimate is based upon the likelihood of each measure being installed. The second element reflects the proportion of that equipment (such as lighting) that would have been adopted without the Program. The third element is timing. The key issue is when the participant would have incorporated a similar measure or design, i.e., did the Program impact when the efficiency measure was installed. This factor adjusts FR for participants who installed measures earlier due to participation in the Program, as described below.

- If the participant would have installed the measure within one year, the direct measurement of FR described above is left unadjusted.
- If the participant would have eventually installed the measure, but not for five years or more, direct FR is multiplied by zero, indicating that the participant is not a free rider.
- Proportional adjustments are made for responses between one and five years.

Likelihood and share questions are asked for each measure. Timing is asked for the overall project. The survey questions on likelihood, share, and timing are provided in Table E-1 below.

Figure E-1. Schematic of the Survey Responses and How They Are Combined to Estimate Free Ridership

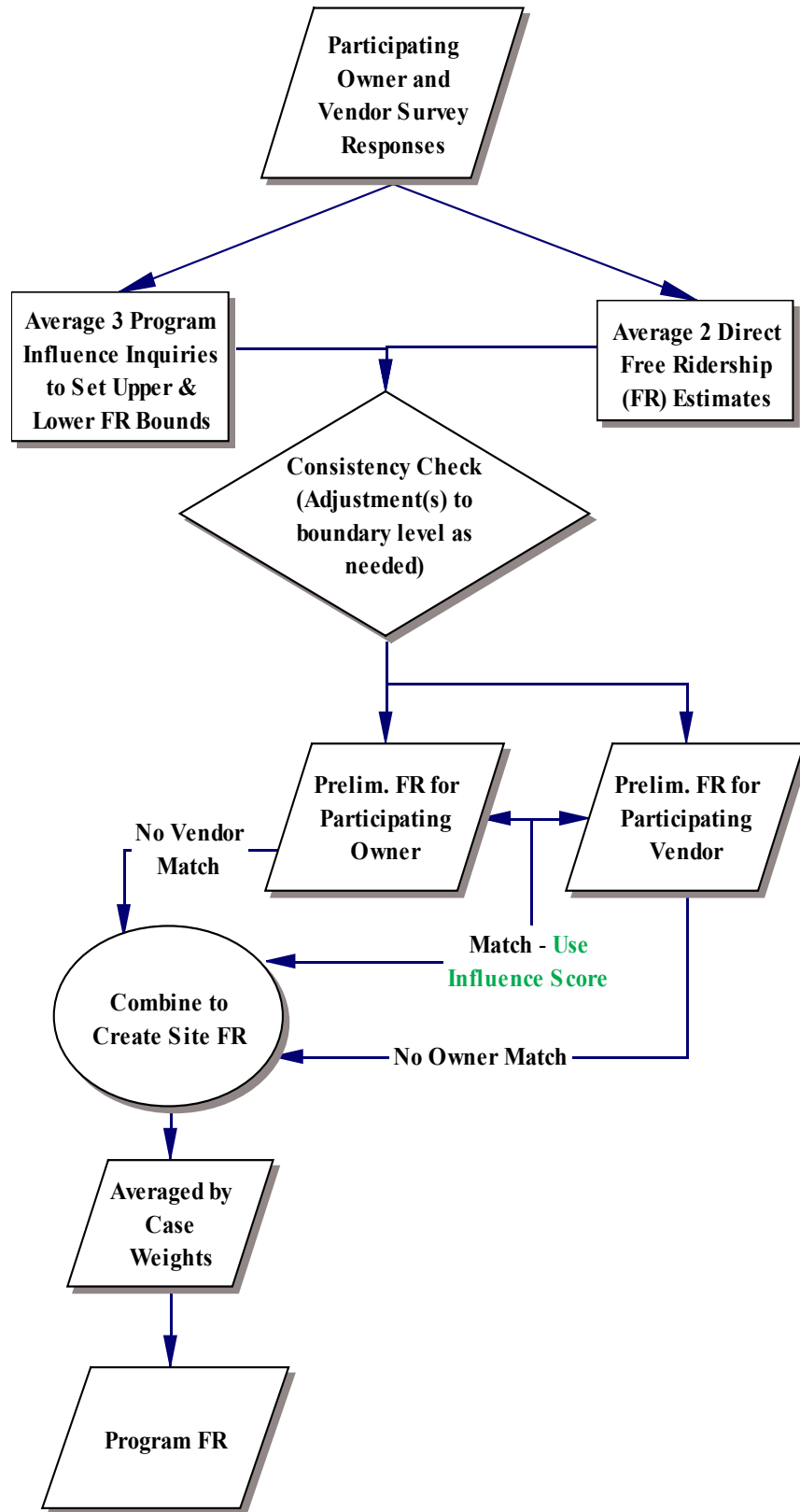


Table E-1. First Direct Free Ridership Likelihood, Share, and Timing Questions with Factor Calculations

Survey Question #	Survey Question	Factor, Where Applicable
FR7	What is the likelihood that you would have incorporated [measure] with the <i>same high level of efficiency</i> if you had not received financial/technical assistance from the Program?	Likelihood by measure
FR8	What percentage of this high efficiency [measure] would you have incorporated if you had not received financial/technical assistance from the EF Program?	Share by measure
FR1/ FR1a	In your opinion, did the financial and/or technical assistance that you received through the program cause you to undertake this project earlier than you would have without the Program? About how much earlier [in number of years]?	Timing factor: Less than or equal to 1 = 1.0 More than 1 year and less than 2 years = 0.75 More than 2 years and less than 3 years = 0.5 More than 3 years and less than 5 years = 0.25 More than 5 years = 0
First direct FR estimate		$[(FR7 \times FR8) \times Savings\ weighted\ across\ measures] \times Timing\ factor$

Table E-2 shows how the measure-level initial FR is used to derive direct FR1 for the three respondents in the examples.

Table E-2. First Direct Free Ridership Example Calculation

S: = Survey Question	Example 1 Owner Responses	Example 1 Vendor Responses	Example 2 Vendor Responses
S: Likelihood Measure 1 would have been adopted without Program (FR7)	0.5	0.5	0
S: Share of measure 1 that would have been installed without the Program (FR8)	0.4	0.5	0
S: Timing factor	--	1.0 (less than or equal to 1 year)	--
<i>First direct FR = FR7 × FR8 × Timing factor</i> ¹	0.2	0.25	0

¹ Timing was not given for owner in example 1 or vendor in example 2. In these cases the savings weighted initial FR was used for the first direct FR.

The examples are of single-measure projects. If the project consists of multiple measures, then the likelihood and share proportions are multiplied calculations completed for each measure and then savings-weighted to obtain a calculation across measures. The timing factor is then applied to calculate the project overall first direct FR estimate by site by market actor.

Step 2: Second Direct Free Ridership Estimate

The second direct FR uses survey inquiries that ask the participant to directly estimate, across all measures, the proportion of the total savings that would have been achieved without the Program. The participants are also asked to estimate the upper and lower bounds for their estimate. This “best” estimate is the second direct FR estimate. Table E-3 shows the responses for these questions and the second direct FR for the examples. Example 1’s owner had a second direct FR best estimate of 20%, example 1’s vendor had a best estimate of 30%, and example 2’s vendor had a best estimate of 100%.

Table E-3. Second Direct Free Ridership Example Calculation

S: = Survey Question	Example 1 Owner Responses	Example 1 Vendor Responses	Example 2 Vendor Responses
S: Best estimate of savings without Program second direct FR	0.2	0.3	1
S: Highest estimate of savings without Program	0.2	0.4	1
S: Lowest estimate of savings without Program	0.15	0.2	1

Step 3: Average Direct Free Ridership Estimates

The two direct FR estimates are averaged to develop a preliminary FR estimate for each participating site per respondent. The preliminary FR is 20% for the example 1 owner, 28% for the example 1 vendor, and 50% for the example 2 vendor as shown in Table E-4.

Table E-4. Averaging Direct FR1 and Direct FR2 Equals the Preliminary FR

	Example 1 Owner	Example 1 Vendor	Example 2 Vendor
First direct FR	0.2	0.25	0
Second direct FR	0.2	0.3	1
Preliminary FR	0.2	0.28	0.5

Step 4: Calculate of Free Ridership Bounds

As illustrated in Figure E-1, a consistency check is performed by comparing the preliminary FR estimates developed through the above described process to an average of responses to three questions regarding the influence of the Program.¹ The three survey questions that comprise the consistency check inquire about plans for high efficiency prior to Program participation, influence of the Program, and the respondents’ stated importance of the Program. The questions and scoring are as follows and as displayed in Table E-5.

¹ Over 20 years of experience in estimating self-report FR for energy efficiency program evaluation has set standards for quality FR measurement. One of these is to include additional inquiries and perform consistency checks across the inquiries. The FR calculation also needs to measure what would have occurred in the absence of the Program, not what the participant “intended” to occur (as many good intentions do not actually become results). Estimating the hypothetical construct of FR based upon a decision that the participant might never have faced is quite difficult. This enhances the importance of the measurement method to be designed for construct validity. This is more important to obtaining a rigorous FR estimate than sampling precision.

1. **Prior plans** – The participant is asked if they had any prior plans to install similar high efficiency measures as the measures received through EF. If so, they are asked to describe their plans for energy efficient installations made prior to participating in the Program. The interviewer then assigns a score for this level of planning that ranges from zero (indicating no plans) to four (indicating that the high efficiency equipment was selected and budgeted).
2. **Program influence** – Participants were asked if the EF Program influenced the type, number, or efficiency of measures installed. Those respondents who answered in the affirmative were asked to describe the Program’s influence on the decision to install high efficiency measures. The interviewer then rated the response from zero (indicating the Program had no influence) to four (indicating the Program was the primary reason that high efficiency equipment was installed).
3. **Program importance** – The participant was directly asked to rate the importance of the Program in their decision to install high efficiency measures on a scale of zero (indicating the Program was not at all important in the decision to install high efficiency equipment) to four (indicating the Program was very important in that decision).

Table E-5. Planning and Influence Questions for FR Adjustments

Survey Question #	Survey Question	Valid Responses	Factor, Where Applicable
FR3	Could you please describe any plans that you had to incorporate the measures prior to participating in the Program?	Verbatim with score recorded by interviewer based upon the following guidelines:	Planning score is inverted prior to being used as 1st of 3 influence scores
		0 = No plans for high-efficiency equipment; respondent may have considered alternative technology options, but did not explicitly consider high efficiency.	
		1 = Initial steps toward consideration of high efficiency such as requesting information on or discussing, in general, high efficiency with vendors or contractors.	
		2 = In-depth discussion or consideration of specific types of high efficiency equipment (e.g., lighting, HVAC, appliances), including their positive or negative attributes and costs.	
		3 = Identification of specific equipment manufacturers and models, including assessment of their relative costs and performance characteristics.	
		4 = High efficiency equipment and designs fully specified and explicitly selected or incorporated into project budget.	
FR5	Please briefly describe how the Program influenced your decision to incorporate high efficiency measures at this site. Include which part or feature of the Program (if any) had the greatest impact on your decision to incorporate the high efficiency measures at this site.	Verbatim with score recorded by interviewer based upon the following guidelines:	2nd of 3 influence scores
		0 = No influence on the decision to install high-efficiency equipment. All equipment would have been installed at the same efficiencies even without the Program.	
		1 = Program helped in making final decision on equipment that had already been thoroughly considered.	
		2 = Program lent credibility to the decision to invest in high efficiency and/or it provided information that helped expand the quantity, scope, or efficiency of the equipment.	
		3 = Program identified a significant number of specific high efficiency options that were installed but that had not previously been considered and/or Program was a major driver behind a significant increase in the quantity, scope, or efficiency of high-efficiency equipment.	
		4 = Program was the primary reason that high efficiency equipment was installed in the project.	

Survey Question #	Survey Question	Valid Responses	Factor, Where Applicable
FR6	On a scale of 0 to 4, where 0 is “not at all important” and 4 is “very important,” please indicate how important the Program (including its financial and technical assistance) was in the decision to incorporate high efficiency measures at this site.	0 Not at all important	3rd of 3 influence scores
		1 Slightly important	
		2 Somewhat important	
		3 Important	
		4 Very Important	

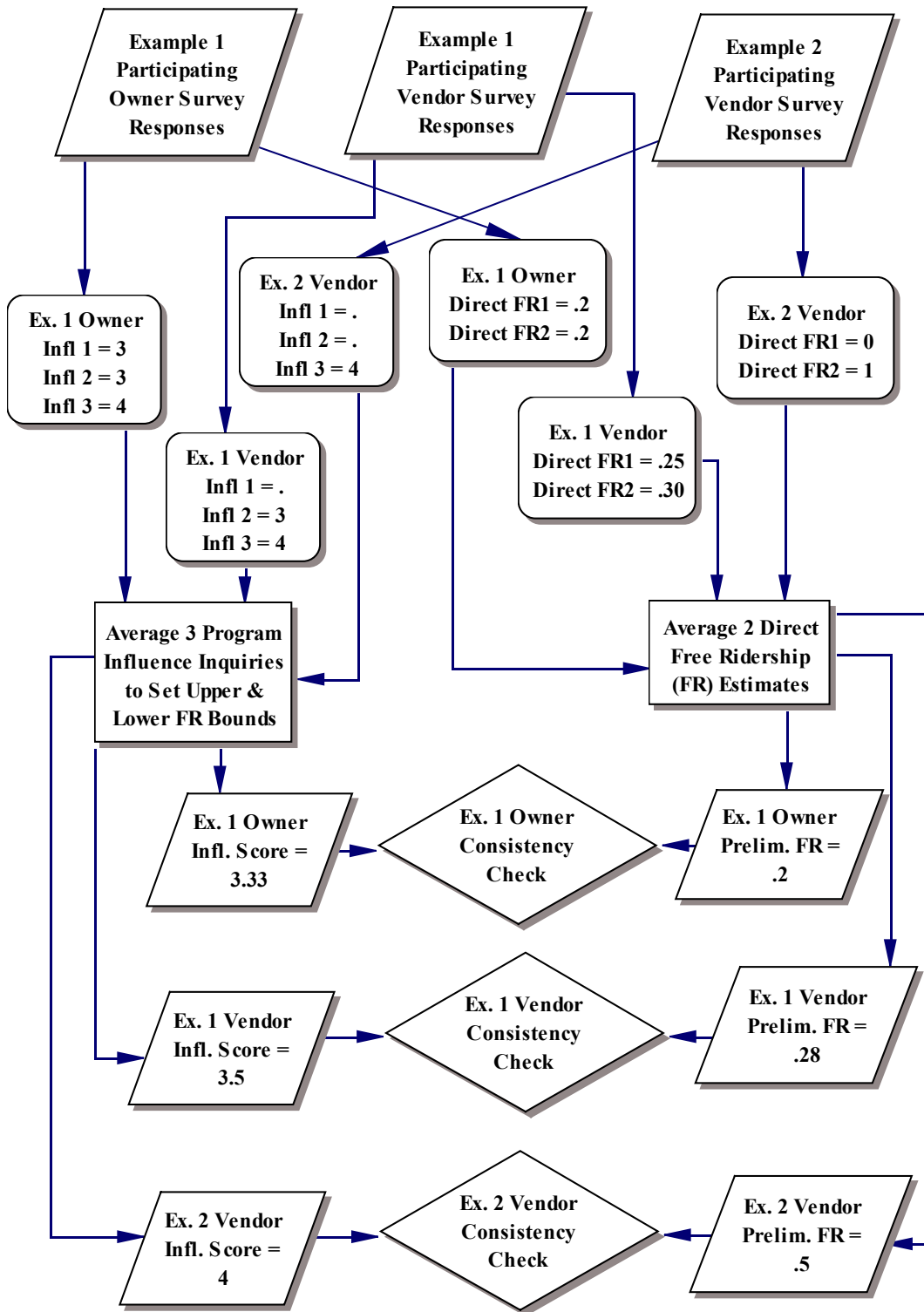
Responses for these three influence questions are provided for the case examples below in Table E-6 along with the average of the three scores.

Table E-6. Influence Survey Questions and Average Influence Score

S: = Survey Question	Example 1 Owner	Example 1 Vendor	Example 2 Vendor
FR3 on prior planning (Response then inverted prior to average)	3	Missing	Missing
FR5 influence on decision-making	3	3	Missing
FR6 importance score	4	4	4
Average influence score	3.33	3.5	4

Figure E-2 illustrates how each of the steps described above are applied through the FR algorithm schematic to derive the direct FR rates, direct FR averages, and average influence scores.

Figure E-2. Schematic of the Enhanced Self-Report Components and How They Are Combined to Estimate Free Ridership – Part 1



Note: A period (.) indicates no data.

The average program influence score was converted into an upper and lower bound range of plausible FR values. These are provided in Table E-7. A few of the lower and upper bound range for FR are as follows:

- If the average influence score is 0.33 or less then the lower bound is 75% FR and the upper bound is 100%.
- If the average influence score is 1.33 then the lower bound is 55% FR and the upper bound is 95%.
- If the average influence score is 2.5 then the lower bound is 5% FR and the upper bound is 55%.
- If the average influence score is 4.0 then the lower bound is 0% FR and the upper bound is 25%.

Table E-7. Conversion Table for Average Influence Scores

Position #	Average Program Influence Score	Lower Bound Direct FR Value	Upper Bound Direct FR Value
0-1	0.00-0.33	75%	100%
2	0.50	70%	100%
3	0.67	65%	100%
4	1.00	60%	100%
5	1.33	55%	95%
6	1.50	35%	85%
7	1.67	30%	80%
8	2.00	25%	75%
9	2.33	20%	70%
10	2.50	5%	55%
11	2.67	3%	50%
12	3.00	0%	45%
13	3.33	0%	40%
14	3.50	0%	35%
15	3.67	0%	30%
16	4.00	0%	25%

Step 5: Consistency Check – Limit Free Ridership Estimate to Bounds

If the participant's preliminary FR estimate falls below the lower or above the upper bounds of FR based on their average influence score, the final FR estimate for that site from that respondent is adjusted upward or downward to the edge of those bounds. In the examples, the preliminary FR for example 1's owner is consistent with his/her average influence score and so is the preliminary FR for example 1's vendor. The vendor preliminary FR for example 2 is 0.5 and the average influence score is 4. These are inconsistent (the preliminary FR is 50% while the three influence questions all have the highest scores possible). Using the conversion table for the upper and lower bounds creates the adjusted FR to be 0.25, the upper bound for an FR with the highest possible influence scores (4.0).

Step 6: Combine Owner and Vendor-Based Estimates

The next step is to derive an FR estimate for each site, combining FRs across owners and vendors when both could be interviewed for the site. One significant improvement in the FR method was made in this evaluation as compared to prior NYSDA evaluations. Previously the end user FR rates were averaged (savings weighted) and the vendor FR was averaged. Then these two averages were averaged together to produce the program's FR rate. The implication of a simple average of the end user and vendor FR estimates is that they carry equal weight. In reality the relationships between end users and vendors vary significantly. At one extreme, there may not be a vendor, i.e.,

the customer chooses what they want and just orders it; at the other end, the vendor may sell the customer on specific technology, potentially using the Program to help sell the idea of making the changes, and the customer relies totally on the vendor.

This evaluation asks a survey question regarding this relationship in the decision-making. Customer influence percentages are assigned from 0% to 100% in 25% increments. The customer versus vendor responses and the assigned percent customer influence is provided in Table E-8.

Table E-8. Customer versus Vendor Influence

Survey Question #	Survey Question	Responses	Customer Influence Percentage
INF1	We are interested in knowing how influential the customer at [site] was in selecting the efficiency/demand measure installed. Which of the following statements best describes the role of the customer for the decisions involving the greatest energy/demand savings?	1. The customer knew what equipment they wanted and its price and planned for this equipment and then you agreed with the choice.	100%
		2. The customer knew the equipment they wanted but needed confirmation on their choice and the cost for obtaining and installing that equipment. You provided the information the customer still needed for the decision.	75%
		3. The customer generally wanted energy efficiency/demand savings and you provided information and recommendations that enabled this equipment to be installed.	50%
		4. You suggested the energy/demand saving measure and then got a supporting opinion from the customer.	25%
		5. You chose the energy/demand saving measure without input from the customer and then the customer followed your recommendation.	0%
Vendor influence is 1 – customer influence.			

Sites with end user and vendor FR estimates are combined site by site by weighting the end user and vendor FR factors based upon a proportional influence score derived from the survey inquiry. This approach should result in a higher level of rigor for the FR estimate than the prior evaluation.

Table E-9 details the decision influence responses and the site FRs for the two examples. The vendor in example 1 provided a response of four to the customer influence question which creates a weighting of 75% of the vendor's FR and 25% of the end user's FR for that site. The sites FRs are then 26% for example 1 and 25% for example 2 (the vendor's FR estimate).

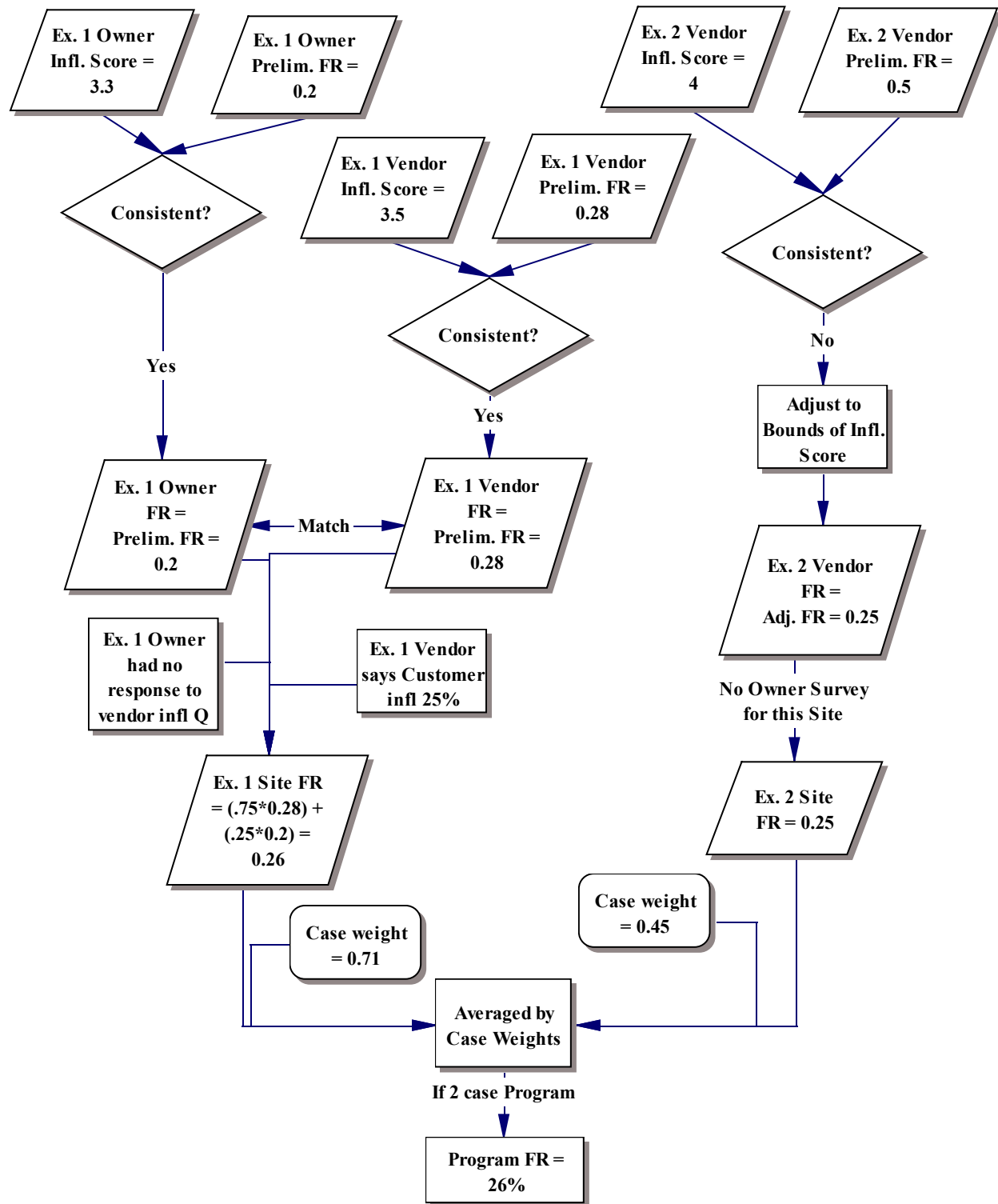
Table E-9. Extent of Market Actor Influence on Decision to Install

S: = Survey Question Extent of Market Actor Influence on Decision to Install	Example 1 Owner Response	Example 1 Vendor Response	Example 2 Vendor Response
S: Customer influence score (survey response)	--	4	5
Preliminary/adjusted FR	.20	.28	25%
Site FR	26% ^a		25%
<i>Site FR</i> = $(0.2 \times .25) + (0.28 \times .75) = 26\%$			

Step 7: Calculate Program-Level Free Ridership from Site-Level Estimates

These last steps in the FR algorithm are shown within the FR algorithm schematic for the two examples in Figure E-3. If the program only had these two participants then the program FR is the savings case weighted average across the two site FRs. Example 1 has a case weight of 0.71 and example 2 has a weight of 0.45. The Program-level FR from the two examples is then 26%.

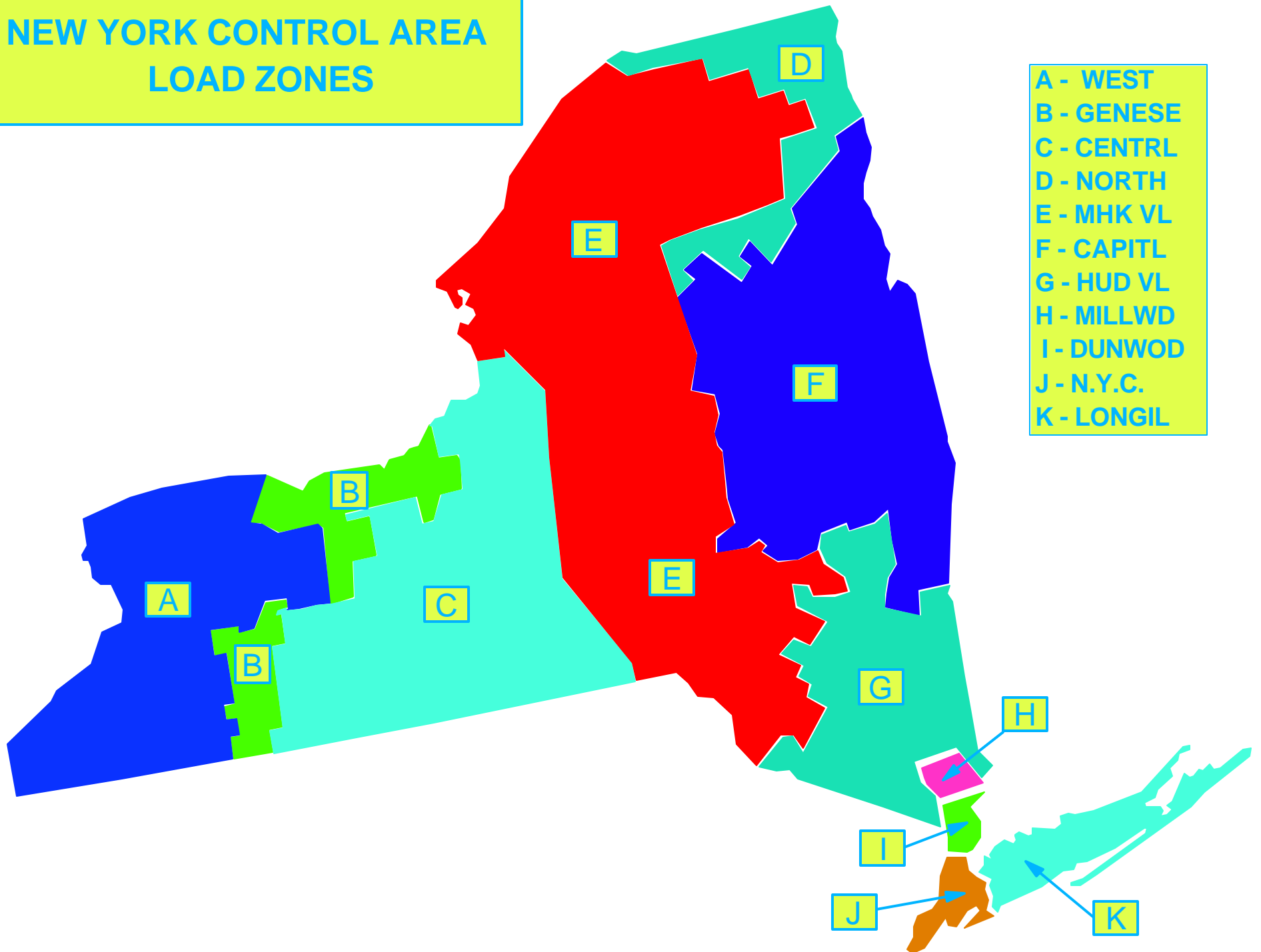
Figure E-3. Schematic of Survey Responses and How They Are Combined to Estimate Free Ridership – Part 2



Appendix F

NYISO Load Zone Maps

NEW YORK CONTROL AREA LOAD ZONES



- A - WEST
- B - GENESE
- C - CENTRL
- D - NORTH
- E - MHK VL
- F - CAPITL
- G - HUD VL
- H - MILLWD
- I - DUNWOD
- J - N.Y.C.
- K - LONGIL

NEW YORK CONTROL AREA LOAD ZONES

