DNV·GL

Massachusetts Commercial and Industrial Evaluation:

Learning from Successful Projects Final Report

Massachusetts Program Administrators and Energy Efficiency Advisory Council Consultants

Prepared by DNV GL

March 24, 2015

Project name:	Final Report
Report title:	Learning from Successful Projects
Customer:	Massachusetts Program Administrators & EEAC Conslutants,
Contact person:	Jeff Riggert
Date of issue:	3/17/15
Project No.:	
Organization unit:	
Report No.:	
Document No.:	

Table of Contents

1 EXECUTIVE SUMMARY

The Mass Save® Commercial and Industrial (C&I) program includes three initiatives: New Construction/Major Renovation, Direct Install (DI), and Large Retrofit (not direct install). Two of these initiatives—DI and Large Retrofit (LR)—target existing buildings. The DI program targets smaller[1] customers whose peak demand is <300 kW, and the LR program targets larger customers, but is open to all customers. The New Construction program targets new construction and major renovation projects, and includes all prescriptive measures, a major part of the program. All three of these initiatives include incentives for both gas and electric energy efficiency measures.

Among the projects incented by the Mass Save C&I initiatives, some may experience higher levels of success than others. While some variance is to be expected, it is important to understand the drivers of success so that these effective practices can be generalized and duplicated elsewhere. This study seeks to increase energy savings across Mass Save C&I energy efficiency projects by:

1. Developing definition(s) of what constitutes project success.
2. Using a variety of data to identify projects that meet the criteria of a successful project.
3. Identifying the factors that contributed to a project's success, trends and indications of replicability or uniqueness.
4. Recommending approaches to generalize and duplicate factors that contribute to project success.

1.1 Evaluation Approach

In order to investigate successful projects, it was essential to identify factors influencing project success. DNV GL began by conducting in-depth interviews with six Program Administrators (PAs) and an Energy Efficiency Advisory Council (EEAC) consultant to identify characteristics of successful C&I efficiency projects in Massachusetts.[2]

Informed by this qualitative assessment, the study team then reviewed the customer billing and program tracking data to develop quantitative metrics for defining and evaluating potentially successful customer projects. Working collaboratively with the PAs and EEAC, the team identified four potential metrics that draw on both qualitative and quantitative criteria:

1. **PA-identified**. This metric categorized a project as successful if a PA identified that project as being exceptionally successful during the in-depth PA interviews.
2. **MOU-signing**.[3] This metric flagged projects as potentially successful if they were undertaken by customers that signed memorandums of understanding (MOUs) with PAs in 2012 and 2013.
3. **Three-year repeat participants.** This metric flagged projects as potentially successful if they were undertaken by customers with repeat participation in energy efficiency programs in 2011, 2012, and 2013.
4. **Combination metric indicated**.[4] This metric evaluated projects based on a combination of depth of savings[5] (amount of lifetime energy savings in relation to customer size) and breadth of savings (measure type diversity).[6]

[1] Small customers have demand less than 300 kW, and medium customers are those with demand between 300 and 750 kW.

[2] Generally speaking, an individual project was defined as some or all of the energy efficiency measures installed at a customer facility in the 2012 program tracking year.

[3] Memorandum-Of-Understanding - National Grid uses the acronym "SEMP" to refer to "MOU." In this report, we use the term "MOU" in the broadest generic sense (inclusive of SEMP).

Significant collaborative iterations with the PAs and EEAC consultants occurred before establishing these metrics by which success could potentially be measured.

Once the four metrics were defined, the study team used them to identify a diverse group of potentially successful projects from the C&I program tracking and billing data as well as a comparison group of projects that did not possess any of the four metrics of success. It is important to note that among C&I projects there cannot be one single metric of success. Instead, each of these metrics was chosen as it points to a different type of success. Using all four metrics to identify the potentially successful projects allows us to speak to a diverse cross-section of potentially successful projects and increases the odds of identifying specific factors that affect project success.[7]

DNV GL interviewed a sample of C&I customers who participated in projects from the successful and comparison groups in order to learn more about their perspectives on factors contributing to project success. The interview findings were compared with the PA/EEAC interviews and analyzed to provide insight into the factors that contribute to project success and to inform our recommendations on how the PAs might replicate these factors in order to increase the prevalence of successful projects.

Figure 1-1 shows the relationships of the evaluation tasks for this study.

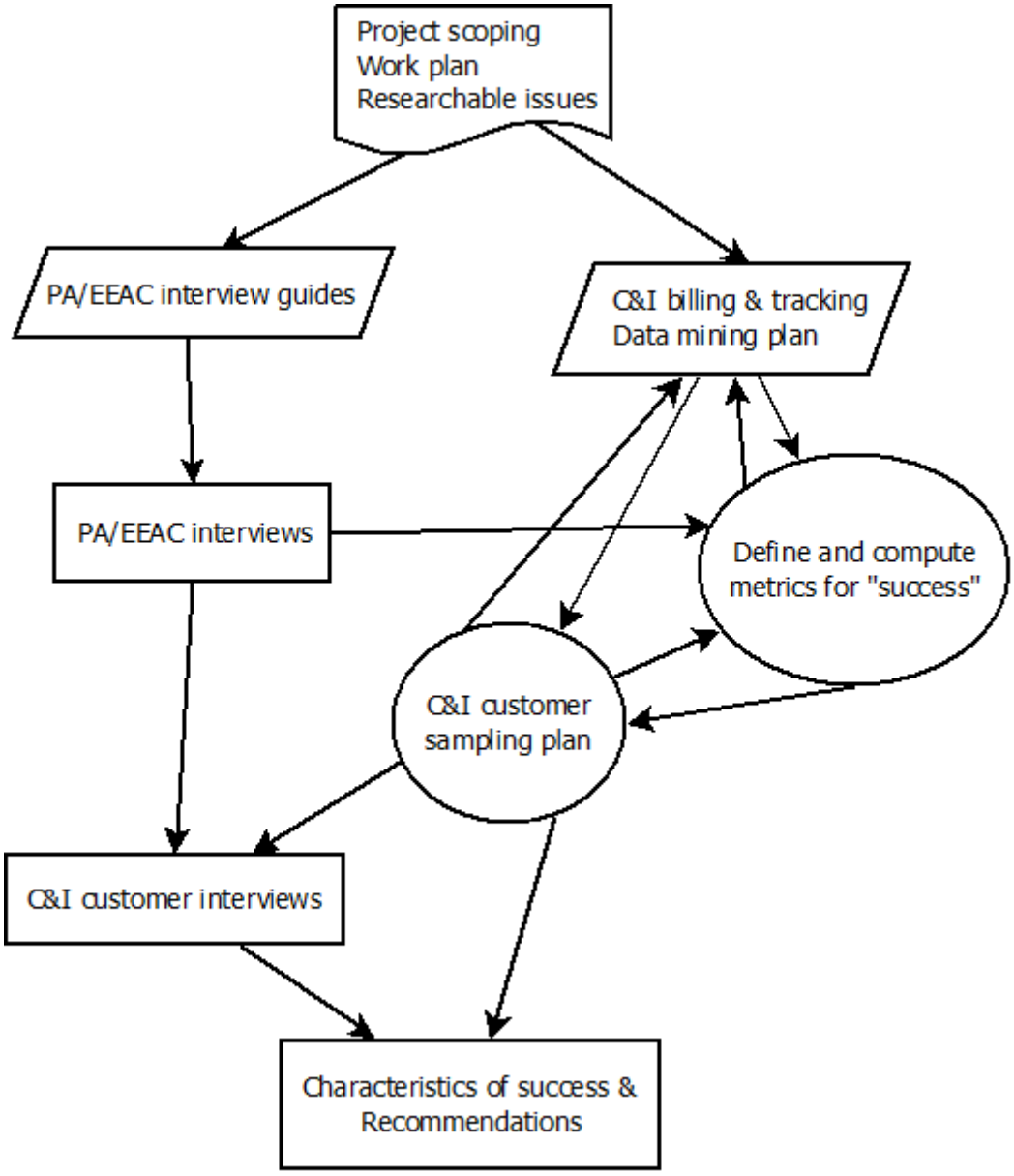
[4] The combination metric—despite being the least rigorous (mainly because of its greater sensitivity to raw data error)—and the PA-identified indicator are the most broadly applicable across varied project types and customer sizes. The MOU-signing metric is currently the most narrowly applicable, because it only applies to a smaller subset of customers that are large and usually institutional in nature.

[5] DNV GL Project #7 (General Process Evaluation-Final Report: MA Energy Efficiency Programs "Large C&I Evaluation," Feb. 16, 2011) defined deep savings as a "higher level of energy savings per project than typical." Page 1-6.

[6] The evaluation team deemed it necessary to include not just tangible quantitative metrics, but also a qualitative metric to identify and characterize successful projects. This is because characteristics of success are intrinsically diverse, and—within a given characteristic of success—variation exists (not discretely "capture-able") because of diversity among projects and customers. At this time, it is not viewed as possible to comprehensively capture success with a single metric. The use of several quantitative metrics goes some way further towards a more comprehensive definition, but a qualitative indicator is still needed.

[7] For example, since three-year repeat participating and MOU-signing customers are generally larger customers, another metric to indicate success across projects from all customer size strata was needed. Our research found that the combination metric best fits the bill for identifying potentially successful projects among small and medium-sized customers as well as larger customers.

Figure 1-1: Evaluation tasks flow chart



1.2 Key Findings

Successful C&I energy efficiency projects are too diverse and complex to be defined by any known singularity. In fact, it may not be possible to find the underlying drivers of success with any single metric or catalyst. However this evaluation, by using multiple metrics and defining multiple catalysts, does shed some light on what factors increase the likelihood that projects possess characteristics of success.

The evaluation approach described above consisted of three primary research tasks: 1) in-depth interviews with PAs and an EEAC consultant, 2) in-depth interviews with C&I customers, and 3) metric development and data mining. Table 1-1 presents the high-level findings from these three efforts. Specifically, the table

presents the factors leading to success identified during our interviews with the PAs/EEAC (indicated by a check mark in the PAs/EEAC column), cross-referenced with the factors noted during customer interviews (indicated by a check mark in the C&I Customers column). The factors are further grouped by Success Categories. We also include a column for those factors that were found to be measureable in the program tracking data (indicated by a check mark in the Data Mining column).

As shown, there is significant overlap between the success factors indicated by the PAs/EEAC and those indicated by the C&I customers. DNV GL finds that those factors noted by both the PAs/EEAC and C&I customers are those most likely to affect the success of a given project since both key parties involved in a given project view them as such. Two categories, Energy Saving Expansion and Proj-o-graphics, are identified as success factors in the PA/EEAC interviews, but are not identified by C&I customers. It is interesting to note that these two categories are also the categories most likely to be measureable in the tracking data, while the categories mentioned most often by customers rarely have a corresponding metric in the data. This indicates that the success factors valued by customers are the “softer” intangible factors like relationships, while the success factors favoured by the PAs/EEAC are both the “softer” and “harder” measurable factors like total savings or measure diversity. The PAs/EEAC viewed relationships as important means for achieving tangible results.

Table 1-1: C&I Project Success Factors

Success Category*	Success Factor / Indicator	PAs / EEAC	C&I Customers	Data Mining
Communication & engagement	Ease or difficulty of making contact		√	
Communication & engagement	Good, open communication and understanding	√	√	
Communication & Engagement	ID correct level of customer engagement	√		
Communication & engagement	Program staff; reputable, trusted and relied upon by customer	√	√	
Communication & engagement	Contractors with competence & expertise	√	√	
Communication & engagement	Use of Project expediters & trade allies	√		
Communication & engagement	Trade ally engagement of customers	√	√	
Education & training	Case studies	√	√	
Education & training	Training & technical assistance	√	√	
Financials, incentives & NEBs	Financing mechanisms	√	√	
Financials, incentives & NEBs	Negotiated incentive offerings	√		
Financials, incentives & NEBs	Project is environmentally "green"	√	√	
Financials, incentives & NEBs	Project yields customer relevant NEBs	√	√	
Precision & forecasting	Accuracy of project related information	√	√	
Precision & forecasting	Project reliably achieves desired and expected energy savings	√	√	√
Program admin. execution & delivery	Contract management and administrative efficiency	√	√	
Program admin. execution & delivery	Minimal disruption to customer operations	√	√	
Program admin. execution & delivery	On-time project completion	√	√	
Other	Energy "champion" (e.g. organizational drives)	√	√	
Other	MOUs/Multi-year agreements	√	√	√
Other	Repeat participation	√		√
Energy savings expansion	Broad energy savings (measure diversity)	√		√
Energy savings expansion	Bundle multiple measures into single project	√		
Energy savings expansion	Deep energy savings	√		√
Energy savings expansion	Dual fuel projects	√		√
Proj-o-graphics	Building type	√		√
Proj-o-graphics	Customer size	√		√
Proj-o-graphics	Fuel type			√
Proj-o-graphics	Measure end use	√		√
Proj-o-graphics	PA characteristics	√		√
Proj-o-graphics	Program / Initiative type	√		√

*Some factors are not discrete to one category.

1.3 Recommendations

To expand the occurrence of successful projects, DNV GL recommends the actions described below. These recommendations are aimed at increasing the occurrence of the success factors listed in Table 1-1 and are supported by DNV GL's research efforts across the C&I portfolio. The recommendations are presented in relation to the factors discussed above.

1.3.1 Communication & Engagement

Leverage trade ally customer relationships to increase customer engagement and communication. Both PAs and customers interviewed noted that the use of trade allies to engage customers was a key to project success. This holds true both for 1) the smaller customer segments, where the sheer number of customers makes it cost-prohibitive for repeated engagement from PA staff and for 2) larger PAs where the services of project expeditors are used to augment PA program staff and increase contact with large and medium sized customers. The PAs can continue to leverage trade allies to increase the likelihood of achieving any number of the success factors related to customer engagement and communication listed in Table 1-1.

1.3.2 Education & Training

Increase emphasis on vendor training.[8] Both PAs and customers interviewed noted that training was a key contributor to project success. By increasing the emphasis on training vendors and other technical staff, the PAs will encourage and support more frequent installation of energy saving measures. Also, increased trade ally training, support and competency are important because of the strong direct relationship trade allies have with customers.

Promote and leverage incentives. The PAs noted that it is important to educate customers about the totality of what they are getting from the programs. One Massachusetts program, the Bright Opportunities Program, provides upstream incentives to distributors to buy-down the cost of energy efficient LEDs and linear fluorescents; these incentives in turn get passed down to the retail and customer levels. Many customers don't know they are getting a discount for these lighting technologies. Program implementers can educate customers about all types of incentives as a way to increase the depth and breadth of energy efficiency measures included in projects.[9] When customers realize they are being offered additional discounting, they are more likely to feel more successful, decide to act, and install more measures and/or projects.

Explore ways for customers to build internal expertise and capacity to manage projects. This may take the form of a shared energy manager position to serve multiple mid-sized customers. The PAs suggested that more could be done to help customers build internal expertise and the capacity needed to implement projects. A shared energy manager could help provide expertise for smaller and mid-sized customers, unable to afford a dedicated energy manager on their own.

1.3.3 Financial Incentives & NEBs

Emphasize the Value of NEBs and "Being Green". Both PAs and customers noted that NEBs, as well as a perception of "being green," are factors that influence a project's success. Oftentimes, the NEBs and "green" aspects of a given project will go unnoticed as stakeholders focus solely on the dollars saved. By marketing the NEBs and other intangibles associated with specific projects or

[8] Historically, there is a greater occurrence of electric measure installation. Other studies have indicated greater emphasis on gas measures in vendor training may be worthwhile. This is seen in the 2011, 2012 and 2013 Customer Profile projects as well as being reflected in the breadth metric discussed in Section 6 of this report. There are fewer opportunities (i.e., less end uses and measures) in gas. Most potential studies and even legislated goals show lower savings for gas compared to electric.

[9] Recommended on page 1-13 of Project-17 Final Report, Process Evaluation of the 2012 Bright Opportunities Program. June 14, 2013.

specific project types, the PAs will increase the potential for project success. It should be noted that case studies are mentioned by both PAs and customers as training and education tactics that lead to project success. The PAs should consider producing case studies that emphasize both project NEBs and the greener aspects of energy efficiency.

1.3.4 Precision & Forecasting

Ensure the Accuracy of Technical Review and Assistance. PAs indicated the importance of "measure twice and cut once." By ensuring that the technical aspects of a project are as accurate as they can be, the PAs will ensure that the project is set up for success. A project that grossly overestimates project savings could still save a significant amount of energy, but will not be viewed as a success by the customer given the high expectations that were set at the outset of the project.

Leverage the results of EM&V site reports. For PAs not doing so already, the results of individual EM&V site evaluations may be used as a mechanism for quality assurance, accuracy and project specific feedback. For example, the PAs could follow up with a project receiving a particularly low (or high) realization rate to determine if there were any issues with the project that went unaddressed. It should be noted, however, that the EM&V work is driven by a random sample of projects and this type of exercise would not replace program QA/QC efforts.

1.3.5 Program Execution & Delivery

Focus on Eliminating Project Delays and Intrusions. It comes as no surprise that projects that are completed on time and with little hassle are viewed more favorably by all parties involved, including both customers and PAs. While the PAs can only exert so much control over the participation process, it is worth assessing participation at regular intervals to determine if there are any improvements to be made. PAs could explore what causes project delays and develop tracking mechanisms and processes to monitor and continually improve services to ensure customer schedules are maintained.

1.3.6 MOUs

Small PAs should adopt a simpler form of the MOUs used successfully by larger PAs. Having a signed MOU was one of the metrics used to identify customers with successful projects, and it was cited as a criterion for success during PA interviews. The PA Differences project found that the smaller PAs have very few large customers that can implement large projects, which are historically a key to achieving savings goals. To increase the critical savings stream from large customers, we recommend that smaller PAs consider adopting a process similar to the formalized MOU that focuses on planning for energy efficiency over time.

1.4 Limitation of Research

There were two limitations to the research. First, there was some subjectivity to the selection and definition of metrics. Second, the research used a single year of tracking data, the 2012 program tracking data, merged with the 2011 billing data, and applied the new metrics developed in this study to that dataset.[10] The use of only one year of program tracking data (2012) limited the effectiveness of the combination metric: (depth-of-savings)+(breadth-of-savings) as a stand-alone tool to measure success, especially for three year repeating customers. This limitation happens when larger customers spread projects out over many years, thereby muting the amount of new savings in any one year. However, the study team attempted to address this limitation by using other metrics (e.g. MOUs) to find successful projects among larger customers. In addition, the PA identified projects occurring in years other than 2012 were not included in the data mining analysis (section 6), thereby limiting the project level information that was included in that part of the study.

The combination metric in its current form (and used as a stand-alone metric) does have applicability when examining smaller projects, to compare one small project to another within a given program tracking year. Smaller customers tend to install multiple measures in one single year, and then not show up as participants again for a number of years.

[10] It should be noted that the study team did create a flag for participants in the 2012 data set who also participated in 2011 and/or 2013.

2 INTRODUCTION

This report explores how successful Massachusetts Commercial & Industrial (C&I) energy efficiency projects occur, so that these practices can be generalized and duplicated elsewhere. Differences and similarities in how customers define and experienced success was the focus of this study.

In 2013, during the final project planning meeting regarding research specifics, PA and EEAC representatives advising DNV GL on this research were vocal about the importance of normalizing energy savings across projects when evaluating project success quantitatively. They suggested we normalize data by examining energy saved by project cost and/or size. PAs further emphasized that relaying information about energy savings without benchmarking it to project size and/or cost may be not useful. As such, assessing available data and proposing a way to normalize data were the first steps within the data mining task. Data mining was an important tool to help identify successful projects, which were then examined and compared to projects in general.

To accomplish the goal of understanding how successful projects came about, C&I projects were defined—and examined by applying the metrics. In particular, the PAs expressed interest in knowing why some projects are more successful than others. Knowing why could potentially lead to improvements in program design and, in turn, increased energy savings.

DNV GL took the following steps to address the research:

- Conduct data mining to identify and segment projects by energy savings as a percentage of usage among a variety of C&I customers across the PAs. Segments included higher than average, average, and below average savings, and (where possible) represented the variety of customer sizes and types.
- Define potential indicators of project success beyond the reported energy savings by interviewing PA and EEAC representatives about what contributes to or detracts from project success.
- Develop successful project definitions based on initial in-depth interviews and data mining findings.
- Use approved success metrics to selectively sample small, mid-sized, and large C&I program participants representing a variety of customer types.
- Compare and contrast project experiences and perspectives through in-depth interviews with a sample of participants that had completed projects identified in each metric category (MOU-signing, PA identified, 3-year repeating, combination-metric criteria meeting).
- Identify and report on factors (common or unique) and project characteristics that have contributed to project success—or the lack of success—across the PAs.

This project involved three primary research tasks, including: 1) in-depth interviews with PAs and an EEAC consultant, 2) data mining and metric development, and 3) in-depth interviews with C&I customers. The data mining task utilized billing and program tracking data across multiple utilities. To support this task, energy-efficiency measure-level billing and tracking data (n~70,000) were linked and rolled up to the project level (n~16,000). Generally speaking, an individual project was defined as some or all of the energy

efficiency measures installed at a customer facility in the 2012 program tracking year.[11] If a facility had multiple customer accounts, it may have had multiple projects associated with it. Electric projects were identified separately from gas projects.

Three new quantitative metrics were developed to attempt to identify potentially successful projects from the dataset. These included metrics for:

- Customers who signed memorandums of understanding (MOU) with PAs in 2012 and 2013.
- Customers with repeat participation in energy efficiency programs in 2011, 2012, and 2013.
- Customers achieving a high level of both depth of savings (amount of lifetime energy savings in relation to customer size) and breadth of savings (measure type diversity).

These metrics were leveraged to identify a sample of potentially successful projects. Projects specifically identified as successful by PAs were also blended into this sample. A comparison group of average and less-successful projects was also sampled for customer interviews.

In-depth interviews were administered to PAs, customers with successful projects, and customers that had projects which were not identified as successful through any of the quantitative metrics or PA interviews. Differences and similarities in how respondents define and experienced success was the focus of this study. The interviews covered topics including customer decision making, project implementation, customer and contractor relationships, energy and non-energy impacts, and free-ridership.

This report includes detailed findings for the sample groups and for a similar data mining analysis applied across all Massachusetts C&I projects logged in the 2012 program participation year. The analyses compares qualitative and quantitative indicators of project success across an array of firm-o-graphics and proj-o-graphics, including customer size, fuel type, energy end use, initiatives/program type, size of utility, and industry sector.

[11] There is not a single definition for what constitutes a project across all PAs. Project IDs are generally assigned by PAs. The precise definition may vary from one PA to another. In general, a project is a group of measures installed at a physical site (or customer account). An account ID is something the PAs assign. It generally correlates to a meter. A site address is the physical location of a site, generally in the form of a mailing address. An address can have multiple accounts and vice versa. An address/account can have multiple projects. The inverse is possible, but unlikely.

3 METHODOLOGY

The methodologies used for the three primary research tasks are detailed in this chapter. These tasks included: 1) in-depth interviews with PAs and an EEAC consultant, 2) data mining and metric development, and 3) in-depth interviews with C&I customers.

3.1 In-Depth Interviews of PAs

DNV GL conducted in-depth interviews with six PAs and one EEAC consultant to uncover factors that lead to project success. Table 3-1 identifies the interview participants, their affiliations, and their titles.

The qualitative results of these discussions are detailed in Chapter 4 of this report. The interview guide included questions about personal roles and background, defining and specifying project success, project initiation, decision making, implementation, and impacts. During interviews with the PAs, we identified and discussed in detail 12 specific projects that were deemed to be especially successful. Appendix C provides the interview questionnaire.

Table 3-1: Phase 1 PA and EEAC interviewees

PA or EEAC organization	Name	Title
Berkshire Gas	Robert Gyurjan	Lead Analyst-Energy Services
Cape Light Compact (CLC)	Meredith Miller	Commercial & Industrial Program Manager
EEAC (CX Associates)	Jennifer Chiodo	Consultant with CX Associates
Liberty Gas (Formerly New England Gas)	Matt Zenni	C&I Program Manager & Evaluator, Energy Efficiency
National Grid	David Gibbons & Ezra McCarthy	Lead Analyst, C&I EE Program Strategy, MA
Northeastern Utilities (includes NSTAR & WMECo)	Nelson Medeiros	Supervisor, C&I Implementation
Unitil	Tom Palma	Manager Distributed Energy Resources

3.2 Data Mining and New Metrics Development

The interim report included a summary of findings from the Phase 1 in-depth interviews with PAs and an EEAC consultant, a first round of proposed metrics, and statistical outputs generated from the application of these new metrics to the program tracking and customer billing data. After submittal of the interim report on July 21, 2014, comments were returned from nine evaluation team members, and we implemented a collaborative process to refine the proposed metrics and sampling approach.

Concurrent with the reporting, presenting, and discussion activities, we examined and manipulated the C&I billing and tracking data to determine and facilitate development and application of new metrics. We also conducted a second, third, and fourth round of statistical outputs and analyses.

3.2.1 What Was Achievable and not Achievable with C&I Billing and Tracking Data

Table 3-2 summarizes the results of several meetings—concluding in a final meeting on September 9, 2014—where metrics for success were discussed by the evaluation team. The table summarizes the pros and cons of the eight metrics discussed during the September 9 meeting. This was not intended to be an exhaustive list, but instead to foster the discussion and modification that followed the meeting. The final four metrics ultimately chosen for use in this evaluation are displayed in bold text in the table below. As part of the data mining effort, the evaluation team examined a number of potential measurement activities that were scoped

in the final work plan in order to confirm which measurements were possible given actual 2012 program tracking data and 2011 customer billing data available in-house from the PAs. Please see Table 3-2 for details.

Table 3-2: Eight new metrics, pros and cons (the four chosen metrics are presented in bold text)

Metric	Calculation	Pros	Cons	Result of Sept 9th Call
Depth of Savings, v1	Total Project Cost / Annual Customer Energy Usage	Broadly applicable, captures level of dollar commitment relative to customer size	Not necessarily capturing measure diversity or longevity. Data issue	Not confident about total project cost in how good it is in tracking data, especially prescriptive projects.
Depth of Savings, v2	MMBTU Lifetime / Annual Customer Energy Usage	Levelized lifetime savings (MMBTU) captures measure life and is more reliable data than what we have for project cost.	Not necessarily capturing measure diversity. And this metric might skew for small customers because of their smaller denominator, but	Favored over "v1" in the row above, as a metric for depth of savings.
Breadth of Savings	Count of Measure Type per Project (with unique end use)	Captures measure diversity	Only looks at measure diversity, and only presence of diversity, not even-ness of it.	This is only a dummy variable and not a computation of the proportion of energy savings contribution by end use type
Combination-metric: Depth-v2 (MMBTU) + Breadth	**Sample only customers who score high on both and using "v2" for depth**	**Captures both depth and breadth**	**Still may favor new construction**	**General consensus, is that using Combination-metric is better than using a single metric**
Measure Life	Average life of measures for project	Captures lifetime energy savings, not just first year savings	Skews in favor of measures with long measure life (aka CHP) that may not be broadly applicable for many customers	There are some short-lived measures like retro-commissioning with 3-5 year measure life, that we consider successful would be ignored by this metric
PA identified customers with Memorandum of Understand (MOUs)	**Flag variable for MOUs**	**Presence of a MOU good indicator of customer commitment to energy savings**	**Only used for large and institutional customers. No variable for MOU currently in the tracking data available to DNV GL. Not all PAs may track this information.**	**We should look at the PA provided list of MOU customers and see how many of them show up in our sample draw. As of 10/6: MOU list from NSTAR received, waiting for Ngrid's list.**
3-Year Repeating Customers (2011+2012+2013)	**Count of flag variables for each year of program participation**	**Multi-year look is possible with current data going back three years**	**May require considerable work with older billing and tracking data years that go back more than 3 years**	**If we only look at customers that repeat in all three years, this would screen out small customers altogether. Nevertheless this is a good metric for large and medium sized customers**
PA identified projects from phase 1 data collection	**NA**	**Already identified and easy to get contact info**	**Limited quantity of contacts - only 12 projects**	**Reviewed & discussed data request status**

3.2.2 What Was Done with Billing and Tracking Data

The research used measure-level billing and tracking data of C&I energy efficiency projects. The 2012 measure-level information—such as energy usage, savings, and measure type—were aggregated at the project level. The final dataset had ~16,000 observations, and also included information on project size, building type, and end uses of energy efficiency measures. Based on consultation with the PAs and EEAC, DNV GL created two metrics—depth of savings and breadth of savings—to identify successful projects based on observed energy savings relative to customer size, and on diversity of end uses for measures taken.

The project-level dataset also included PA-identified successful projects, a variable to identify projects that participated in energy efficiency programs from 2011 to 2013 (three-year repeat), and electric and gas customers that signed MOUs with NSTAR and National Grid in 2012 and 2013, which were identified based on the information provided by the respective PAs. Overall, the project-level dataset included information on

efficiency measures, annual electricity use, energy savings, project and efficiency measure characteristics, and variables indicating how projects were identified as successful.

3.2.3 Development of Quantitative Metrics that Indicate Project Success

The consensus among the PAs and EEAC consultants was to use four metrics (discussed earlier, and identified in Table 3-2) in the sampling and analysis of successful C&I customer projects. Using all four metrics to identify the potentially successful projects allows us to speak to a diverse cross-section of potentially successful projects and increases the odds of identifying specific factors that affect project success.

Depth of savings was computed using the project lifetime levelized savings (MMBTUs) divided by annual customer usage ("Depth"=MMBTUS/Annual usage). For a project to fall into the combination metric successful category, it had to meet the following logic function criteria. See Table 3-5 for tabular representation of this logic function.

IF (breadth > = 1 AND 6 < depth < 10) OR
(breadth > = 2 AND 2 < depth < 10) OR
(breadth > = 3 AND 1 < depth < 10)
THEN *project is combination metric successful.*

This captures the size of projects in relation to customer size, and avoids using the sometimes problematic project cost data. Depth-of-savings scores in the 6 to 10 range are considered excellent, but scores above that are suspect for data error. A series of meetings and conversations with the PAs and EEAC occurred to decide how best to use the depth-of-savings metric. This resulted in the decision to specifically choose projects with a depth of savings in the 6 to 10 range for the combination metric. However, this standard was relaxed to allow depth-of-savings scores lower than 6 when breadth of savings was 3 or higher.

Together with DNV GL, the PA/EEAC team made the final determination on scoring thresholds that would include (or exclude) projects from the combination-metric-defined successful group. The number of projects that fell within the various depth, breadth, and combined scoring bands (shown in Table 3-3, Table 3-4, and Table 3-5) helped to guide the selection of the threshold values.

Table 3-3: Depth-of-savings metric (Lifetime MMBTU savings/annual usage)

Depth-of-savings score	Number of projects	Percentage of total projects (%)
> 10.00	684	4%
6.00-9.99	526	3%
5.00-5.99	260	2%
4.00-4.99	412	3%
3.00-3.99	568	4%
2.00-2.99	930	6%
1.00-1.99	1,678	10%
< 1.00	5,693	35%
Zero	362	2%
Unknown	5,093	31%
Total	**16,206**	**100%**

Breadth of savings is a count of measure types included in a given project. For a measure to be a different measure type, it must have a different end use.[12] This provides a census of the diversity of measure types included in projects. We sampled only those customers who scored favorably in both depth and breadth of savings. As shown in Table 3-4, the vast majority (93%) of projects included only one type of measure. Only a fraction of one percent (3 out of 16,206) included four measure types. The remaining 7% of projects included two or three measure types. The threshold for the "combination" metric sampling was two measure types or greater.

Table 3-4: Project diversity (breadth-of-savings)

Number of measure types per project	Number of projects	Percentage of total projects (%)
4	3	0.0%
3	193	1.2%
2	889	5.5%
1	15,121	93.3%
Unknown	0	0.0%
Total	**16,206**	**100.0%**

Combination (depth+breadth): Table 3-5 displays depth of savings cross-tabulated by breadth of savings for all projects. Projects that fell into the categories **bolded** in the table were included in the portion of the sample driven by the combination metric. The program types represented within each in-sample group are displayed in *(small-font italicized parentheses)*. The majority (61 out of 76) of in-sample projects are from the DI program. Eight in-sample projects are New Construction projects, two are LR projects, and five projects are associated with an unknown initiative/program.

[12] For example: a lighting measure and a lighting control measure are the same measure type.

Twelve of the interviews completed for successful projects were from this pool of 76 projects. The total sample-draw was large in relation to the targeted number of completed interviews, because some of the projects were missing customer contact data.

Table 3-5: Depth-of-savings metric cross-tabulated with breadth-of-savings metric (the "combination")

	Breadth-of-savings (measure diversity)				
Depth-of-savings metric	One measure type	Two measure types	Three measure types	Four measure types	depth metric bracket
0-0.99	*5,800*	*246*	*9*		6,055
1.00-1.99	*1,526*	*135*	*16*	**1** (1-NC)	1,678
2.00-2.99	*810*	*99*	**21** (18-DI, 1-LR, 2-DK)		930
3.00-3.99	*515*	*46*	**7** (7-DI)		568
4.00-4.99	*369*	*41* (34-DI, 3-NC, 4-LR)	**2** (1-DI, 1-NC)		412
5.00-5.99	*244*	*16* (13-DI, 3-NC)			260
6.00-9.99	*526*	**38** (31-DI, 4-NC, 1-LR, 2	**6** (4-DI, 1-NC, 1-DK)	**1** (1-NC)	577
10.00 or greater	*581*	*47*	*8*		633
Total per project type count**	10,371	671	69	2	11,113

* Bold numbers are allowed in sample, italicized & shaded are not.
** Tabulation does not include missing values.
*** (In parenthesis) breaks out program type: New construction (NC), large retrofit (LR), direct install (DI).

Repeat customers[13] were flagged for up to three years of repeat participation in 2011, 2012, and 2013. Out of a total of approximately 17,000 projects for which we had linked billing and tracking data, 747 customers participated in all three years (see Table 3-6). There were enough three-year repeat customers present in the dataset to sample successful electric customers in all three size strata. For gas projects, there were enough three-year repeat participants to sample both large and medium-sized customers. For sampling small gas customers, we needed to default to the depth- and breadth-of-savings metrics.

Table 3-6: Three-year repeat participants

Sample Group	All 2012 Participants who also participated in 2011 and 2013	Three year repeaters in sample-pull of successful projects
Small electric customers (<75kW)	54	2
Medium-sized electric customers (75-750kW)	152	12
Large electric customers (>750kW)	396	34
Small gas customers	6	5
Medium-sized gas customers	14	13
Large & very large gas customers	16	16
Size Unknown	109	0
Total	**747**	**82**

An MOU flag was also added to the dataset for 2012 and 2013 NSTAR and National Grid customers who signed an MOU agreement. MOU customers represented a small subset of the total C&I customer base. Only

[13] No overlap between 3-year repeaters in 2012 tracking data and the 12 PA Identified projects.

large and institutional customers receive MOU offerings. So, where MOU customers existed, they were favored in sampling.

For NSTAR, 7% (11 of 153) of MOU-signing customers were also three-year repeat participants in the 2011 to 2013 timeframe. For National Grid, the percentage of MOU customers that were also three-year participants was 61% (17 out of 28). It may be that NSTAR's MOU customers completed more projects in years prior to 2011 and/or after 2013, and therefore had fewer instances of three-year repeat participation in the 2011 to 2013 timeframe.

Among the17 National Grid customers that were both MOU-signing and three-year participants, 16 were large electric customers and installed LR energy efficiency measures (see Table 3-7). All MOU-signing customers (with known sizing strata) who were also three-year-repeat participants were included: 1) in the sample-pull of successful projects for C&I customer interviews, and 2) as successful projects for the data mining and analysis.

Table 3-7: MOU-signing customers who are also three-year repeat participants (2011-2013)*

Sample group	NSTAR	National Grid
Small electric customers (<75kW)	0	0
Medium-sized electric customers (75-750kW)	0	0
Large electric customers (>750kW)	4 (0-DI, 2-NC, 2-LR)	16 (0-DI, 1-NC, 15-LR)
Very small gas customers	0	0
Small gas customers	0	0
Medium-sized gas customers	0	0
Large & very large gas customers	0	0
Size Unknown	7 (0-DI, 4-NC, 3-LR)	1 (0-DI, 0-NC, 1-LR)
Total	**11**	**17**

(In parenthesis) breaks out program type: New construction (NC), direct install (DI), and large retrofit (LR)
It is not known why some data was missing at the raw data level for customer size.
* A single year of program tracking data (2012) used for customer also participating in 2011 and 2013.

Interestingly, there is no sampling overlap between combination-threshold-meeting customers and three-year-repeat customers. In other words, none of the 747 three-year-repeat customers has threshold meeting scores for the combination of depth and/or breadth metrics. The lack of overlap is largely due to the fact that repeat participants tend to spread their projects (and thus savings) out over multiple years, and since the combination metric was computed on only one year of data, customers that spread projects (and savings) across multiple years had a lower value. Reasons for this are discussed further in Chapter 6, which details the results of our metrics analysis of the merged billing and tracking dataset. All 12 of the PA-identified successful projects from Phase 1 were blended into the sample pull, if the project was complete or nearly complete and contact information was available. Please see section 3.1 of the methods and 4 for results for more details on the PA identified projects.

3.3 C&I Customer In-Depth Interview Sample Framework

Customers sampled for interviews were drawn via a non-statistical approach. The PA/EEAC team was supportive of this widened standard as a better means to identify and segregate successful projects from those not meeting the study's success criteria. DNV GL drew a sample sufficient for completing 25 interviews

of customers with successful projects and another 25 for comparison-group projects. The following sampling approach was implemented for successful projects:

1. All 12 PA-identified successful projects from Phase 1 were blended into the sample pull, if the project was complete or nearly complete and the contact information was available.
2. Because there was a higher than expected number of three-year repeat participating customers present in the C&I project-level dataset (747), there was ample repeat participation data from which to draw. About half of the sample draw of successful projects was from these three-year repeat participants.
3. All MOU-signing customers who were also three-year repeat participants (11 for NSTAR,[14] and 17 for National Grid) were included in the sample of successful projects.
4. The remaining successful projects were selected via the combination metric. Here, projects scoring in the range of 6.00-9.99 for depth of savings[15] and that also included two measure types (for the breadth-of-savings metric[16]) were included in the sample pool. Any project that included three or more measure types and scored from 2.00-9.99 in depth of savings were included, as well.[17]

The results from the successful group were compared to a control group. This control group, which included a sample of comparison-group projects, was a random draw of projects scoring below the metric thresholds used to sample successful projects.

The research plan for this study called for customer interviews for up to 28 successful and up to 28 comparison-group projects. We ultimately targeted completion of 25 successful and 25 comparison-group interviews (see Table 3-8 below).

3.3.1 Successful Project Sampling Strategy

To support this study, we took a single year (2011) of C&I billing data and linked it to 2012 tracking data, and then rolled this linked dataset up to project level (project ID). There was ample data to sample for both the "successful" and control groups from this dataset (Approx. 17,000 participants).

The three quantitative metrics (combination metric, three-year repeat, and MOU-signing) were used to sample for successful projects. Only customers for which there were data to compute these metrics were allowed in any sample pulls (unless it was a PA-identified successful project).[18] This metric-dependent missing data issue occurred when either customer usage or project savings data were missing.

The approach for sampling customers with successful projects is described below; half of the sample was drawn from customers identified as three-year-repeat participants, and half was drawn from projects identified by applying the combination metric. MOU-signing projects were included as a subset of the three-year repeat half of the sample. The one qualitative metric (PA-identified) was also blended into the dataset, if projects for those customers appeared in the 2012 tracking data.

- **Three-year-repeat customer half:** For half of the sample, we only sampled from customers in all size strata who had participated three years in a row (2011, 2012, and 2013). All three-year-repeat

[14] Only four of these 11 customers have customer usage/sizing data.

[15] Depth-of-savings = MMBTUs Savings / Annual Customer Usage. MMBTUs Savings equals the project's lifetime levelized energy savings.

[16] Breadth-of-savings is a count of measure types included in the project.

[17] As it turns out, no NSTAR projects from MOU-signing customers scored above the combination sampling thresholds. Also, only two three-year-repeat participants exceeded these thresholds. This seems to validate the need for a blended sample using multiple metrics.

[18] We requested and received some customer usage and project information along with customer contacts from the PAs on the projects they identified as successful in Phase 1 of this research.

participating customers who signed an MOU and for which there were data to compute metrics were included in the sample. A random number seed applied to three-year-repeat customers was used to select projects to fill the remaining size-strata and fuel-type quotas. The only exception to this was with the smaller gas customers; there were not enough three-year repeat participants in the dataset. In this case, we defaulted to customers who scored well in the depth- and breadth-of-savings metrics to fill this fuel type/size strata.

- **Combination metric half (depth+breadth combined):** For all size strata, we only sampled from customers meeting one of two combination thresholds (two measure types + a depth score of 6.00-9.99, or three measure types + a depth score of 2.0-9.99).[19] However, there was one project included in the sample that did not fit these rules; this project had four measure types, but scored 1.0-2.0 on depth of savings.
- **MOU-signing customers:** For large and medium NSTAR and National Grid gas and electric customers, we selected all four NSTAR MOU customers with known size strata who were also three-year repeat participants for the sample pull. We did the same with National Grid MOU customers.

A sample pool about four times the size of the completion target was pulled. This was necessary to ensure we would meet the target, because some customers are difficult to contact or unavailable at the time of the research to participate in an interview.

3.3.2 Average/Typical Projects Sampling Strategy

After filtering out the sample draw of successful projects, a random number seed was assigned and fixed. Then, a sample was drawn within each size strata and fuel type. These comparison-group customers were interviewed, and their responses were compared to those from the successful project respondents.

Table 3-8: Blended and stratified sample of projects for C&I customer interviews

Sample Group	Successful Projects (Completion Target)	Comparison Group (Completion Target)	Successful Projects (Sample Pull)	Comparison Group (Sample Pull)
PA Identified successful projects from phase 1 interviews (electric & gas combined)	5	0	12	0
Small electric customers (<75KW)	3-5	4-6	61 (50-DI, 3-NC, 3-LR, 5-DK)	70 (55-DI, 3-NC, 9-LR, 3-DK)
Medium-sized electric customers (75-750KW)	3-5	4-6	22 (11-DI, 6-NC, 5-LR)	29 (9-DI, 4-NC, 14-LR, 2-DK)
Large electric customers (>750KW)	3-5	4-6	37 (1-DI, 12-NC, 24-LR)	7 (0-DI, 1-NC, 6-LR)
Small gas customers	2-4	2-4	8 (3-DI, 4-NC, 1-LR)	25 (2-DI, 7-NC, 16-LR)
Medium-sized gas customers	2-4	2-4	13 (0-DI, 8-NC, 4-LR, 1-DK)	17 (2-DI, 5-NC, 10-LR)
Large & very large gas customers	2-4	2-4	17 (0-DI, 10-NC, 7-LR)	4 (1-DI, 0-NC, 3-LR)
Totals	**25**	**25**	**158**	**152**

* Overall, we wanted about 20 gas (10 successful and 10 average) and 30 electric (15 successful and 15 average) survey completes.
** Approximately 20% of the sample was comprised of smaller PA customers (not National Grid or NSTAR).

3.3.3 Break-Out of Combination Metric Sample Pull by PA

The majority of the projects included in the sample pull for successful projects came from the two largest PAs, NSTAR and National Grid. DI projects were more numerous than both New Construction and LR projects (see Table 3-9). Please note that this was a state-wide study, and not intended to be a

[19] No MOU-signing customers met the combination threshold.

representative sample by PA. Instead, this is a combination-metric-driven subsample of successful projects. Some of the smaller PAs, for which no sample was drawn here, did have successful projects included in the larger sample of all successful projects. They showed up in the three-year-repeating or PA-identified categories (not included in this combination-metric subsample).

Table 3-9: Combination metric sample pull of successful projects by PA

Program Administrator (PA)	Direct Install	New Construction	Other Retrofit (not	Don't Know	Totals
Berkshire Gas	0	0	0	1	1
Cape Light Compact (CLC)	19	3	1	0	23
Liberty Gas	0	0	1	0	1
National Grid	2	29	23	0	54
NSTAR	31	9	18	0	58
WMECO	13	2	1	5	21
Totals	65	43	44	6	158

*Unitil not pulled in sampling on combination metric.

3.3.4 Other Considerations

There were a variety of other considerations, some impacting the selection of metrics used and not used in this study. Also, once metrics were chosen, some of the following considerations impacted exactly how metrics were defined. This section presents a brief summary of these nine considerations. The first seven did impact metrics in some way and the last two did not.

3.3.4.1 Considerations impacting metric selection or definition

Direct Install (DI) projects were included, with a sample including smaller customers in order to provide a more complete view of success across a variety of customers. We included a specific sample for small customers since the repeat and MOU-signing customers were mostly large customers who are not eligible for DI.

New Construction vs. LR projects: Projects that scored high on both depth and breadth of savings were likely to be New Construction, and not as likely to be LR projects. In fact, LR projects that scored high on both depth and breadth of savings were a small subset, and were not likely to appear much in the broader sample unless we had a prescribed quota for those projects. This is partially because the LR program is more narrowly targeted, while true New Construction projects inherently include more comprehensive measures by program design. Also, the LR projects are less numerous than DI projects.

Measure life: Using measure life would sample for long-lived measures such as Combined Heat & Power (CHP), which is only applicable to a few customers. On the other end of the spectrum, shorter-life projects such as retro-commissioning (3-5 year measure life) would be considered unsuccessful by this metric, even though they are considered to be some of the best at achieving savings over time. Measure life was used indirectly in this study because it is a component of lifetime levelized savings (MMBTUs), which is the numerator of the depth-of-savings metric.

MOUs: NSTAR and National Grid provided data on their customers who signed MOU. Only NSTAR and National Grid track customers with MOUs. Customers that signed MOUs with PAs elevated their level of commitment to long-term energy savings and therefore projects involving MOUs could be an indicator of

project success. MOUs are typically limited to a small subset of customers that are large and often institutional. Customers with an MOU tend to be repeat customers, as the MOU is a multi-year agreement, but there can also be a lag time between when the MOU is signed and when projects actually get installed and show up in C&I tracking data.

Outliers and data error: We filtered out obvious outliers (depth metric >10.0). Data error that is not obvious will remain unfiltered. We tracked and noted the cases used and cases dropped (as outliers, or for lack of matches in billing and tracking).

Proj-o-graphics: As it is pertinent to this research to define success within categories (and not just across categories), the projects with the best metric(s) from the three electric and four gas customer size strata were selected. In addition, the study team worked with the PAs/EEAC consultants to identify any other "proj-o-graphics" of interest (i.e., measure type, building type, etc.).

Building type: We reviewed the sample pull for building type to ensure diversity.

3.3.4.2 Considerations not impacting metric selection or definition

Project confirmation and free-ridership: A question about what the program did to help the project move forward was included in the interview in order to find out if the customer planned to complete the project anyways (an indicator of free-ridership). In addition, it was first confirmed that the customer completed the project.

Qualitative nature of study: It is worth noting that measuring project success is fundamentally a qualitative exercise, and that quantitative metrics aimed at measuring success are merely an augmentation. For this reason, this study described project success both qualitatively and quantitatively, and then leveraged the quantitative metrics to help identify potentially successful projects and then determine which factors contributed to the success of those projects. In doing this, the validity of four metrics as measures of success was tested as well.

3.3.5 Sample Disposition

We found that customers with comparison-group projects were less accessible to interview than customers with successful projects. We made attempts to contact 94 customers with successful projects, and completed 31 interviews. Despite contacting more customers with comparison-group projects (106), we only completed interviews with about half as many (17). As shown in Table 3-10, the interview completion rate for successful projects was more than twice that achieved for comparison-group projects (33% vs. 16%).[20]

[20] The difference is statistically significant at the 99% confidence interval (Z-Score test).

Table 3-10 Sample disposition and completed interviews

Customer sample group	Sample-pull (n)	Unique Part-icipants (n)*	Contacts provided with phone or email (n)	Contact with phone or e-mail after internet searches (n)	Contacts called (n)**	Com-pleted (n)	Contacts resulting in interview
Successful	215	141	92	123	94	31	33%
Comparison Group	225	206	125	145	106	17	16%

*Eliminates duplicate contacts from sample pull
**Not all contacts were called or emailed because (as the number of completes in a given strata were met) the remaining contacts in that strata were immediately dropped from the contact list.

In addition, it should be noted that it was easier to complete a greater number of interviews with customers on the electric side because there were significantly more electric projects in the tracking data than on the gas side. Also, customer contact data (i.e., phone#, email address) for gas projects was less populated than it was for electric projects.

For successful projects, an average of 1.87 contact attempts (via phone and email) were made per completed interview. It took 45% more contact attempts on average (2.71 attempts) to complete a comparison-group project interview. Table 3-11 shows the final sample disposition of C&I interviews.

Table 3-11: Final sample disposition of C&I customer interviews

Sample Group	Successful		Comparison Group	
	Target	Complete	Target	Complete
PA-identified (elec & gas combined)*	5	6		
Small electric (<75kW)	3to5	10	4to6	7
Medium-sized electric (75-750kW)	3to5	5	4to6	5
Large electric (>750kW)	3t05	6	4to6	1
Unknown electric size***		1		
Small gas	2to4	0	2to4	3
Medium-sized gas	2to4	1	2to4	0
Large & very large gas	2to4	5	2to4	1
Unknown gas size**		3		
Total	**25**	**31***	**25**	**17**

* PA-identified projects not added to total summation to avoid double-counting
** All three are PA-identified
*** A single three-year-repeater

Among the 48 completed interviews, 31 were done with customers from successful projects. For the purpose of analysis in this report, the 31 successful projects are segregated into four subgroups;

- 12 combination metric-indicated successful[21]
- 10 three-year repeat customers
- 5 PA-identified successful customers[22]
- 4 MOU customers

The remaining 17 customer projects fall into the comparison group.

[21] No overlap between combination and three-year repeater respondents

[22] One of the PA-identified successful projects was also an MOU project not included in the MOU group, so as to avoid double-counting

4 RESULTS OF IN DEPTH PROGRAM ADMINSTRATOR INTERVIEWS

DNV GL completed six in-depth interviews (IDIs) with representatives from the Massachusetts PAs, and one with a member of the EEAC consultant team. All seven respondents described typical characteristics and features of successful projects. Five of the six PAs were able to provide examples of specific successful projects (12 total) and specific unsuccessful projects (3 total). [23,24]

From the PAs, we also obtained the names of six project champions and referrals to an additional contact that could provide the names of other customer project champions. Project champions include facility managers, business owners, and other C&I building professionals described as being proactive energy efficiency enthusiasts at the vanguard of energy conservation and the greening of C&I structures and systems. These PA-identified successful projects and champions were targeted for interviews in the C&I customer interviews.

This chapter details the findings from the six PA/EEAC IDIs, focusing on the following topics:

- Interviewee background
- Customer decision making and engagement
- PA relationships
- Energy and monetary impacts
- Additional project non-energy benefits
- Other impacts
- Unsuccessful projects

At the end of this chapter, we summarize our findings from the PA in-depth interviews.

4.1 Interviewee Background

All of the PA representatives and the EEAC consultant were familiar with C&I programs in Massachusetts. Representatives from the smaller PAs tended to have roles in multiple C&I programs (Large C&I New Construction, Retrofit, and Direct Install) as well as involvement in multiple phases of energy efficiency projects (e.g., outreach/marketing, customer decision making, implementation, and project impacts via M&V and tracking). In other words, the smaller PA representatives tend to play the role of generalists. Greater staffing levels at the larger PAs allowed for more specialization among program staff.

4.2 Customer Decision Making and Engagement

The PAs and EEAC consultant identified a number of components of the customer decision making and engagement phases of an energy efficient project that lead to project success. A brief discussion of each of these components is included below.

4.2.1 Identify the Correct Level of Engagement with the Customer

PA representatives need to know what level within the customer organization to engage with. This can vary with project cost, as small projects can be funded by facility managers from maintenance budgets, but larger projects may require engaging executives that control capital budgets. Connecting with organizational

[23] Includes projects not completed.

[24] These are the projects specifically identified by the PAs as unsuccessful during the in-depth-interviews.

drivers who help make decisions about projects is an important ingredient of success. Organizational drivers are the most influential people within the organization, who often authorize facility improvements or other monetary expenditures. Organizational drivers are sometimes also project champions. It is worth noting that larger organizations are more complex than smaller ones. It may take a bit longer to identify the key decision maker in large organizations than in smaller ones.

4.2.2 Leverage Project Champions

The presence of PA champions,[25] along with customer champions, is another key ingredient to many successful projects. Ideally, customer champions need to understand, value, and be self-driven to pursue conservation and operational savings and efficiency gains. PAs that seek out and engage with customer champions are not only more likely to achieve greater savings, but also to establish and build relationships both professionally and personally. One PA described the type of relationship in which large C&I customers not only turn to PAs to aid in decision making about energy efficiency and facility improvements, but also to ask "where to get the best cup of coffee in town or bite to eat." Though not mentioned in the interviews with PAs or EEAC, it is possible that a higher level of free-ridership occurs among customer project champions.

4.2.3 Utilize Memorandum of Understanding

The use of an MOU is particularly helpful with institutions (e.g., colleges) and large customers with existing formal or informal guidelines and other policies related to natural resource usage. MOU agreements, between the PA and the customer, obtain long-term buy-in and commitment to improving energy efficiency at high levels within the organization. They also include multi-year commitments to savings goals, and quantify what the spending requirements are to achieve those goals. MOUs are powerful engagement tools to get customers started and to keep them going in the years to come with implementing energy efficiency projects.

4.2.4 Utilize Case Studies

Preparing and presenting successful project case studies that show a track record of delivering large energy savings, accurate savings estimates, productivity enhancements, and other non-energy benefits are keys to initiating new successful projects. One PA said that case studies showcasing real energy savings and non-energy benefits (e.g., organizational productivity and employee comfort gains) from prior projects are particularly helpful. Another PA described a third type of case study: "We should show customers the good track record of engineering firms that estimate savings and show case studies of this to customers on just how accurate their baseline estimates and savings estimates were." The customer needs to feel comfortable that the PA and contractors will deliver the benefits promised before agreeing to projects.

4.2.5 Package Multiple Measures into a Single Project

Several PAs have found that when proposed energy efficient measures are presented as separate projects, customers tend to agree to only complete the measures with the quickest payback. In the case of the DI program, customers sometimes install the free measures, and choose not to pursue both the bigger and more expensive measures and those with longer paybacks. This is unfortunate, as the measures that are larger and/or have a longer payback frequently offer the greatest long-term energy savings. One effective

[25] One PA mentioned that certain account reps have a knack for making projects happen, and used the term "PA Champion" to mirror "Customer Champion."

solution to this problem is to bundle the quick payback measures with longer-payback measures, and to present them to the customer as single projects.

4.2.6 Trade Allies

Leverage trade allies and third-party contractors

According to the PA representatives, leveraging relationships with contractors and other third-party market actors can be a powerful tool in achieving both a higher project count and greater project success. Contractors can do much of the customer engagement in their effort to obtain and complete jobs. One PA suggested that it is most important to leverage contractors as a *de facto* sales force among smaller electric and gas PAs, because smaller PAs have fewer internal staff. Coordination and communication between contractors and PAs can also result in a more seamless customer experience.

Design programs based on contractors' view of success to increase the ability to leverage third-parties

One PA reported that contractors view success in terms of ease of program enrollment and participation. Anything done to streamline the program process, speed up incentive payments, and reduce paperwork can increase the likelihood that contractors will sell the program to their customers. Contractors view projects as successful when ease of program entry is maximized and participation-related paperwork or hassle is minimized. When programs are successful in these ways, contractors are more likely to see them as worth their time and effort to participate in and promote to their customers.

4.2.7 Offer Negotiated Incentives

Some PA representatives indicated that in past projects, they have had the flexibility to offer negotiated incentives, in which the percentage of project costs incented or the dollar amounts incented per unit of energy savings generated are not fixed. This flexibility allows the PA to bargain for or adjust the incentive amount if necessary to obtain project approval. With negotiated incentives, it is important to have both principle guidelines to aid in deciding how much money to offer a customer, and knowledge of the customers' financial criteria.

4.2.8 Finance Customer Project Cost via Low and Zero Interest Loans

Customers can take advantage of the option to use some of the programs' first-cost buy-down incentive to obtain zero interest loans via the Mass Bank Loan Program. This is a good option for customers that need projects to be cash-flow positive from day one, but the trade-off is debt incursion.

4.2.9 Leverage Drivers of Customers' Decision Making Process

Several PAs mentioned that a key driver of the project implementation decision is the company's need and desire to remain competitive in the global marketplace. Projects that improve the energy efficiency of industrial processes and systems also improve global competitiveness and aid in stemming the tide of manufacturing job loss to overseas markets. Moreover, the accompanying reduction in material waste and operational downturns—coupled with other non-energy benefits—often exceeds the value of energy savings for industry. Continuous process improvement policies already exist in major industries. When energy efficiency projects are framed with this business mantra in mind, industrial managers are more often persuaded to action.

4.2.10 Leverage Direct Install Incentives to get "One-Off" Projects

PAs simply don't have the staffing to engage with DI customers year after year. Said another way, the continued relationships that have been described as essential for success in this report are simply too expensive to have with smaller customers. This is why it is particularly important to persuade small customers to install many measures in a short period of time, because the frequency of engagement with this very large customer class is necessarily low. The free-to-customer DI measures can be used to leverage other measures not fully paid for by the program. If the Massachusetts program design team has not already done so, they could look at making the installation of free measures a contingency of customer buy-in on at least one non-direct-install measure.

4.2.11 Monetize the Cost of Inaction

One PA reported using the C&I Management Committee's pro-forma tool to show customers the cost of inaction. [26] The PA indicated that this tool has helped to move projects forward by engaging customers in discussion that helps to overcome barriers such as first-cost, longer payback periods, and customer financial limitations.

4.3 PA Relationships

The PAs and EEAC consultants identified a number of aspects of a successful project that are driven by the ongoing relationship between the PA and customers, trade allies, and other third parties. It should be noted that in one way or another, all respondents mentioned customer satisfaction as a key outcome of project success.

4.3.1 Establish PA as a Trusted Advisor

Once a good, trusting, PA-customer relationship is established, customers may begin to initiate contact with PAs before making equipment or building improvements. One PA representative described a change in how a customer approached making upgrades to its facilities. Before a strong relationship developed between the PA and customer, the customer would primarily seek information and advice from contractors, salespersons, and other market actors. But once a strong relationship was established with the PA, based on prior success from collaboration and the development of trust, the customer now turns to the PA first before making any changes in their facilities or operations.[27] Such examples are indications of success, as they can lead to a continuous string of future projects that achieve deep and lasting energy savings. The PA as a third-party, unbiased trusted advisor is a key to repeat participation. On larger and more complicated projects, PA C&I manager engagement is particularly important to scrutinize manufacturer claims about product savings and performance.

4.3.2 Provide Superior Customer Service

Each of the respondents mentioned management of customer relations and continuous customer engagement as important components to project success. Included within these components are managing customer expectations and communicating potential projects and their impact on customer operations and facilities. One PA representative elaborated that account managers should be schooled in the sales

[26] In this case, the pro-forma is a standardized tool that is utilized by at least one PA to show customers the cost of inaction. Measuring the success of the pro-forma tool is not a focus of this study.

[27] Project 7 (General Process Evaluation – Final Report, Feb. 16, 2011) reported "…strong customer relationships are developed over the long term by handling a variety of everyday issues." Page 1-5.

profession, obtain specific training on the intricacy of business-to-business sales, and become knowledgeable of the customer's business prior to the first customer contact. While continuous customer engagement may be a best practice with respect to larger customers, the cost of maintaining customer contact with smaller customers is too high given the small amount of energy savings achievable. Thus, for smaller C&I customers, project success may mean completing projects in a short period of time so that the PA staff and/or vendors supporting the project can be freed up to initiate and maintain contact with other small customers.

One PA stated, "Successful projects are larger projects that showcase our technological expertise in helping our customers solve their problems. From a customer's perspective, it's …a smooth [project]…. From a vendor's perspective, it's about not holding the project up…"

4.3.3 Educate and Train Trade Allies & Other Market Actors

PA-sponsored training programs for contractors, which can improve contractor knowledge and buy-in with respect to the program, can also increase the success of projects. Contractors educated about energy efficient technologies can showcase those technologies and educate their customers accordingly. In addition, PA-sponsored training may also include manufacturers and distributors, along with contractors. These gatherings are an opportunity to obtain program buy-in and to educate all market actors about energy efficiency. Program buy-in by market actors not only leads to a greater number of projects, it may also deepen and broaden savings by encouraging the installation of more measures per project.

4.3.4 Manage Customer Expectations

A number of things outside the circle of PA (or even customer) control can impact timelines. For this reason, it is easier to manage customer expectations, through continuous dialogue between the customer and PA representatives, than actual timelines. This also reduces the chance of unpleasant surprises for the customer.

Several PAs indicated that talking to the customer too early about project costs can be a mistake. They report higher success in the decision-making phase when customers first have the opportunity to conceptualize the scale and scope of benefits and other impacts before project costs are discussed.

4.3.5 High-Velocity Projects

PAs and implementers should strive to keep projects moving and prevent slow-downs. Projects that progress rapidly through the process of scoping, designing, costing and bidding, execution and implementation, verification, and closure will have a good impression on customers and leave them wanting more. In contrast, if projects get bogged down or include unpleasant surprises, customers may become reluctant to do more in the future. Some of the larger PAs employ the services of project expeditor trade allies to make projects move faster. Perhaps smaller PAs could pool their resources with each other and hire a single project expediter to serve their customers.

4.4 Energy and Monetary Impacts

Generally, successful projects are characterized by achievement of deeper and broader energy savings, which translate into cost savings for the customer. The PAs and EEAC consultants identified the following characteristics of projects with successful outcomes in terms of deeper and broader savings.

4.4.1 Encourage Cross-PA Collaboration

Close collaboration between the gas and electric PAs prior to engaging a customer is an approach that reportedly leads to a greater number of projects and deeper and broader energy savings. Collaboration simplifies customer participation and adds value from the customer perspective. In other words, collaboration makes participation more seamless with fewer variables for the customer to juggle. There is less initial friction on projects when the customer is dealing with a single, coordinated PA alliance. PA collaboration plays well from a customer standpoint for these reasons. And since many projects involve both gas and electric savings, the payback and other financials appear more attractive on collaborative projects because the customer is seeing the benefits from both fuel-type savings along with any additional non-energy benefits.

4.4.2 Provide Reliable Savings Estimates

Providing a reliably close match between projected and realized energy savings is important for project success, customer satisfaction, and development of a trusting relationship. To ensure reasonable customer expectations about the level of savings projects will generate, it is important that estimates are rigorously developed and validated—starting with the baseline, and carrying through to post-installation measurement and verification. In addition, projects with accurately documented savings can also be used by PAs or contractors to sell new projects, and by PAs as case studies for marketing more projects.

4.4.3 Utilize PA or Program Engineering Expertise

Customers often lack the internal capacity and resources to undertake projects. The technical assistance provided by engineers external to the customer organization can address this barrier. Comprehensive engineering analysis—at the system and building level, not just the machine or measure level—ensures project success and achieves deeper savings. Projects are more likely to be successful when engineers remain engaged beyond the initial technical assessments and audits; for example, it is beneficial for engineers to remain engaged when the contractor is specifying equipment, in order to prevent contractors from defaulting to less-efficient equipment that may be more familiar and comfortable to them.

4.4.4 Hit Multiple Bottom Lines

Several PAs described success as projects that “hit multiple bottom lines.” Success occurs when projects deliver load reduction (kW) for the utility, along with energy usage reduction (kWh) and good financial payback for customers. Hitting multiple bottom lines was also described as delivering on other types of non-energy benefits (see section 4.5) such as increased building occupant comfort or decreased wear-and-tear on equipment.

4.5 Additional Project Non-Energy Benefits

One PA representative described the contribution to success that occurs when a project “hits multiple bottom lines.” In the context of non-energy benefits, this means the project not only delivers dollar savings on energy bills, it may also improve productivity, throughput capacity, material waste reduction or recycling, and comfort; reduce loads; and/or provide other non-energy benefits. For example, projects that target and deliver substantial water savings can be particularly successful at hitting a secondary or tertiary (in the case of hot water) bottom line for customers, as the cost of water is on the rise due to aging water and sewer pipe infrastructures, depleting ground and surface supplies, water quality issues, climate change, population growth, and the expansion of cities.

Another example of non-energy benefits relates to CHP, which not only provides large energy savings, but can also provide backup power during system outages that would otherwise shut down plant operations. In some cases power quality is also improved, and/or customers are able to sell power back to the grid at opportunistic times. Finally, CHP projects tend to have long measure lives (e.g., 20 years or longer), which is another outcome or characteristic of successful projects.[28]

As discussed earlier, case studies have been identified as a successful way to market programs. Case studies highlighting the non-energy benefits of energy-saving projects (e.g., improved comfort for workers) can be particularly effective in persuading customers where non-energy operating costs (i.e., labour and materials) are a much greater portion of business cost than energy. One interviewee mentioned a BOMA (Building Owners and Managers Association) study which reported that 90% of building costs are occupant costs.

In one example of water savings, a chain of Laundromats reduced hot water consumption by 80% by installing ozone injected washing systems. This spawned similar projects at a chain of nursing homes, where the ozone injected clothes washing technology reduced the number of hot water cycles required to clean clothes from five down to just one.

The PAs described several industrial process and system examples of non-energy benefits. These included waste energy, water, and materials being repurposed and recycled back into the manufacturing process. In addition to the utility bill and material cost savings, air and water effluent and solid waste declined.

Different customer types value non-energy benefits differently. For example, a for-profit corporation will assign high value to productivity gains, whereas a school might value benefits such as an environmental education. For this reason, project selection can be based in part on the type of customer in relation to non-energy benefits.

4.6 Other Impacts

Successful projects were identified as providing a number of other benefits for the customer and/or the PA. Specifically, the PAs and EEAC consultants identified the following other impacts.

4.6.1 Increase Customer Knowledge

It a sign of success when building operators understand projects in their buildings, how to use or operate the implemented measures, and how they impact their buildings.

4.6.2 Include High-Visibility or High-Profile Measures

Installing highly visible measures such as photovoltaic (PV) solar panels[29] to display green building technologies can also provide a non-energy benefit in terms of enticing others to take action. High visibility projects in public places can be accompanied by an educational component that demonstrates the technologies and informs others about energy-saving technologies and practices. Also, display of LEED certification plaques in prominent locations can draw attention to and educate people about project successes. Larger projects (with complexity, higher price tags, and deeper savings) tend to garner greater visibility as well.

[28] Success is indicated by extending the energy savings for a longer period of duration.
[29] Though sited as an example, PV is not currently being incented in the C&I programs.

4.6.3 Create a Culture of Repeat Customers

There are a variety of reasons why a customer may not be able to implement all recommended energy efficiency projects in a facility in a single year. Reasons include lack of capital in a single budget year, the timing of improvements in relation to scheduled downtimes, the need for certain improvements to be done in sequence and not in parallel, approval lag-times, and other implementation delays. This necessitates multi-year participation to achieve deeper and broader energy savings.

An indicator of success is when a customer is completing a higher-than-average number of projects. This happens in projects where PA engagement and relationships change the company culture so that the customer is looking for energy efficiency opportunities as a self-starter, and this becomes part of company culture.

One member of the evaluation team recommended tracking and measuring PA account manager engagements. From this, stand-out PA account reps could be identified, practices examined, and successes possibly replicated elsewhere.

4.7 Unsuccessful Projects

Interview respondents also mentioned several characteristics associated with unsuccessful projects. These included not delivering on expectations, negative unintended consequences, poor customer financials, staff turnover, and lack of overall system optimization.[30]

4.7.1 Not Delivering on Customers' Expectations

One PA representative said, "Even when the measure works, is functional, and costs what it was supposed to cost, if the savings don't materialize, that is an unsuccessful outcome." It is important to not only know what the energy savings will be, but also to anticipate secondary and tertiary effects of making a change to a building or industrial process or system. Unintended and unanticipated changes could adversely impact energy consumption. As one PA put it, "We should not trust or rely on manufacturer-provided energy savings data. We need more scrutiny and use of our own engineers to scrutinize complicated or questionable projects more."

4.7.2 Negative Unintended Consequences

These can arise if the designer or installer does not understand the particular physical and human environment where the measure is being installed. For instance, the upgrade or improvement may interfere with other uses of building space. The new equipment might take up more space or get installed in a different spot that is needed/used for something else unbeknownst to project designers.

An example of negative unintended consequences was the installation of an energy efficient blower fan in a school gymnasium that was used for varied activities, including sports and theatre. In this case, the new fan was noisier than anticipated. So the fan was redesigned with larger blades that run quieter, but the larger fan blades hit the structure once a second attempt at installation was made. In this example, if the installers and designers had understood the varied use of the space where the fan was being installed, the design and redesign flaws could have been avoided.

[30] In Project 10, "MA Large C&I Process Evaluation," C&I program managers/staff reported that project payback was the most frequently cited customer reason for not pursuing deeper savings. Also, hassle factor, need for a higher level of approval, lack of PA/customer incentive (for deeper savings via incentives or energy savings credits), lack of staff time/availability, and lack of technical knowledge were also cited. Page 1-9, July 20, 2012.

4.7.3 Poor Financial Conditions

C&I customers in poor financial condition or whose business and market futures are uncertain can be resistant to program participation. Things will play out in the general company, the specific marketplace, and with technological change. This is largely beyond the control of the PA, and, generally, the PA simply has to wait for those situations to become more stable. This is another reason for continuous customer engagement over long periods of time. When the organization's situation improves, they are more likely to engage with the program when making equipment or facility improvements. Assuming the company continues to exist, eventually the timing will get better. Technological certainty will emerge, company financials strengthen, or economic conditions improve.[31]

4.7.4 Staff Changes

Changes in staffing either within the PA or at the customer facility can also delay or even reset projects. Staff changes at the customer site are unavoidable, but PAs can take measures to ensure that projects continue to move forward if PA staff changes occur.

4.7.5 Lack of Overall System Optimization with Installation of New Measures

One member of the evaluation team described the lack of overall system optimization with new measure installation as "the spectre of lost opportunities for greater savings" and "a most egregious failure of energy efficiency programs." The incremental lost opportunity for greater savings happens when system efficiency measures get installed without optimizing the overall efficiency of building systems. In other words, it's like cream-skimming or picking the low-hanging fruit. Packaged projects can result in deeper savings than the piecemeal approach. For example, it may be possible to use a smaller HVAC system if an upgrade is done in tandem with building shell measures that increase insulation to reduce heating loads, and lighting projects that reduce indoor heat load to reduce summer peak electric demand associated with air conditioning needs.

4.8 Summary of Findings from PA In-Depth Interviews

The interviews of PAs/EEAC indicated that effective customer engagement involves:

- Finding organizational drivers and project champions.
- Contractors acting as a *de facto* sales force (this is especially valuable for smaller PAs).
- Implementing MOUs with large and institutional customers to get long-term buy in and commitment for conservation.
- Use of case studies that accurately showcase large amounts of project-delivered energy savings. This is viewed as an important marketing tool.
- Negotiated incentives and zero-interest loans for measures requiring project financing.[32]
- Educating customers about the cost of inaction, and the non-energy benefits that matter most to their businesses.

[31] Continual customer engagement with customers in poor financial condition could pay off if/when their financial condition improves in the future. A prior report by DNV GL, the *Mid-Sized Customer Needs Assessment*, provides specific details on the PAs' go-to market approach to small, medium, and large customers

[32] The DNV GL Project #10 report ("Large C&I Customer Process Evaluation"-July 20, 2012) suggested the addition of an on-bill financing option and marketing this to dormant customers. Page 1-13.

- A streamlined program participation process, gas and electric PA collaboration, and high-velocity projects.
- Technical assistance.[33] This is most important with smaller customers lacking internal resources. Smaller customers also experience less frequent contact with PAs; thus, it is particularly essential to leverage subsidized DI measures to get customer buy in on other, more complicated measures.[34]

[33] The DNV GL Project #10 ("Large C&I Customer Process Evaluation"-July 20, 2012) stated that to get deeper savings in the future,…"the large C&I program should target participants with more sophisticated audits and technical assistance." The report also indicated considerable interest in a standardized lifecycle costing tool. Page 1-10.

[34] DNV GL Project #7 ("General Process Evaluation-Final Report: MA Energy Efficiency Programs 'Large C&I Evaluation"-Feb. 16, 2011) reported; "Despite identifying financial barriers as the most important obstacle to deeper savings…technical staff said comprehensive field inspections and more comprehensive program design are more effective at generating deeper savings." Page 1-8.

5 RESULTS OF C&I CUSTOMER INTERVIEWS

As noted in section 3.3.5, DNV GL completed 31 interviews with C&I customers with successful projects, and 17 interviews with customers with comparison-group projects. The 31 respondents for successful projects were categorized into four customer groups: 1) PA-identified successful, 2) MOU-signing, 3) three-year repeat participants, and 4) combination metric identified. The 17 respondents for comparison-group projects formed a fifth customer group: comparison group.

This chapter discusses the findings of the interviews with C&I customers, and compares the responses among the five customer groups identified above. Interviewees were asked to comment on program initiation, external audits and technical assistance, and a wide range of other topics related to program success.

Respondents reported having from 1 to 35 years of experience in their current jobs, with a mean of 12.0 years. Forty percent of all respondents were from management; 10% were general managers, and the other 30% were other types of managers, including facility, maintenance, program, project, or office managers. Twenty-one percent of respondents were directors, and 15% were engineers (see Table 5-1).

Table 5-1: Job titles of C&I customers

Job Title	Percent of all respondents (n=48)
Director	21%
Engineer	15%
General Manager	10%
Facility/Maintenance Manager	8%
Manager - Other	8%
Owner	8%
President	8%
Program/Project Manager	8%
Office Manager	4%
Condo Association	2%
Electrician	2%
Executive Assistant	2%
Volunteer	2%

* “All respondents” includes both respondents with successful and comparison group projects.

Twenty-three percent of respondents indicated their primary job responsibility was facility operations, while 19% indicated facility management, and 13% management of facilities and/or staff. Another 13% reported that their primary job responsibility was proprietor—usually an owner actively involved in the business. Less than 10% indicated roles in finance, office administration, sustainability, human resources, healthcare, marketing, procurement, or general business activities (generalist/multi-role).

Table 5-2: Job responsibilities of C&I customers

Job Responsibilities	Percent of all respondents (n=47)
Facility Operations	23%
Maintenance of facility	19%
Management	13%
Proprietor	13%
Finances/Budgets	9%
Office/Administrative	6%
Generalist/Multi-roles	4%
Sustainability	4%
Health care giver	2%
Human Resources	2%
Marketing	2%
Procurement	2%

5.1 Processes for Identifying Energy Efficiency Opportunities

C&I customers use a variety of processes to identify energy efficiency opportunities (see Table 5-3). Customers with successful projects who were in the PA-identified and MOU-signing groups indicated greater availability and reliance on internal resources to identify energy efficiency projects than most other customer groups. Several three-year repeat customers indicated internal resource utilization, as well. Only one customer in the comparison group said that internal resources were used to find project opportunities.

Though difficult to quantify, it may be that C&I customer internal resource capability and utilization correlates with greater project success. In some cases, greater resource capability and utilization may also stem from internal organizational efficiency or effectiveness. However, none of the combination metric identified customers mentioned the use of internal resources to identify project opportunities. This could be due to the fact that—unlike the PA-identified and MOU-signing customer groups—the combination metric group included many small customers, whose internal resources are scant compared to large customers. However, it should be noted that the DI program is designed to overcome this barrier for small customers by providing turnkey assessment and installation. Please see Table 8-2 of the appendix for greater details.

It should be noted that MOU-signing customers reported the largest facility size on a square-footage basis (1,313,000). Combination metric customers indicated the smallest facilities (20,775), even smaller than customers with comparison-group projects (85,711), again likely due to the fact that smaller customers are more likely to install a number of measures in a single project compared to larger customers who may spread out their energy efficiency improvements over time. Figure 5-14 toward the end of this chapter shows the average square footage for each of the sample groups.

Table 5-3: C&I customer process for identifying energy efficiency opportunities

C&I customer process for identifying energy efficiency opportunities	PA identified (n=5)	MOU-signing (n=4)	Three-year repeater (n=10)	Combination-metric (n=12)	All Successful Projects (n=31)	Comparison Group (n=17)
PA representatives identify projects	20%		20%		10%	
Trade allies identify projects	20%	25%	10%	25%	19%	24%
Internal expertise utilized	40%	100%	10%		23%	6%
External auditors / energy use monitors				8%	3%	12%
Included during renovation or remodeling			10%	8%	6%	
Rebate driven						18%
Equipment replaced upon failure						6%
Codes and standards driven				8%	3%	
When opportunity is easy and cheap						6%
Totals*	**80%**	**125%**	**50%**	**50%**	**65%**	**71%**

* Multiple responses allowed

5.2 Program Initiation and Awareness

The interviewed customers reported first learning about energy efficiency programs/initiatives from a variety of sources. Overall, the most common method reported was from contractor/vendor trade allies (23%). It is interesting that 26% of customers with successful projects said they first became aware of programs/initiatives because of prior program participation,[35] while none of the customers with comparison-group projects mentioned prior participation. This suggests some correlation between success and repeat participation. Stated another way, a disproportionate amount of success (and perhaps program-attributable energy savings) is coming from this subset of (here, self-identifying) repeat-participating customers.

For customers with comparison-group projects, trade allies, contractors, and vendors were more than twice as likely (35%) to be the initiation source than for customers with successful projects (16%). It should be noted that this is potentially a function of large customer ties to PA representatives.

Table 5-4: Program awareness/initiation

How customers first learn about energy efficiency programs	All Successful (n=31)	Comparison Group (n=17)	All Customers (n=48)
Trade ally / contractor / vendor	16%	35%	23%
Prior program participation*	26%	0%	17%
PA contact	16%	12%	15%
Mailer/Newsletter from PA	13%	6%	10%
Customer initiated contact with PA	10%	12%	10%
Phone call from PA representative	6%	6%	6%
In-person visit from PA representative	3%	12%	6%
Internal personal contacts	6%	0%	4%
External personal contact	0%	12%	4%
E-mail from PA representative	3%	0%	2%
Don't Know	0%	6%	2%

* Here self-identified as repeat-participants, not necessarily 2011-2013 tracking-data indicated.

[35] It may be that extensive or long-running prior program participation is associated with not recalling the origin of initial program awareness.

5.3 External Audits and Technical Assistance

When all respondents were specifically asked if they had received an external technical assessment or audit, 67% said "yes." PA-identified successful customers and MOU-signing customers were most likely to use internal auditors. This is at least in part due to the fact that these two customer groups are typically larger organizations that employ specialized staff with the capabilities to perform internal energy audits. Specialized staff are less prevalent at smaller and medium-sized organizations, resulting in their use of external auditors.

Table 5-5: Received external audit or technical assessment*

Customer Group	Yes, external audit	PA or internal Audit	DK / NA
PA-identified successful (n=5)	60%	40%	0%
MOU-signing (n=4)	50%	50%	0%
3-year repeat participants (n=10)	60%	30%	10%
Combination-metric identified (n=12)	83%	8%	8%
All Successful (n = 31)	**68%**	**26%**	**6%**
Comparison Group (n=17)	**64%**	**24%**	**12%**

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

5.4 Energy Efficiency Opportunities Not Pursued

Respondents were asked if they considered other energy efficiency opportunities for the project that were not pursued, and 29% said "yes." Projects considered but not pursued included boilers, HVAC, lighting, refrigeration, solar, thermostats, and windows.[36] Interestingly, customers with PA-identified successful projects were most likely (60%) to indicate projects considered but not pursued (see Table 5-6). This might suggest that the PA-identified successful projects enjoyed a more exhaustive process to identify measures within projects and/or greater comprehensiveness and diversity of measures considered within projects. It stands to reason that more measures considered, in a given project, increases the likelihood that at least one measure will not be pursued. This also could mean that during year-over-year participation customer engagements, the PAs and trade allies are preparing the customer for the next investment opportunity.

Table 5-6: Other opportunities considered with project, but not pursued?*

Customer Group	Yes	No	Don't Know	If yes, what measures
PA-identified successful (n=5)	60%	40%	0%	Boiler, LEDs, thermostats
MOU-signing (n=4)	25%	25%	50%	VFDs
3-year repeat participants (n=10)	20%	40%	40%	HVAC
Combination-metric identified (n=12)	24%	58%	17%	Thermostats, windows
Comparison Group (n=17)	24%	59%	18%	Lighting, refrigeration, solar
Total	**29%**	**48%**	**23%**	

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

[36] Please note: solar and windows are not supported by the Mass Save C&I program.

Respondents who indicated unpursued opportunities in the project were asked why. All but two of the 12 responses indicated financial reasons, including long payback, high first cost, and limited budget. The remaining two customers (both with comparison-group projects) cited the need for other building improvements to precede the installation of unpursued measures.

Table 5-7: Reason additional opportunities considered, but not pursued*

Customer group	Reason additional opportunities considered, but not	n
PA identified successful	Payback, ROI too long	2
	First cost too high	1
MOU-signing	Payback, ROI too long	2
	Limited budget	1
Repeat participants (3yrs)	Limited budget	1
Combination-metric identified	Payback, ROI too long	1
	First cost too high	1
Comparison Group	Must do other improvements before facility can handle measure	2
	Limited budget	1

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

5.5 Why Projects Are Pursued

Customers indicated both financial (Table 5-8) and non-financial (Table 5-9) reasons for doing projects. Eighty-seven percent of all respondents reported receiving financial incentives for energy efficiency projects, and no one reported not receiving incentives. Specifically, over half of respondents (56%) described the type of incentive as a first-cost buy-down rebate provided by the PA. Fifteen percent reported free measures, and 13% did not specify the type of incentive. Several (4%) customers indicated that the PAs subsidized contractors on their behalf, and one other (2%) reported on-bill financing. Respondents associated with the combination metric customer group reported receiving free measures at a higher rate (33%) than any other customer group. This is expected since the combination group is more likely to be served under the DI initiative, which provides free measures as part of the participation process.

Table 5-8: Financial incentives received for project*

Customer Group	Yes	Yes, reduced first cost	Yes, free measures	Yes, utility payment to contractor	Yes, on-bill financing	DK / NA
PA-identified successful (n=5)	0%	80%	0%	0%	0%	20%
MOU-signing (n=4)	0%	75%	0%	0%	0%	25%
3-year repeat participants (n=10)	10%	50%	10%	0%	10%	20%
Combination-metric identified (n=12)	0%	58%	33%	8%	0%	0%
All Successful (n=31)	**3%**	**61%**	**16%**	**3%**	**3%**	**13%**
Comparison Group (n=17)	**24%**	**47%**	**12%**	**6%**	**0%**	**12%**
Total	**10%**	**56%**	**15%**	**4%**	**2%**	**13%**

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

Fifty-three percent of customers with comparison-group projects reported being motivated to action by reduced utility bills, compared to only 19% of customers with successful projects. Sixteen percent of customers with successful projects cited conservation as a motivational driver, compared to 0% of customers with comparison group projects. The difference is even greater when comparing conservation-motivated actions of combination metric successful projects (33%) vs. comparison-group projects (0%). The findings indicate that money matters more to customers with comparison-group projects, and conservation matters more to those with successful projects, independent of customer size.

Table 5-9: Non-financial incentive reasons for implementing project (percent of responses) #**

Non-incentive driver of action	PA identified (n=5)	MOU-signing (n=4)	Three-year repeater (n=10)	Combination-metric (n=12)	All Successful Projects (n=31)	Comparison Group (n=17)
Better lighting quality						12%
Competitiveness	20%		10%		6%	
Conservation		25%		33%	16%	
Dealing with single contractor						6%
Ease of installation						6%
End of service life						6%
Energy efficiency			10%	25%	13%	18%
GHC reduction						6%
Improved comfort			10%		3%	
Increased productivty	20%				3%	
New equipment reliability			10%	17%	10%	12%
No up front cost	20%				3%	
Payback		50%			6%	6%
Reduce operating cost	20%	25%		8%	10%	12%
ROI			20%	8%	10%	12%
Trusted trade ally				8%	3%	
Utility bill reduction	20%		30%	17%	19%	53%
Don't Know			10%		3%	12%
Totals*	**100%**	**100%**	**100%**	**117%**	**106%**	**159%**

* Multiple responses allowed
** Despite being explicitly asked about NON-financial incentives here, some customers still responded with financial reasons.
# Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

5.6 Why Projects Are Not Pursued

All respondents were asked to describe barriers that impeded the implementation of projects. A strong majority of three-year repeat (80%), combination metric (70%), and comparison group (65%) customers said that there were no barriers to project implementation. PA-identified, MOU-signing, and combination metric customers described several barriers related to the cost of operational downtime. PA-identified and MOU-signing customers cited permitting requirements with external organizations as another barrier (see Table 5-10).

Table 5-10: Barriers to project implementation*

Customer group	Barriers to implementing projects	Percent within customer group	n
PA identified successful	Believability of savings estimates overcame by gaurantee of savings by Project Expediter	20%	1
	EPA water discharge permit	20%	1
	Interconnection agreement lag-time	20%	1
	Internal approval process lag-time	20%	1
	Operational downtime overcome internally	20%	1
MOU-signing	No barriers	25%	1
	Inacurate savings estimates and engineering resource availability	25%	1
	Lots of steps and time to implement	25%	1
	Operational downtime overcome internally	25%	1
3-year repeat participants	No barriers	80%	8
	Believability of savings estimates	10%	1
	Paperwork	10%	1
Combination-metric identified	No barriers	58%	7
	Business financials in downturn	8%	1
	Contractor problems, overcame by PA	8%	1
	Lack of knowledge and funding	8%	1
	Lag time on equipment order	8%	1
	Operational downtime expense overcame	8%	1
Comparison Group	No barriers	65%	11
	Could not use preferred contractor	6%	1
	Installation left incomplete	6%	1
	Internal approval process lag-time	6%	1
	Operational downtime expensive	6%	1
	Sandbagged by contractor on cost	6%	1
	Yes, but concerns over lighting quality and disruptive installations did not materialize	6%	1

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

5.7 Project Assistance

Customers with successful projects reported receiving project assistance from energy advisors, program implementers, and other program staff at slightly higher levels than customers with comparison-group projects. Also, 8% of customers with successful projects reported receiving assistance from other trade allies such as project expediters, compared to 0% of customers with comparison-group projects.

Table 5-11: From whom customers indicate receiving project assistance*

Market actor	PA identified (n=5)	MOU-signing (n=4)	Three-year repeater (n=10)	Combination-metric (n=12)	All Successful Projects (n=31)	Comparison Group (n=17)
Energy advisor such as energy engineering firm	20%	25%	0%	17%	13%	12%
Program implementation contractor	0%	25%	50%	75%	48%	41%
Other progam staff (PA reps, Tech Service Reps)	20%	25%	20%	8%	16%	12%
Other trade allies such as project expediter	40%	0%	10%	8%	13%	0%

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

Respondents were asked to describe the impacts of project assistance from the four types of market actors displayed in Table 5-11. Customers reported being impacted by implementation contractors the most, and often said that contractors did most of the work. Customer respondents mentioned the PAs as the second-most common market actor providing project assistance, mainly because PAs administered, audited, and funded projects. Customers also reported receiving assistance from energy advisors, consultants, and manufacturers. See Table 8-1 of Appendix A for details.

5.8 Project Implementation Process

Respondents were asked to describe the step-by-step process undertaken to complete projects from start to finish. Table 8-4 of Appendix A details the process of implementing projects from the customer perspective. The responses show that MOU-signing and PA-identified customers had more internal specialized staff to implement projects than customers with comparison-group projects.

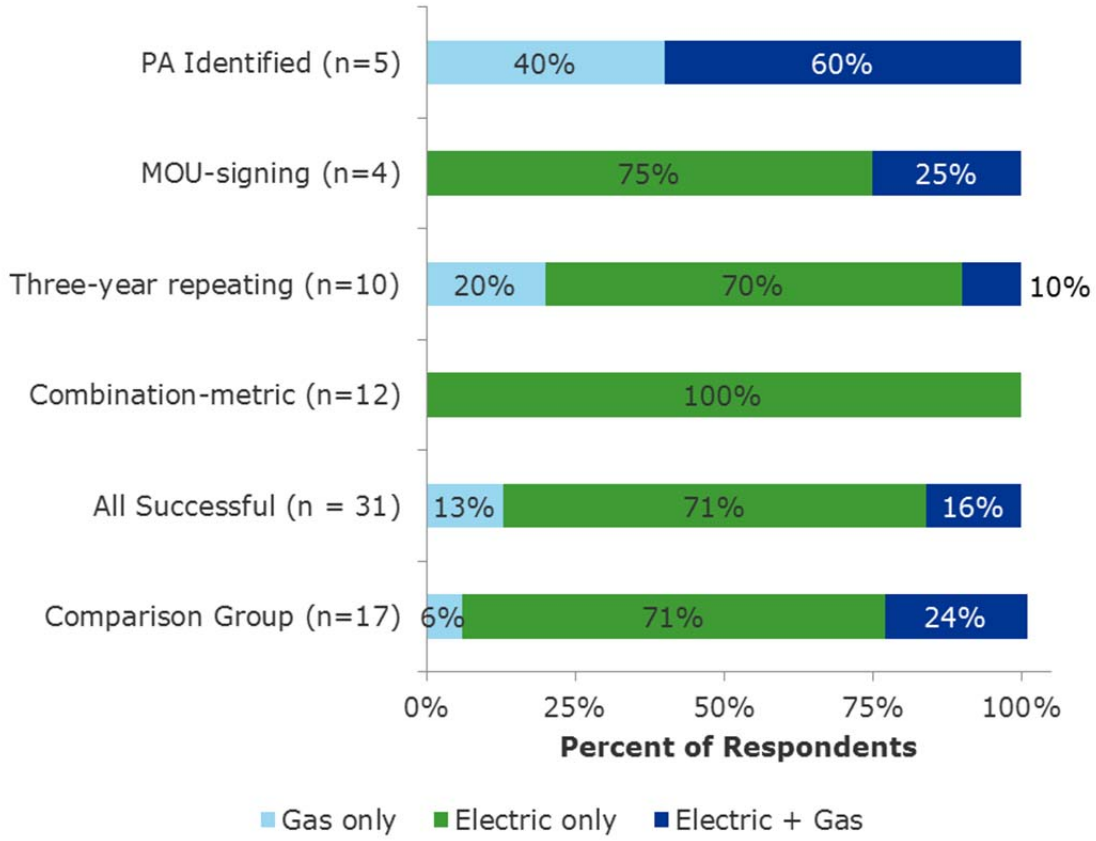
Customers with comparison-group projects were more likely to report project initiation from contractors than from any other market actors. None of the PA-identified or MOU-signing customers reported contractor-initiated projects. Instead, these customers indicated that internal staff or the PAs initiated projects. Aside from the resource advantages associated with being large, this could be an indicator of the value of internal or PA-related project champions, as opposed to contractors just working to sell jobs.

After project initiation, facility audits were often mentioned next in the step-by-step process of implementation. The results of the audits contain project scoping, specification, and estimates of costs and benefits. From this, customers reportedly decide if and how to proceed with work. After work is completed, a post inspection is often performed by PAs or contractors to verify installation.

5.9 Fuel Types and Projects

Overall, the majority (71%) of the projects completed by the responding customers were electric-only, followed by a combination of electric and gas (18%), and gas-only (11%). Figure 5-1 breaks out fuel type by customer group. Among successful customer projects, dual-fuel projects were most prominent (60%) for the PA-identified customer group. PAs found dual-fuel projects to be noteworthy, but the other three identifying metrics did not identify them quite as prominently. In fact, none of the combination metric projects were dual fuel.

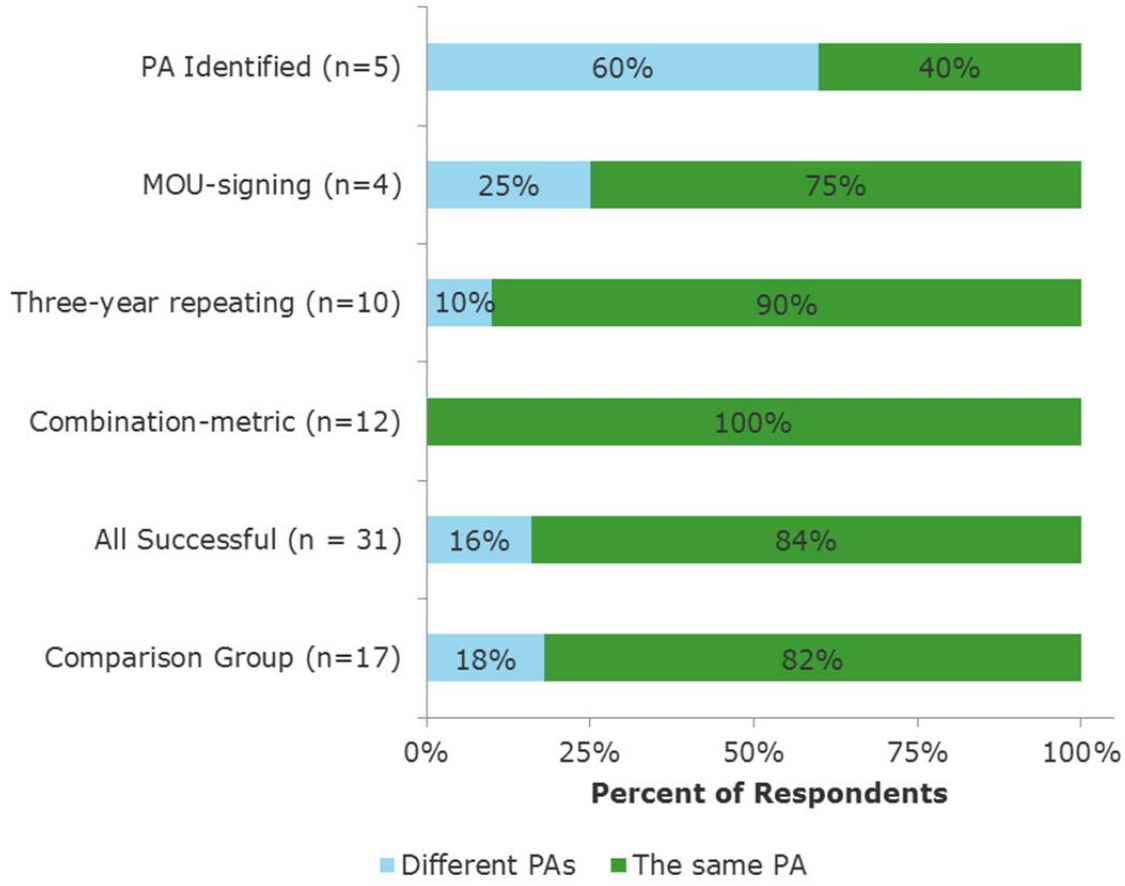
Figure 5-1: Fuel types involved with projects*



* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

The majority (83%) of all respondents reported utilizing a single PA on their projects. In some instances, the same PA was used for both electric and gas measures, but for others the electric and gas PAs were different. This can be observed in Figure 5-2 below. PA-identified and MOU-signing customers were more likely (60% and 25%, respectively) to utilize more than one PA during project implementation than the other three customers groups. Utilization of multiple PAs naturally correlates with dual-fuel projects. More often than not, projects that utilize more than one PA and fuel type enjoy greater measure diversity.

Figure 5-2: PAs utilized by customers



* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

For projects that utilized more than one PA, customers were asked to explain their experience with the involvement of two organizations. Five of the customers had a favorable experience with the different PAs, whereas one respondent indicated that the process was more challenging, as coordination needed to be done through two entities as opposed to one (see Table 5-12).

Table 5-12: Customer experience when utilizing different PAs*

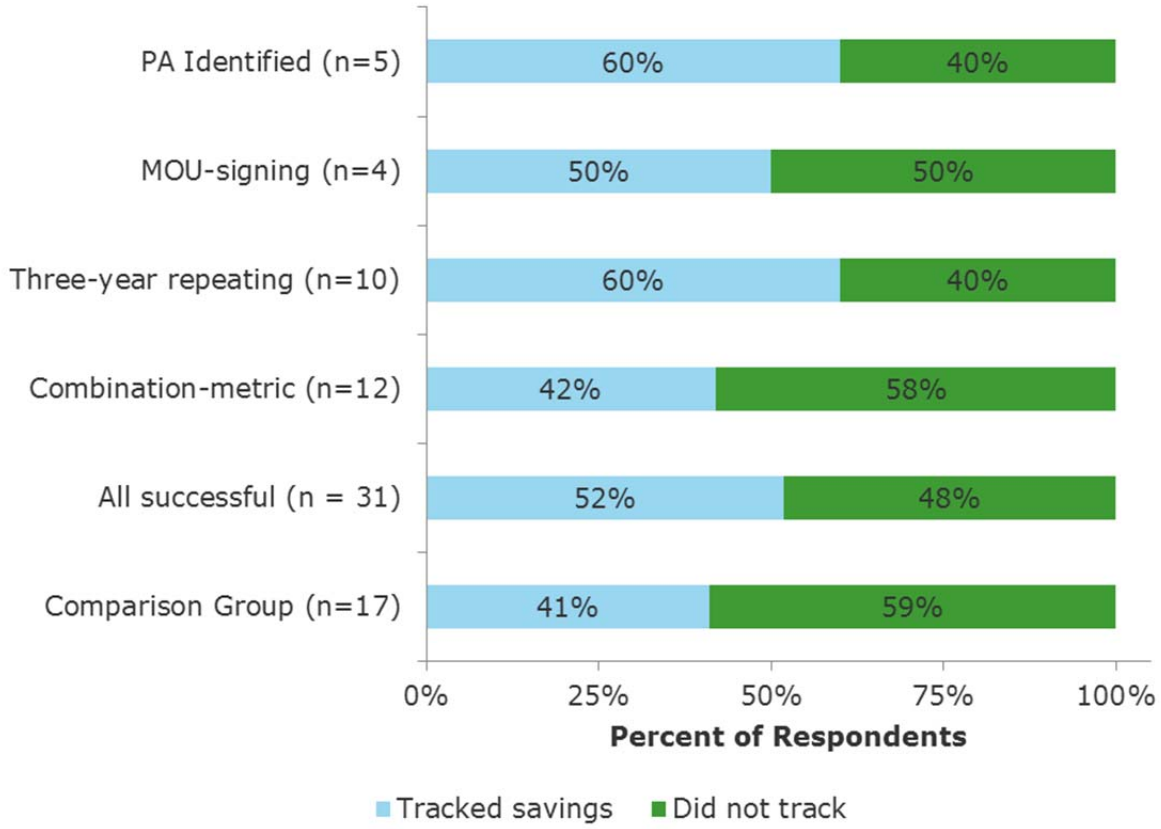
Customer Group	Experience with Different PAs
PA Identified (n=1)	There was no difference and it seemed like they were only working with one PA.
MOU-signing (n=1)	Doesn't differ much. They're pretty good at navigating between the utilities, and they have account reps that are attentive at both PAs.
Three-year repeating (n=1)	The experience went well.
Comparison Group (n=2)	Responses were split between there was no difference, and the other thought that the process was more challenging as coordination was more difficult.

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

5.10 Customer Tracking and Perception of Bill Savings

Respondents indicated an even split, with half tracking their bill savings and the other half not tracking it (see Figure 5-3). This is an interesting, because one would think that most customers would look for bill savings derived from projects. Customers with successful projects were more likely (42-60%) to track bill savings than customers with comparison-group projects (41%).

Figure 5-3: Percent of customers tracking bill savings*



* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

A slight majority of the respondents who said that they could quantify the energy savings (6 out of 11, or 55%) provided an actual quantifiable answer for the energy bill reduction. Self-reported energy bill reductions ranged from 30 to 50% (see Table 5-13). One customer simply said, "the savings were good."

Table 5-13: Customer-reported savings due to projects*

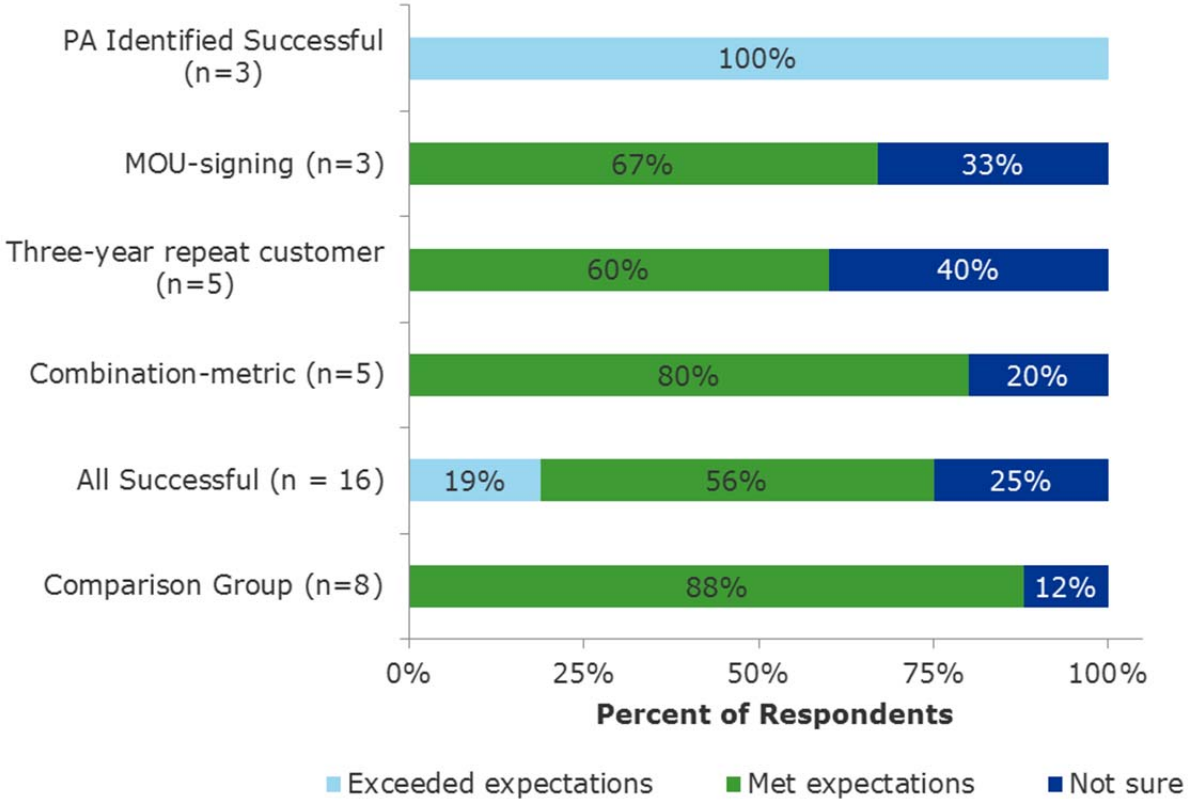
Customer Group	Savings reported by customer
PA Identified (n=3)	50% reduction in electricity usage 50% reduction in gas usage Over $1 million annually
MOU-signing (n=1)	Respondent could not say specifically
Three-year repeating (n=1)	Customer reported the savings were good
Combination-metric (n=2)	45% energy reduction 50% savings in energy
Comparison Group (n=4)	About a 30% reduction The rest could only indicate that it went down

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

The majority of all respondents (67%) indicated that the savings met their expectations, and 13% indicated that the savings exceeded their expectations. Twenty-one percent were not sure, and no one said that the savings fell short of their expectations.

All three (100%) of the PA-identified customers responding to this question indicated that savings were higher than they expected. Several respondents, all of which indicated it was hard to know if their expectations were met, said that changes in operating patterns and the lack of sub-meters made it difficult to see savings from specific measures or projects (see Figure 5-4).

Figure 5-4: Customer reporting of how well projects met their bill savings expectations*



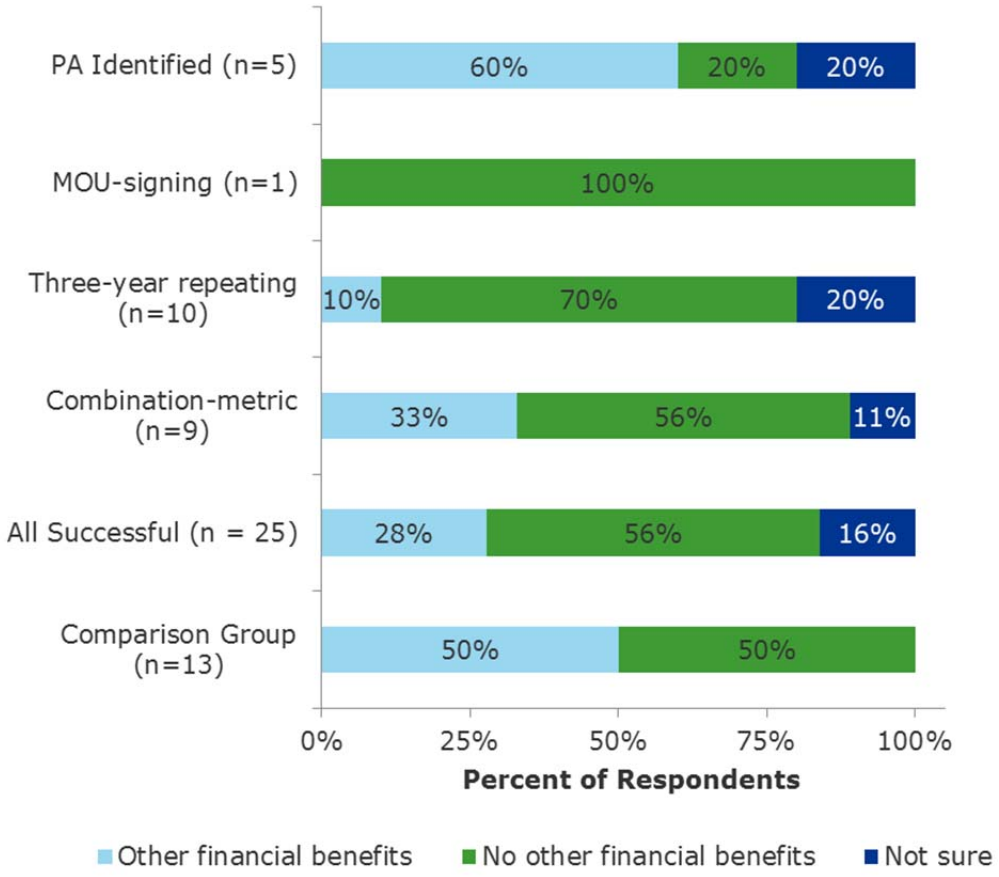
* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

5.11 Non-Energy Benefits (both Financial and Otherwise)

A slim majority of all respondents (54%) indicated that there were no financial benefits gained through their project aside from energy bill savings. A third of all respondents (33%) did receive non-energy benefits that were also financial. The remaining 13% could not say if they had received additional financial benefits.

Figure 5-5 provides a breakout by customer group of reported financial non-energy benefits. As was the case with extra energy bill savings, PA-identified customers indicated the highest frequency (60%) of other financial benefits.

Figure 5-5: Customers reporting additional financial benefits*



* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

Respondents were then asked to describe the nature of these financial non-energy benefits. Most other financial benefits received by the customer were reductions in maintenance costs and operational downtime as their systems operate more efficiently. This includes benefits such as reduced labor costs, as the customer doesn't need to pay an outside party to repair the equipment (see Table 5-14).

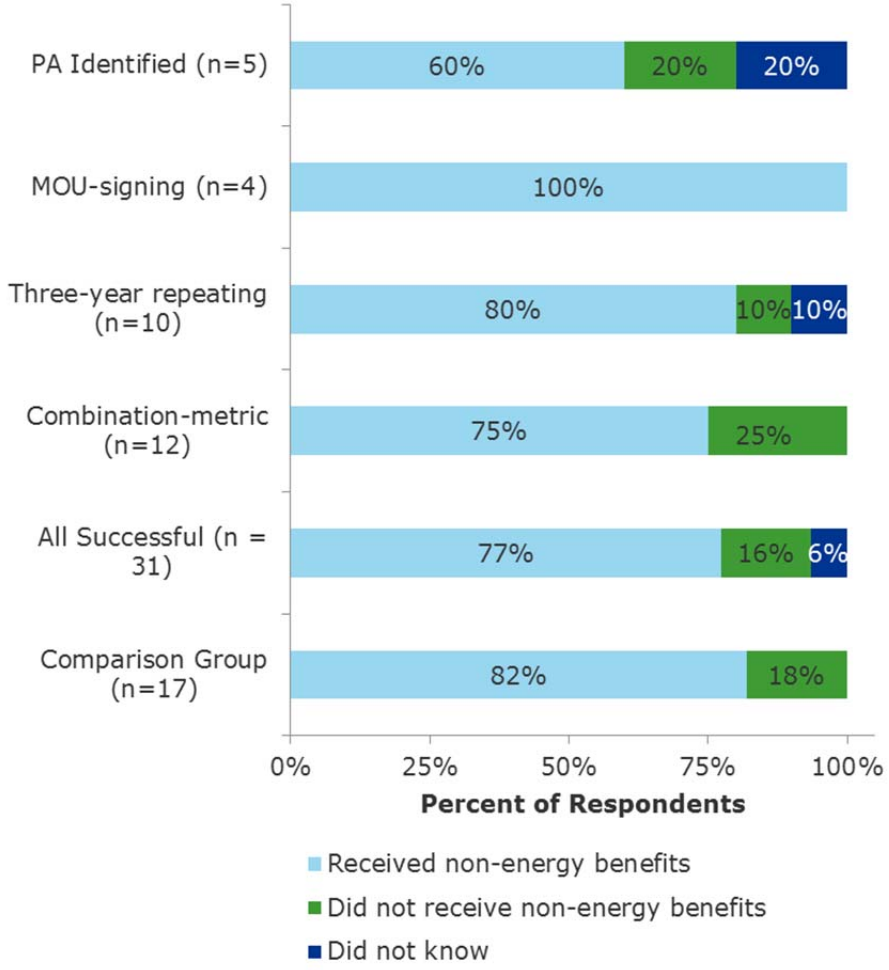
Table 5-14: Additional financial benefits received by customer*

Customer Group	Other benefits explained
PA Identified Successful (n=3)	business (more running hours) and less operational down time Reduced water consumption, as less well water needs to
Three-year repeat customer (n=1)	Better quality products (due to more even heating)
Combination-metric (n=3)	Labor cost savings Equipment maintenance savings No out of pocket bulb costs
Comparison Group (n=9)	Reduced wear and tear on system Reduced maintenance costs Increased consumer shopping in store A way to attract new tenants

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

Non-energy benefits can also be non-financial (not have a dollar amount attached to them), but nevertheless can produce value in the eyes of the customer. The majority (80%) of all customers reported receiving non-energy benefits (both financial and otherwise) as a result of their projects, whereas 18% did not indicate any non-energy benefits (see Figure 5-6).

Figure 5-6: Customers receiving non-energy benefits from projects*



* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

Many non-energy benefits experienced by the customer were in the form of improved operations and maintenance, comfort, health, safety, and public perception of the business being greener and doing their part for the environment. One customer said that the implementation of energy efficiency can be used as a public relations or marketing tool to demonstrate their commitment towards being greener, and as a way to better attract customers (see Table 5-15).

Table 5-15: Non-energy benefits received by customer*

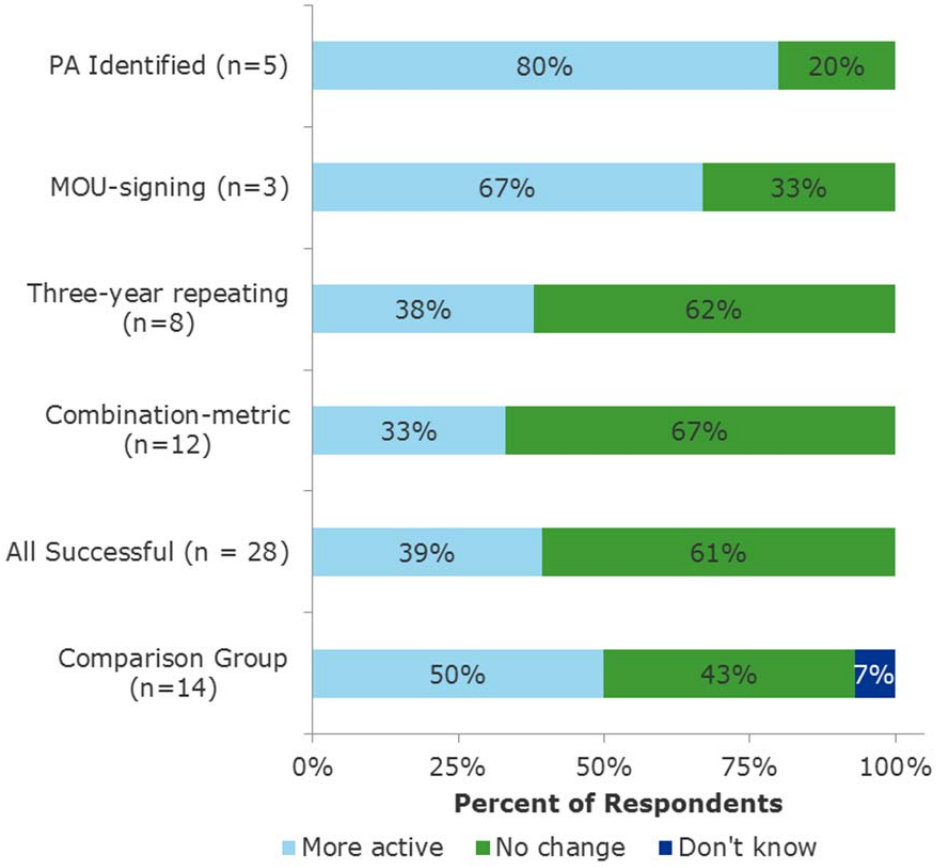
Customer Group	Non-energy benefits received by customer
PA Identified (n=4)	Reduction in carbon footprint (25%) Improved health and safety (25%) Improved Public Relations (25%) Increased comfort (25%)
MOU-signing (n=4)	Increased comfort and safety (25%) PR benefits through the promotion of green technologies (25%) Reduced operations & maintenance costs (25%) Added equipment safety measures (25%)
Three-year repeating (n=8)	Reduced operations and maintenance (30%) Increased comfort (40%) Less down time (10%) Better work conditions (10%) Customers like it (10%)
Combination-metric (n=9)	Environmental benefits (8%) Improved conditions (17%) Green perceptions (17%) Operations & maintenance savings (17%) Improved safety (8%) Increased comfort (8%) Improved facility usage (8%) Public Relations benefits (8%) Improved aesthetics (8%)
Comparison Group (n=14)	Operations and maintenance (33%) Perception of being more green (6%) Increased comfort/better working conditions (56%) Reduced carbon outputs (6%)

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

5.12 Customer Understanding of Energy Usage

All respondents were asked if they had become more active in managing energy use because of the project. Overall, half of respondents (50%) indicated that projects did not help them understand their energy usage more, and nearly an equal amount (48%) said that it did help. Many of those respondents that answered "no change" indicated that they have always been aware of and continually monitored their usage (see Figure 5 7).

Figure 5-7: Change in managing energy usage because of projects*



* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

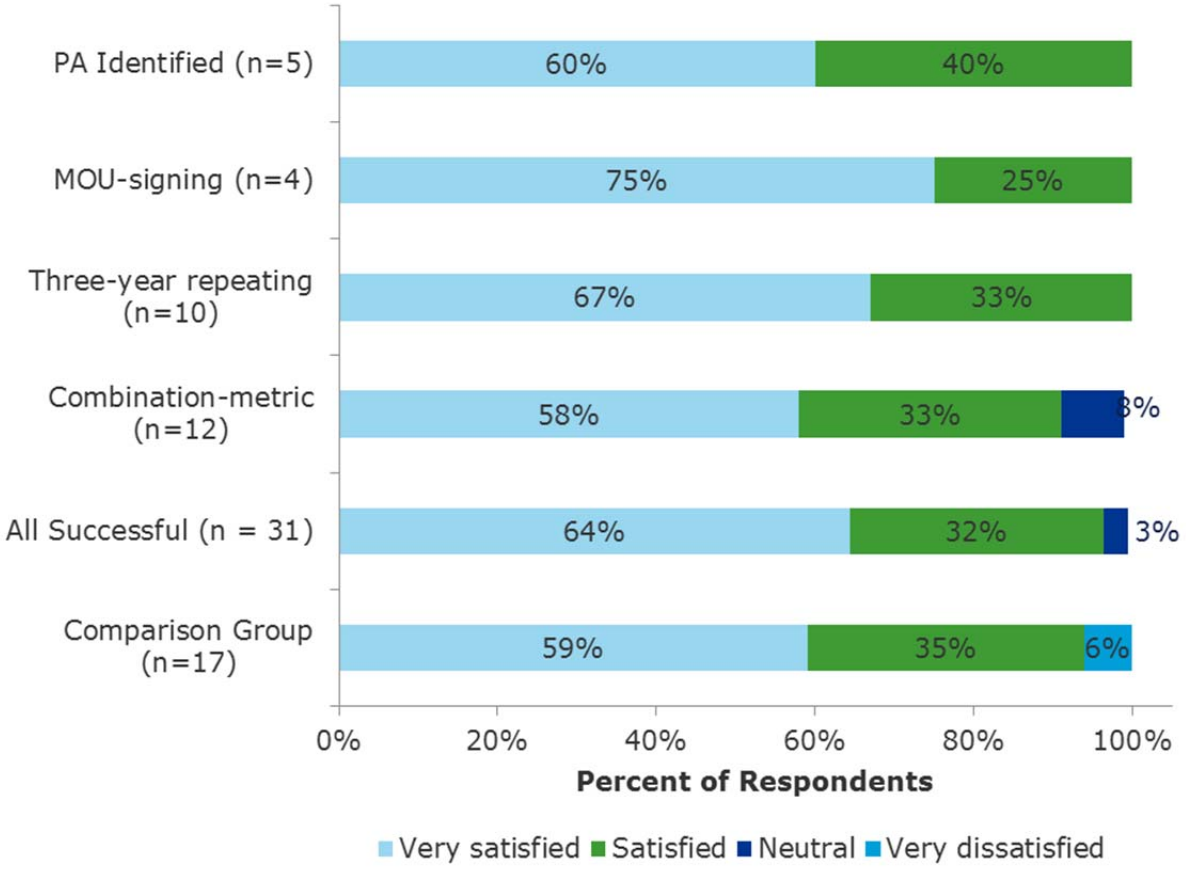
5.13 Customer Satisfaction with Projects

The vast majority of all respondents (96%) indicated that they were satisfied with the project. This measure of satisfaction included responses of 4 to 5 on a 5-point scale:

- 5.0 = extremely satisfied (63%),
- 4.5 = satisfied (8%), and
- 4.0 = somewhat satisfied (25%).

Though generally satisfied, the comparison group had a higher percentage of dissatisfied respondents (6%) when compared to the four successful groups (0%). This offers some evidence for the validity of the success criteria (see Figure 5-8 below). Figure 5-11 offers additional evidence supporting the validity of the criteria, with regard to customer reporting of project success. In fact there was some modest correlation between 1) customer satisfaction, 2) customer reporting of project success, and 3) metric-indicated customers with successful projects.

Figure 5-8: Customer satisfaction with completed projects*

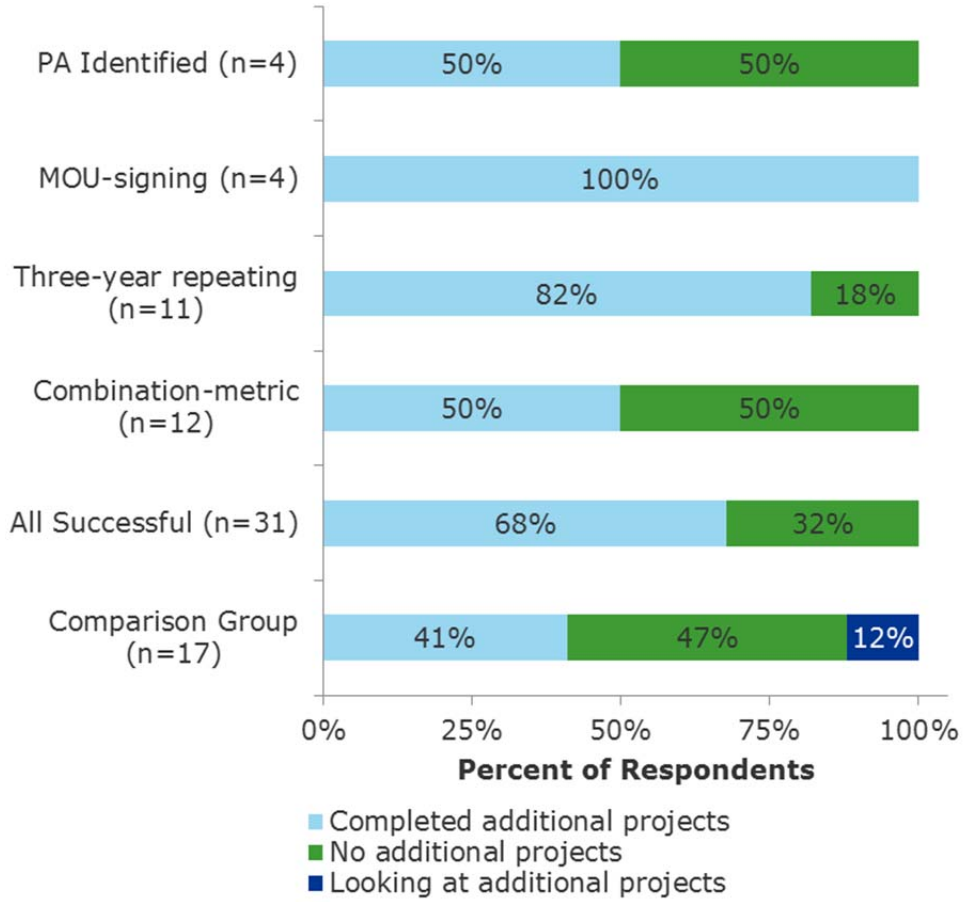


* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

5.14 Additional Projects, Possibly Representing Spillover

Overall, the majority of the respondents (55%) indicated that they had completed additional projects since the project they were asked about in the survey. The remaining portion (45%) indicated they either had not completed any, or that they were in the process of looking into some other projects (see Figure 5-9). All successful groups indicated completing additional projects at higher rates (50 to 100%) than the comparison group (41%).

Figure 5-9: Completion of additional projects, since this project*



* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

The reasons for the respondents deciding to pursue additional projects were mixed and varied. They included rebates/saving money, environmental concerns, positive initial experiences, and recommendations from vendors (see Table 5-16).

Table 5-16: Reason for pursuing additional projects*

C&I Customer Group	Reason for pursuing additional projects
PA Identified Successful (n=2)	Vendor recommendations Energy savings
MOU-signing (n=3)	Money/rebates Environmental concerns/goals Payback periods under 3 years
Three-year repeat customer (n=1)	Contractor recommendations
Combination-metric (n=2)	Got the ball rolling towards other energy efficiency projects Continually looking to improve their facilities
Comparison Group (n=4)	Good return on investment Familiarity with the process No paperwork involved (contractor did it all) Success with previous projects

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

Respondents completing additional projects all reported using Mass Save to complete them. This indicates the importance of Mass Save, and the effect it has on getting energy efficiency projects completed in Massachusetts. Although, it also suggests that there may be limited spillover (see Table 5-17).

Table 5-17: Funding source for additional projects*

Customer Group	Projects utilizing Mass Save
PA Identified Successful (n=1)	Yes (100%)
MOU-signing (n=4)	Yes (100%)
Three-year repeat customer (n=2)	Yes (100%)
Combination-metric (n=2)	Yes (100%)
Comparison Group (n=5)	Yes (100%)

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

5.15 Memorandums of Understanding (MOUs)

An MOU is a multi-year signed agreement between the PA and the customer whereby the customer and PA mutually agree to complete energy efficiency projects to meet a savings reduction target. All of the respondents (100%) that were designated as having signed an MOU with the PA confirmed that they did sign an MOU and were familiar with the agreement. MOU-signing customers indicated experiencing a number of benefits since signing the MOU, including improved rebates, pursuit of more projects and savings, and less counterproductive dialogue with the PAs. The guarantee of energy savings was also mentioned as a benefit of MOUs.

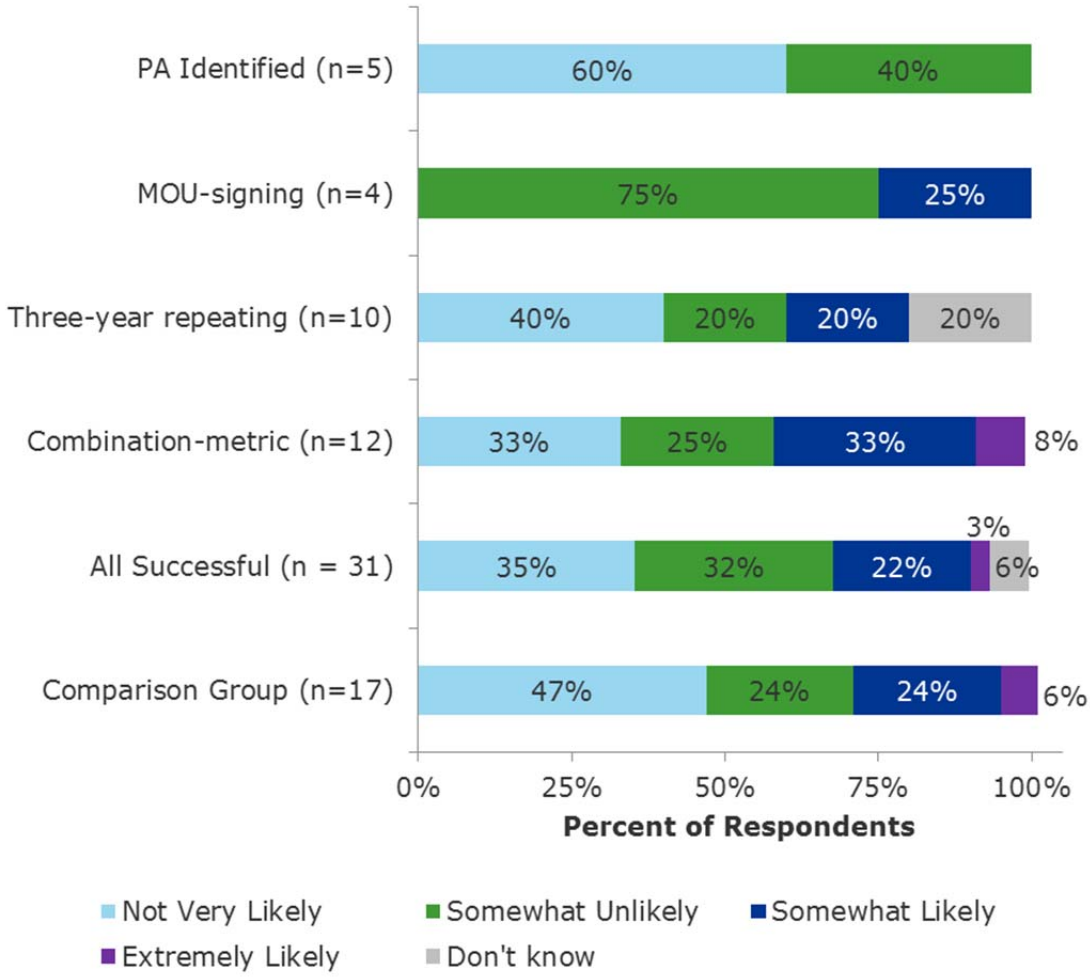
One respondent said that MOUs set performance targets, and to achieve these targets the largest energy-using equipment is often targeted to reach that goal, and that this had the effect of further increasing energy savings. Another respondent said that MOUs strengthen relationships with PAs and mean “less back-and-forth and disagreements.” Another stated that energy savings goals are more likely to be met, because MOUs are long-term commitments that must be honored.

All of the respondents that weren't identified by the PAs as MOU-signing confirmed that they did not sign an MOU. Interestingly enough, one of the comparison-group customers was considering signing an agreement with the PAs at the time of the interview.

5.16 Free-Ridership

Overall, the majority of the respondents (68%) indicated they were not likely to have completed the project without the assistance from the PA (39% said "not very likely at all," and 29% said "somewhat unlikely"). This indicates that support from the PAs made a significant difference in the number of projects that were completed (see Figure 5-10). In addition, it is an indication that the selection of successful projects was not biased towards free-riders as we see that the program did have an impact on customers' decision to move forward with the project.

Figure 5-10: Likelihood of completing projects without PAs*



* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

5.17 Factors Leading to Project Success

Respondents were asked to list and describe factors that lead to project success. The responses from different customer groups varied, but some commonalities included having a positive experience, achieving savings, the program staff and contractors being reputable, and having an effective energy efficiency champion working on the project (see Table 5-18).

The most common factor cited (by 50% of the combination metric identified customers, and 31% of the customers with comparison-group projects) was the energy and bill savings achieved. To get a deeper understanding of what success means to the customers, DNV GL asked the customers to discuss what makes the projects successful aside from energy and bill savings. A number of customers (one with a comparison-group project, one PA-identified, two combination metric identified, and two repeat participants) mentioned having a positive experience with trade allies. The integrity of the company and its workers, and flexibility in scheduling work around the customers' schedules led to positive experiences for many customers. This makes sense, as difficulties with the contractors and/or issues with the program staff hamper the chances a project will be successful.

One combination metric identified customer, one repeat participant, and one customer with a comparison-group project noted that a project is successful if it benefits both parties involved (both PA and customer). It's interesting to see altruism or symbiosis at play. Similarly, two customers with comparison-group projects and one combination metric identified customer noted that projects are successful if they benefit the environment through decreased energy consumption and greenhouse gas (GHG) emissions. Perhaps, there may be intrinsic psychological benefits with conservation, leading people to feel success.

Table 5-18: Factors making energy projects successful*

Customer Group	Factors making energy efficiency projects successful
PA Identified Successful (n=1)	•Convenience •Flexibility in the scheduling the work
MOU - signing (n = 4)	•Easy to implement programs •Having a trusted point-of-contact •Integrating project to academic •good Public relation •Having the utility as the project champion •Collaboration among stakeholders •Resources that Utility brings
Three-year repeating (n=8)	•Good Program staff •The comfort level was achieved and the system still operates effectively •Achieving energy efficiency •Having an accurate audit done •A project that benefits both parties involved. •Good relationship with utility representative •Good experience with the account representative and the burner supplier •Being reasonable and not setting the benchmark too high
Combination-metric (n=8)	•Contractors and program representatives very professional •Having a positive experience •Savings money and energy •Not having to replace equipment as often now •Having the utility as the project champion •Completing the project on time, the equipment works, and the desired outputs were achieved •Has to be a win-win situation where you save money, and the energy usage benefits the environment
Comparison Group (n=11)	•Environmental benefits through energy savings, and doing their part to save the planet •Bill savings, longer lasting equipment •Achieving the planned goals •Improved aesthetics of the property •Increased feeling of safety from the residents •Improving the system from what was there previously •Having good planning and preparation •Communication and timing •Flexibility and scheduling of contractors •Having good quality products installed, with a good service staff •Having a designated person as the energy champion, and designating it as a priority

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

Respondents were asked to choose the most important factors leading to success. A positive relationship with trade allies was the most commonly cited factor associated with project success, accounting for 30% of all factors cited. Other top factors included competent workers, accurate information throughout the project, minimal to no disruptions to operations or customers, and the achievement of desired end results (see Table 5-19).

The time to project completion was another important factor. Several respondents indicated that success was driven in part by quick turn-around in communications between customers, the PA, and contractors; and minimizing the amount of time of intrusion caused by contractor measure installation. Two MOU customers, one repeat participant, and three comparison-group customers said that when the intrusion was very slight, and operations did not require a large downtime, the project was successful. It is important to note that energy and bill savings were cited in many of the responses, but this was covered in the previous question.

Table 5-19: Top factors that lead to successful projects*

Customer Group	Top factors leading to success
PA Identified (n=5)	•Partnering with the person doing the work, to understand why they are doing what they are •Good analysis of the project beforehand •Having accurate information on costs and savings expected •Having a relationship and trust with the utility personnel
MOU-signing (n=4)	•No interference to residents or operations •Having a contact person that he can get answers to right away •Satisfaction with the equipment •Producing good PR and getting people to know about the improvements made
Three-year repeating (n=10)	•Quick turn-around on the approval process •Having the utility put the customer in contact with the appropriate vendors •Cost of the equipment and the simplicity of the units installed •Appropriate and competent staff members
Combination-metric (n=12)	•Weren't in the customers way •Quick installation time •Clean, professional and polite staff/workers •Competent and flexible workers
Comparison Group (n=15)	•Influencing others to make the same changes •Peace of mind, knowing they don't have to replace equipment •Energy savings •Making the space more appealing than it was previously

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

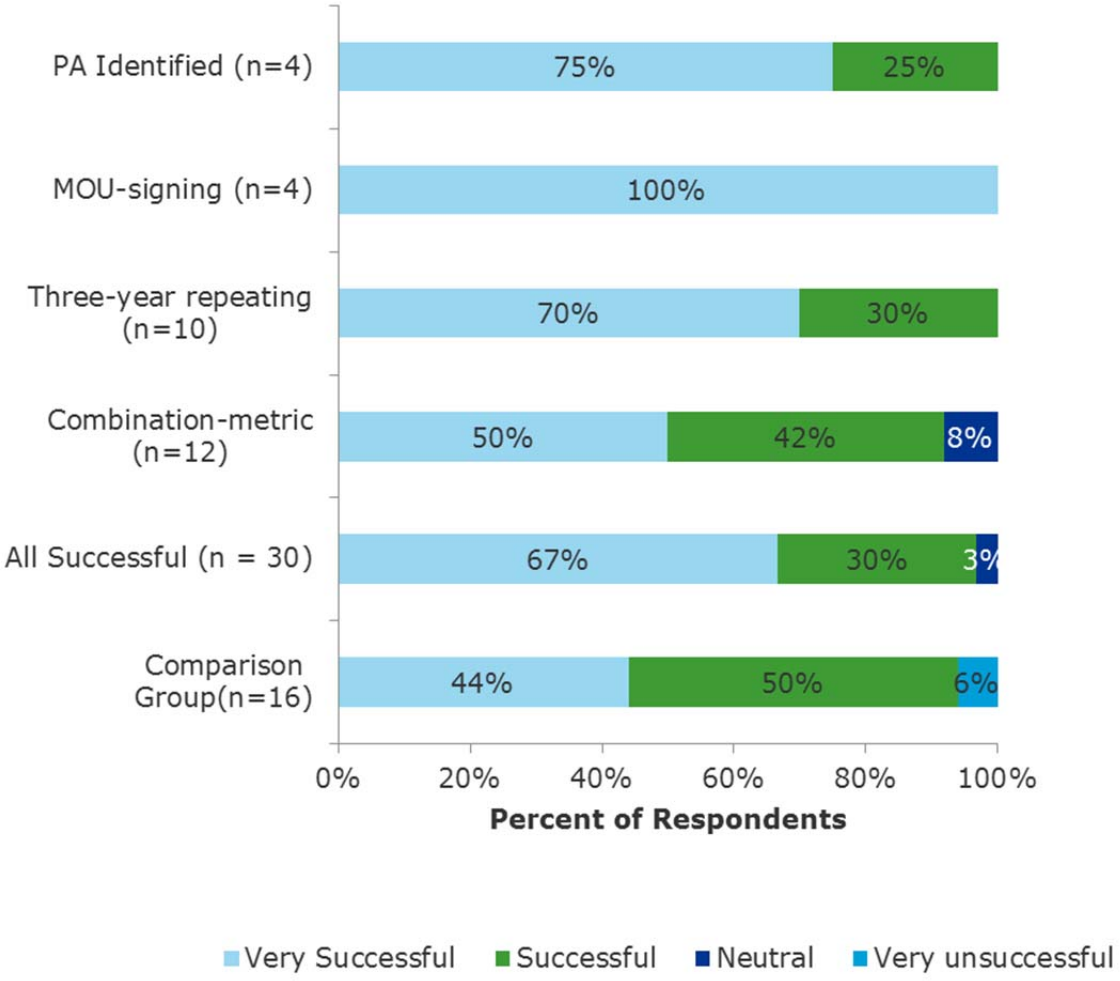
The majority of respondents (92%) reported that completed projects were considered successful, to some degree or another. This measure of success included responses of 4 to 5 on a 5-point scale:

- 5.0 = very successful (59%),
- 4.5 = between successful and very successful (4%), and
- 4.0 = successful (33%).

Overall, reported levels of success are quite high among all customer groups. This is not surprising given that it is a self-reported metric given by the customer and overall customer satisfaction with PA programs is high. Figure 5-11 provides a breakout by customer group. All groups within the successful category were more likely to self-report the highest level of success, “very successful” (50-100%), than the comparison-group category of customers (44%). As noted above, this lends some credence to the choice in metrics to identify success.

The three-year repeaters reported more success than both the comparison group and the combination metric group, but less success than PA-identified and MOU-signing customers. It may be that three-year repeaters have higher expectations than the PA-identified and MOU groups, and/or it may be a function of the less selective nature of the three-year repeating criterion when compared to PA-identified and MOU-signing criteria.

Figure 5-11: Customer reporting of project success*



* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

5.18 Factors Hindering Success

Respondents were asked to identify issues that hinder success. They cited issues including the disruption of building operations or tenant inhabitation when the contractor was performing work, communication problems between customers and the PAs, and lack of funding needed to cover the cost of audit-recommended measures (see Table 5-20). The time it takes to complete the project, including paperwork and the application processes, was mentioned by one MOU-signing customer, one repeat participant, one

combination metric identified, and one customer with a comparison-group project. Communication lag-times of more than a few days were also cited.

One PA-identified, three combination metric, and two customers with comparison-group projects described contractors leaving materials lying around after installations, interfering with residents, interfering with other workers, sizing equipment incorrectly, using poorly performing equipment, and overselling the work.

Table 5-20: Factors causing projects to be unsuccessful*

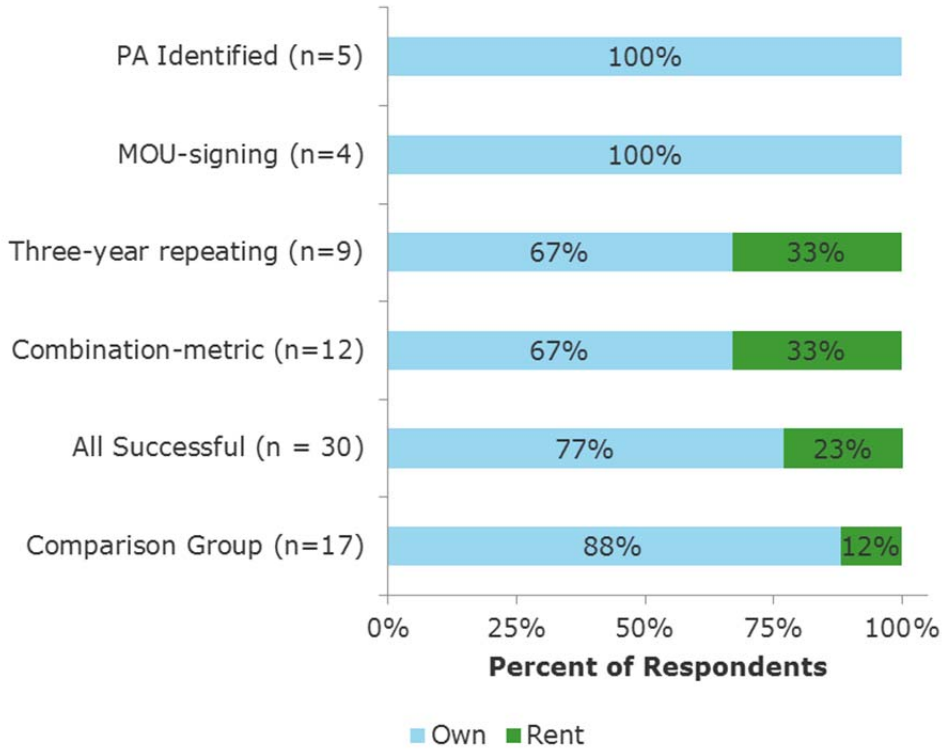
Customer Group	Factors making project unsuccessful
PA Identified (n=4)	•Not being able to find the right person at the utility •Communication lags of more than a few days between the utility and the customer •Equipment not performing as expected •Contractors not sizing correctly •Price negotiations taking a long time
MOU-signing (n=3)	•Workers disrupting people's lives •When projects go unnoticed, PR is a good thing and should be recognized •If the operators of the building do not have a commitment to stick to the original project plan •Operators not using equipment effectively after installation
Three-year repeating (n=4)	•If the desired comfort level wasn't achieved •Work disruptions •If the project didn't save money
Combination-metric (n=10)	•Contractor left materials lying around •If they had to shut down operations or be an inconvenience •Not getting enough funding to go through with the recommended improvements •Contractors overselling to the customer, creates a trust gap
Comparison Group (n=13)	•Lack of incentives •Issues with measures not being covered in the program •The program telling you that you have to hire this company to do the work •Lack of a streamlined process •Lack of communication •Not doing enough pre work •Interruption of work schedules •Arduous application processes •If the equipment is defective

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

5.19 Firm-o-Graphics

The majority of the respondents (81%) owned their property and 19% leased their buildings (see Figure 5-12). None of the PA-identified or MOU-signing customers rented, and only 33% of three-year repeat participating customers and combination metric identified customers rented. Twelve percent of customers with comparison-group projects were renters.

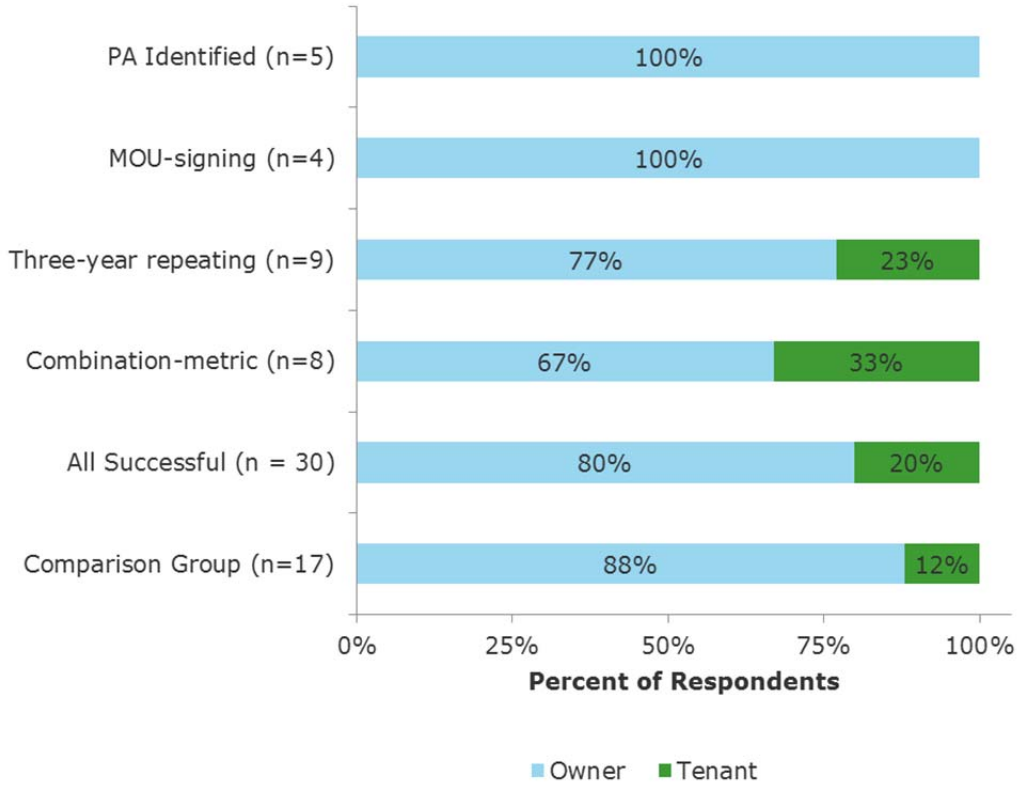
Figure 5-12: Customer ownership of facility*



* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

The majority of the respondents (83%) indicated that the owner was responsible for the utility bills. In the majority of cases, this means that the company paid its own utility bills, as they owned the property. Figure 5-13 illustrates that utility bill responsibility almost mirrors/largely reflects the facility ownership shown in Figure 5-12.

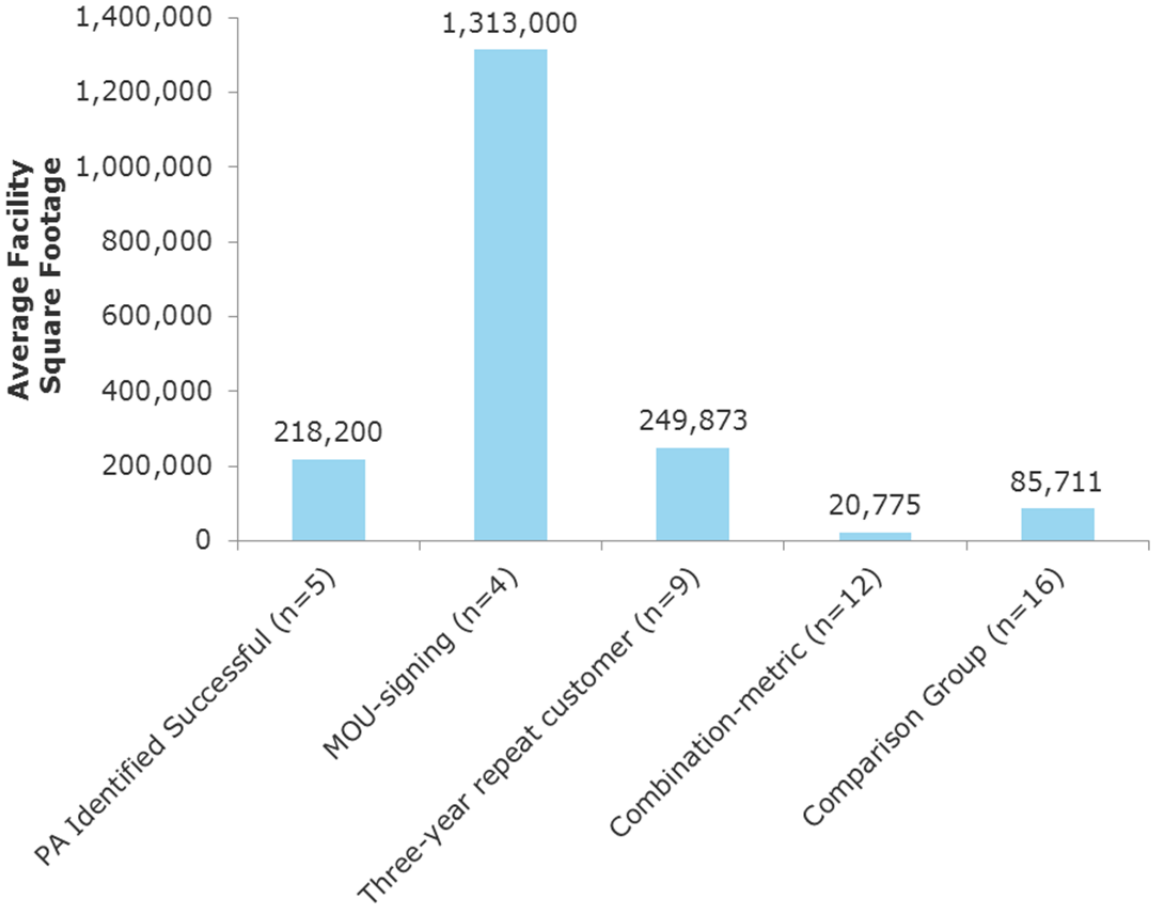
Figure 5-13: Market actor responsible for utility bills*



* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

The sizes of the facilities varied greatly across the interviewed customer groups. MOU-signing customers reported the largest buildings, and combination metric customers reported the smallest (see Figure 5-14).

Figure 5-14: Facility square-footage by customer group*



* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

Respondents indicated a variety of different building types associated with their projects. Among all respondents the most common building types were manufacturing (22%), education (17%), public assembly (11%), and office (8%). The remaining market sector types were represented by 2 to 4% of total respondents.

Eighty percent of PA-identified customers were from the industrial sector, and 75% of MOU-signing customers were from the educational sector. None of the respondents with comparison-group projects was from either the industrial or educational sectors (Table 5-21 below displays building type by customer group).

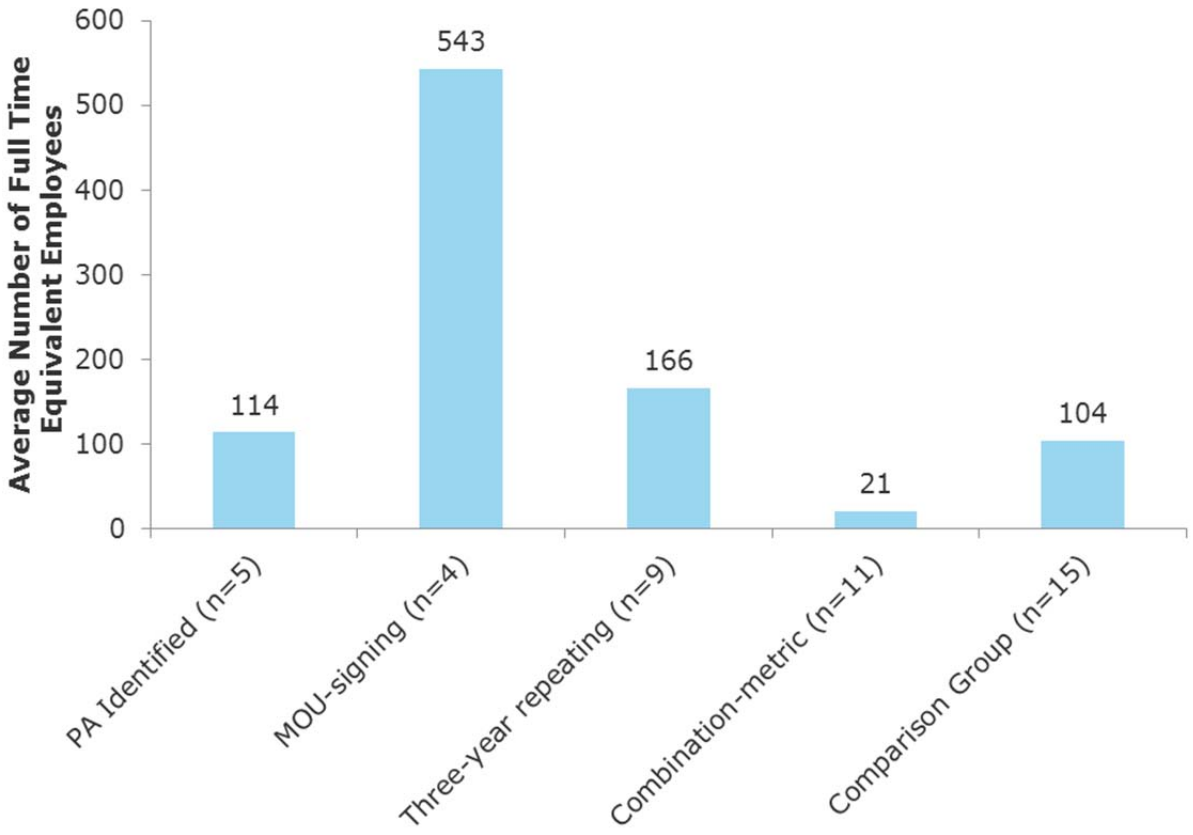
Table 5-21: Building/end-use types by customer group*

Customer Group	Market sector building type
PA Identified Successful (n=5)	Manufacturing or Industrial (80%) Lodging (20%)
MOU-signing (n=4)	Education (75%) Manufacturing or Industrial (25%)
Three-year repeat customer (n=10)	Manufacturing or Industrial (50%) Public assembly (20%) Education (10%) Lodging (10%) Office (10%)
Combination-metric (n=12)	Education (25%) Manufacturing or Industrial (17%) Food sales (17%) Office (17%) Public assembly (17%) Retail (8%)
Comparison Group (n=15)	Retail (33%) Public assembly (20%) Other (14%) Office (13%) Industrial (7%) Education (7%) Food Service (7%)

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

MOU-signing customers reported the largest number of full-time equivalent employees (543). This was followed by repeat participants (166), PA-identified (114), comparison group (104), and combination metric facilities (21). This makes sense because MOU-signing respondents were from manufacturing or higher educational facilities, which tend to have more employees than service or retail facilities. The number of employees also positively correlates with square footage (see Figure 5-15).

Figure 5-15: Full time equivalent employees by customer group*



* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

5.20 Additional Customer Comments

At the conclusion of the interviews, two customers wanted to give additional comments about their projects that were not addressed in DNV GL's interview questions (see Table 5-22).

Table 5-22: Additional comments about customer projects*

Customer Group	Misc. comments about projects
Combination-metric (n=1)	These programs are great. I think that it was hard for us to calculate whether this project was successful because as I mentioned, we made the improvements right when we got there and we were only there for two years. I don't know what the actual energy savings were because I saw it as an investment.
Comparison Group (n=1)	So many projects get stuck between concept and execution. Sometimes it's internal, sometimes it's delays getting pre-applications approved, but the usual problem is it needs somebody's approval and it just sits on their desk.

* Three year repeat participant sample drawn from single year of program tracking data (2012), but who also participated in 2011 and 2013.

5.21 Summary of Findings from In-Depth Interviews with C&I Customers

DNV GL completed 31 interviews with C&I customers with successful projects, and 17 interviews with customers with comparison-group projects. A detailed description of how these customers were selected is provided in Chapter 3 of this report, Methodology. Appendix D presents the customer interview guide.

Table 5-23 presents the top success factors identified by C&I customers in the in-depth interviews.

Table 5-23 Description of project success factors (the customer perspective)

Success Factor	Description of factor
Competent installation contractors	Experienced, well-trained contractors that exhibit high levels of expertise, proficency and competence should be on all projects.
Accurate information throughout project	Accuracy starts with good analysis prior to project implementation and involves good communication throughout project.
Minimal disruption to customer operations	Flexible installers and implemeters that; work at the convenience of customer operations are polite and professional, and leave work areas cleaner than what they were prior.
Achievement of desired end results	Resulting outcome should both; 1) energy related and 2) non-energy related (uniquely important to each type of customer - e.g. productivity, comfort, aesthetics), meet or exceed expectations.
Positive experience for customer	Only pleasant surprises for customer, if any at all.
Achieving energy savings	This #1 customer-cited factor depends on everything from pre-project accurate savings projections to post installation inspection and engineering engagement.
Reputable program staff and contractors	The integrity and competence of competence impacts the all-important trust factor in the relationship between contractor and customer, which secondarily effects the PA-customer relationship.
Being "green"	Project environmental benefits (via decreased energy consumption and pollution) yield intrinsic psycological benefits with conservation, leading customers to feel more successful.
Having effective energy champion	Ultimately, it's people make great things happen, regardless of other circumstances. It's highly valuable to have customer champions for project, and the value of trade ally or PA champions should not be overlooked either.
Time to completion	On-time or early completion of project (Driven by turn-around in communications between customers, the PA, and contractors).

C&I customer interviews also yielded the following significant findings:

- All successful customer groups (PA-identified, MOU-signing, three-year repeat participants, and combination metric identified) indicated completing additional projects since the project in question at higher rates (50 to 100%) than the comparison group (41%).[37]
- “Low ROI” and “limited budget” were the two main reasons cited for not moving forward with projects.
- Being less accessible[38] and lacking internal resource capacity are two customer characteristics that appear to correlate with less success.
- Non-energy benefits (NEBs) influence perception of project success. NEBs experienced by customers included improved operations and maintenance, comfort, health and safety, and public perception of the business being greener and doing its part for the environment.

[37] Please see Figure 5-9 for a graphical representation on additional project completion by customer group.

[38] Customers identified as successful were more accessible for interviews than customers in the comparison group.

Though generally satisfied, the comparison group had a similarly low percentage dissatisfied (6%) than the four successful groups (0%). A somewhat similar pattern was found in regard to customer reporting of project success. All groups within the successful category were more likely to self-report the highest level of success, “very successful” (50-100%), than the comparison-group category of customers (44%). Both of these findings offer some evidence supporting the validity of the success criteria. In fact, there was some modest correlation between: 1) customer satisfaction, 2) customer self-reporting of project success, and 3) metric-indicated customers with successful projects.

6 RESULTS OF C&I DATA MANIPULATION, MINING, AND METRICS

This chapter details the findings from our data-mining effort and the application of new metrics to that data. The objectives of this task included describing the data through the lens of the four metrics and assessing where successful projects are and are not occurring in the overall population. In order to achieve these objectives, we explored differences and similarities among the five customer groups (the four subgroups of successful customers, plus the comparison group).

Our findings, presented in this chapter, are grouped according to the following topics:

- Metric-driven segregation of successful projects from all 2012 C&I customers
- Defining metrics and success by PA
- Depth of savings, breadth of savings, and other success metrics by PA
- Three-year-repeat participants by PA
- Projects with MOU-signing customers
- Defining metrics and success by fuel type
- Depth of savings, breadth of savings, and other success metrics by fuel type
- Defining metrics and success by initiative/program type
- Depth of savings, breadth of savings, and other success metrics by project/initiative type
- Defining metrics and success by building type
- Depth of savings, breadth of savings, and other success metrics by building type
- Defining metrics by end use
- Defining metrics by customer size

6.1 Metric-Driven Segregation of Successful Projects from all 2012 C&I Customers

To begin the data mining task, we first applied a filter to all cases in the 2012-tracking merged to 2011-billing dataset. All cases with a depth of savings greater than 10.0 were excluded from the analysis entirely, because they were suspect for data error. This resulted in ~800 out 16,200 being thrown out, including some MOU-signing, three-year repeating, and PA-identified customers.

Of the remaining ~15,400 projects, approximately 5,000 were removed from the dataset because they were missing either the total MMBTU savings or the total energy consumed, which were necessary to determine the projects' depth of savings.

Thus, the study only considered 10,430 projects for descriptive analysis. The final dataset included 715 successful projects and 9,715 comparison-group projects. Among successful projects, 76 were combination metric identified, 604 were three-year repeaters, 45 were MOU-signing, and 22 were PA-identified. The sum of the four successful groups is more than 715 because some of the projects overlapped between the successful groups. There were 12 common projects between three-year repeaters and PA-identified projects, and 20 common projects between the three-year repeaters and MOU-signing customers. The study includes overlapping projects in both groups while generating summary statistics.

6.2 Defining Metrics and Success by PA

The following two sections look at PA differences among successful projects by depth of savings and by breadth of savings.

6.2.1 Depth of Savings and Other Success Metrics by PA

The constraints of using any single metric (or component of a metric) to quantify success are apparent in Figure 6-1 and Table 6-1. For example, the depth of savings component of the combination metric is higher on average (1.50) in the comparison group than it is for all successful projects (0.95). Here, the PA-identified, MOU-signing, and three-year repeating customers dragged down the average depth-of-savings score for the "all successful projects" group.[39] While focusing on a single metric clearly has limitations, this analysis reveals some useful findings and sets the stage for possible metric bi-angulation and triangulation.

As shown in Table 6-1, the three-year repeating customers had the lowest mean score for depth of savings (0.33), at least in part because energy savings is spread out over more than one year for these customers. Also, repeat customers tend to be larger customers, and customer size is the denominator for this metric.

The same can be said of MOU-signing customers, which are inherently larger institutional customers. Despite this disadvantage, MOU customers scored an average of 0.80 for depth of savings, second highest among the four successful subgroups. This suggests a higher level of commitment for energy-saving projects. MOU-signing customers of NSTAR scored about twice as high for depth of savings (1.12) than MOU-signing customers of National Grid (0.57).

Not surprisingly, customer projects meeting the combination metric threshold for success had a much higher mean depth-of-savings score (5.75). This is mainly a function of the fact that higher depth-of-savings scores were one of two criteria for inclusion in the combination metric group. (The other criterion was breadth of savings, which is discussed in the next section.) Cape Light Compact (CLC), National Grid, and NSTAR combination metric projects all scored in the 6 to 7 range, while WMECO lagged a bit at 4.43.

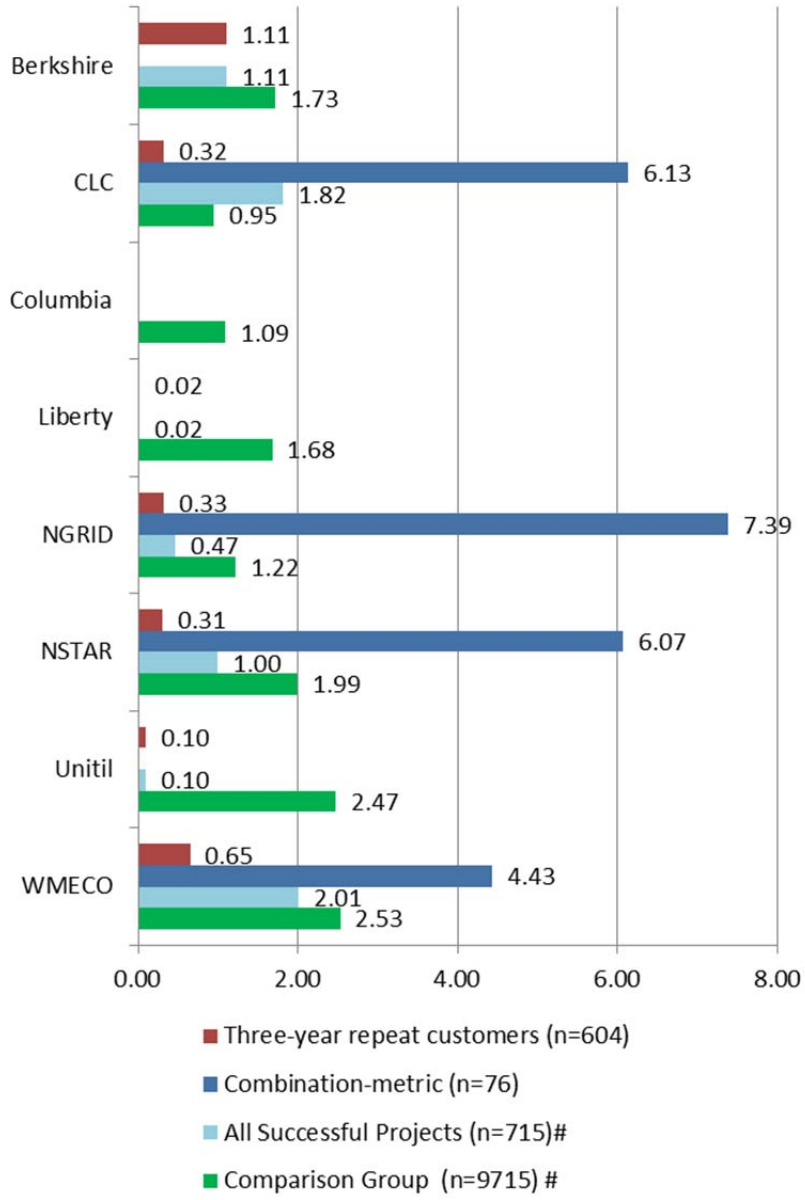
PA-identified successful projects would have scored second highest (0.85 instead of the actual value of 0.58) for depth of savings among the four successful project subgroups if the evaluation team had been able to identify every project in the available tracking data. As it was, some of the projects either were tracked outside of the years for which DNV GL has tracking data or insufficient information was provided to accurately identify the project in the tracking data.[40]

Comparison-group projects scored an average of 1.50 for the depth-of-savings metric. Though substantially lower than combination metric successful projects, this is still higher than the other three successful subgroups. This is not unexpected, given that the combination metric was correlated with smaller customers while the MOU and three-year repeating metrics were correlated with larger customers. This validates the need for and use of multiple criteria, because reliance upon a single quantitative metric is inadequate.

[39] This is due in part to customer size being the denominator of the depth-of-savings metric.

[40] The DNV GL team endeavoured to obtain additional information about the PA identified projects in order to accurately flag them in the tracking data, but was not always successful.

Figure 6-1: Average (mean) depth of savings for successful projects by PA



*** PA-identified successful projects not available in 2012 tracking data are not included.
**** Overall, ~5,000 projects were dropped because customer size or project savings data were missing, and/or because the project's depth-of-savings score was greater than 10.0.
# A single project may skew the depth of savings for small PAs significantly, especially since this figure is based on a single year of program tracking data.
Depth of savings was computed on one year of data, and thus is understated for repeat customers who spread projects out over multiple years.

Table 6-1: Depth of savings (mean scores) for successful projects by PA* ##

Program Administrator (PA)	PA-Identified (n=22) ***	n	MOU-signing customers (n=45)	n	Three-year repeat customers (n=604)	n	Combination-metric (n=76)	n	All Successful Projects (n=715)#	n	Comparison Group (n=9715) #	n
WMECO					0.65	32	4.43	18	2.01	50	2.53	665
Unitil					0.10	6			0.10	6	2.47	83
NSTAR			1.12	19	0.31	259	6.07	34	1.00	308	1.99	3369
NGRID	0.85	15	0.57	26	0.33	253	7.39	3	0.47	269	1.22	3940
Liberty					0.02	1			0.02	1	1.68	53
Columbia											1.09	532
CLC	0.00	7			0.32	52	6.13	21	1.82	80	0.95	960
Berkshire					1.11	1			1.11	1	1.73	113
Mean/Sum**	**0.58**	**22**	**0.80**	**45**	**0.33**	**604**	**5.75**	**76**	**0.95**	**715**	1.56	9715

* Filters all projects with combination metric greater than 10.0.
**Means apportioned to n's by PA.
*** PA-identified successful projects not available in 2012 tracking data are not included.
# Overall, ~5,000 projects were dropped because customer size or project savings data were missing, and/or because the project's depth-of-savings score was greater than 10.0.
Depth of savings was computed on one year of data, and thus is understated for repeat customers who spread projects out over multiple years.

6.2.2 Breadth of Savings and Other Success Metrics by PA

The count of measure types[41] for each project (i.e., breadth-of-savings) is another way to analyze projects' success. The amount of energy savings increases with the breadth of measures installed. Figure 6-2 gives average breadth-of-savings scores for different groups of projects by PAs. The breadth-of-savings metric is very similar across the four successful project groups, with the exception of the combination metric group, which was significantly higher at 2.53.[42] This is not surprising, since combination metric projects were identified as such based on high breadth- and depth-of-savings scores. The average breadth of savings for successful groups is 1.18, whereas comparison-group projects implemented an average of 1.07 energy efficiency measures. For most customer groups, the breadth of savings metric is very close to 1.00, indicating that a majority of projects include only one energy efficiency measure type.

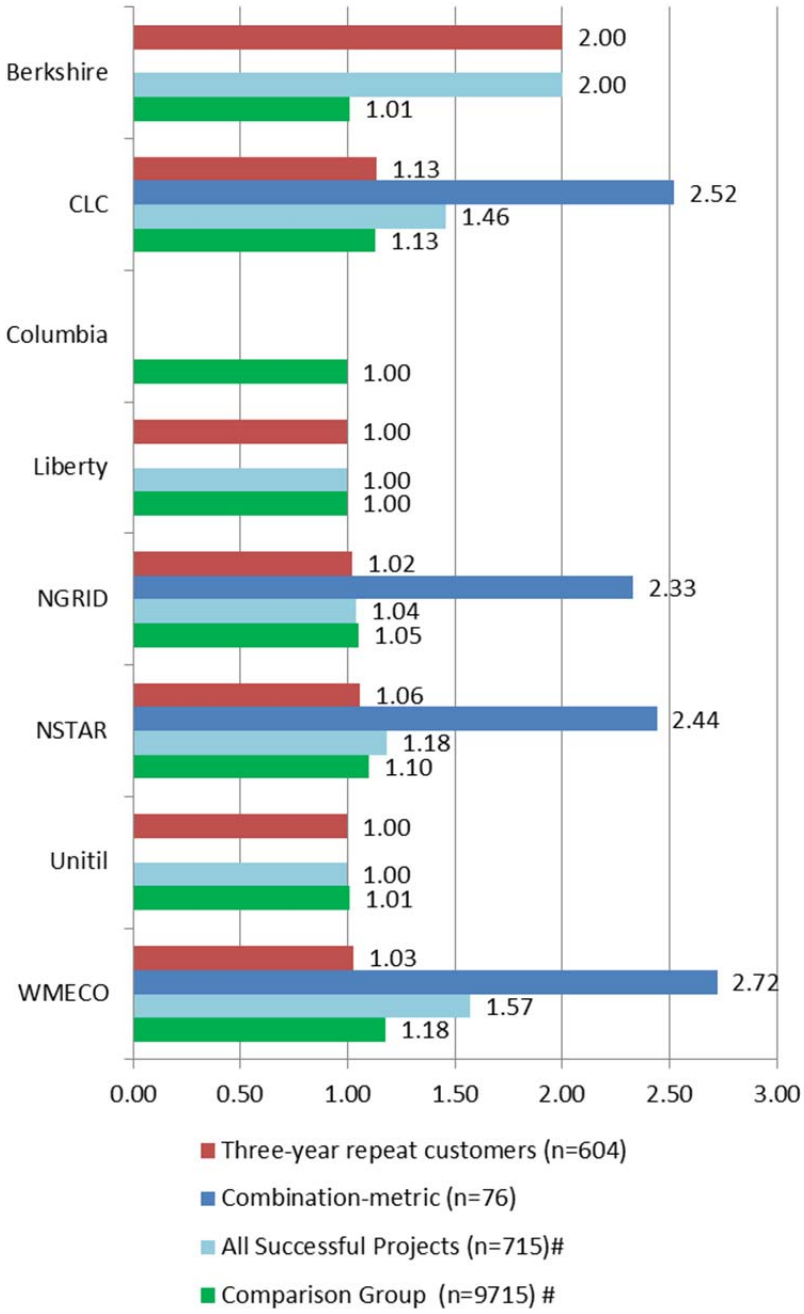
There are variations on the number of energy efficiency measures types implemented among successful project groups.[43] Figure 6-2 provides detailed information on the average breadth of savings and number of projects by PA. WMECO and CLC customers with successful projects implemented more measure types per project than comparable National Grid and NSTAR customers. The average breadth of savings for WEMCO's successful projects was 1.57 (n=50), while CLC's successful projects averaged 1.46 (n=80). NSTAR's successful projects (n=308) had an average of 1.18 measure types, and National Grid's—which accounted for 38% of total successful projects—had an average of 1.04.

[41] The DNV GL team looked at measure end-use categories to determine the breadth of savings metric. I.e. a project doing 5 lighting measures would score a 1, while a project doing 1 lighting and 1 HVAC measure would score a 2.

[42] Because breadth of savings was only computed based on one year of data, it is understated for the large customer groups who tend to repeat participate and spread energy saving measures out over multiple years.

[43] While Berkshire's average breadth of savings is 2, we do not further discuss this in the analysis since it has only one project in the "All Successful" group.

Figure 6-2: Average breadth of savings of successful projects by PA* **



*If data was missing for a PA, which was needed to compute a metric, the graph display bar for that metric is not shown.
** Breadth of savings was computed on one year of data, and thus is understated for repeat customers who spread projects out over multiple years.
*** PA-identified successful projects not available in 2012 tracking data are not included.
# Overall, ~5,000 projects were dropped because customer size or project savings data were missing, and/or because the project's depth-of-savings score was greater than 10.0.
# A single project may skew the depth of savings for small PAs significantly, especially since the figure is based on a single year of program tracking data.

Table 6-2 shows the breadth of savings for each of the four successful subgroups, the successful group altogether, and the comparison group.

Table 6-2: Breadth-of-savings (mean scores) for successful projects by PA* ###

Program Administrator (PA)	PA-Identified (n=22) ***	n	MOU-signing customers (n=45)	n	Three-year repeat customers (n=604)	n	Combination-metric (n=76)	n	All Successful Projects (n=715)#	n	Comparison Group (n=9715) #	n
WMECO					1.03	32	2.72	18	1.57	50	1.18	665
Unitil					1.00	6			1.00	6	1.01	83
NSTAR			1.11	19	1.06	259	2.44	34	1.18	308	1.10	3369
NGRID	1.00	15	1.07	26	1.02	253	2.33	3	1.04	269	1.05	3940
Liberty					1.00	1			1.00	1	1.00	53
Columbia											1.00	532
CLC	1.16	7			1.13	52	2.52	21	1.46	80	1.13	960
Berkshire					2.00	1			2.00	1	1.01	113
Mean/Sum**	**1.09**	**22**	**1.09**	**45**	**1.05**	**604**	**2.53**	**76**	**1.18**	**715**	1.07	9715

* Filters all projects with a combination metric greater than 10.0.
**Means apportioned to n's by PA.
*** PA-identified successful projects not available in 2012 tracking data are not included.
# Overall, ~5,000 projects were dropped because customer size or project savings data were missing, and/or because the project's depth-of-savings score was greater than 10.0.
A single project may skew the depth of savings for small PAs significantly, especially since the figure is based on a single year of program tracking data.### Depth of savings was computed on one year of data, and thus is understated for repeat customers who spread projects out over multiple years.

6.2.3 Three-Year-Repeater by PA

Another metric for identifying successful projects is the status of continued participation in energy efficiency programs. Repeat-participating customers have more experience with the efficiency programs and may be more likely to be engaged in the program than one-time participants.

The program tracking data shows that 7% of projects (736 out of ~10,430) took part in energy efficiency programs continuously for three years from 2011 to 2013. National Grid (302) and NSTAR (336) account for almost 87% of repeater customers. Cape Light Compact has 52 three-year repeat customers (7.1%), and WMECO has 38 (5.2%). Other PAs— Berkshire, Liberty, and Unitil—have a total of eight three-year participants. It should be noted that these percentages are highly correlated with the size of the PA.

Electric PAs have a higher incidence of three year repeating participants, likely because there are more opportunities for electric projects than gas ones. Table 6-3 shows that the incidence of three year repeating is higher across the board for electric PAs when compared to gas only ones. This holds both when the total number of three year repeating customers is divided by total number of 2012 projects (second to last column) or all 2012 billed accounts (last column).[44]

[44] This study only looked at three year repeaters specifically for the 2011+2012+2013 timeframe. Three year repeaters for other three year timeframes are not included.

Table 6-3 Three-year repeating* customers by PA**

PA	Total 2012 Participating Customers (n)	Total Billed Accounts (n)*	Three Year Repeating Customers (n)	2012 Participants that are Three Year Repeaters	2012 Billed Accounts that are Three Year Repeaters
Berkshire	114	4543	1	0.88%	0.02%
CLC	1040	25504	52	5.00%	0.20%
Columbia	532	37566	0	0.00%	0.00%
Liberty	54	3395	1	1.85%	0.03%
NGRID	4209	226063	302	7.18%	0.13%
NSTAR	3677	160098	336	9.14%	0.21%
Unitil	89	5212	6	6.74%	0.12%
WMECO	715	15916	38	5.31%	0.24%
Sum	**10430**	**478297**	**736**	**7.06%**	**0.15%**

* A single year of program tracking data (2012) used for customer also participating in 2011 and 2013.
** From 2012 C&I Customer Profile Report.

6.2.4 Projects with MOU-Signing Customers

MOUs between utilities and customers is another success metric used in this study. An MOU shows a commitment from customers to save energy. However, there are few caveats associated with this metric. Only large and institutional customers receive MOU offerings, and not all PAs track MOU customers. This report includes MOU customers from the two largest PAs. Table 6-3 shows that 180 customers signed MOUs with either National Grid or NSTAR. National Grid has only been offering MOUs since 2011. As a result, more NSTAR MOU-signing customers are showing up here and in the 2012 tracking data.

Table 6-4: MOU-signed customer accounts by PA

Program Administrator (PA)	MOU Customers (n*)
NGRID	28
NSTAR	152
Total	180

* Count of unique customer accounts.
** Not all customers listed participated in the 2012 program tracking year.

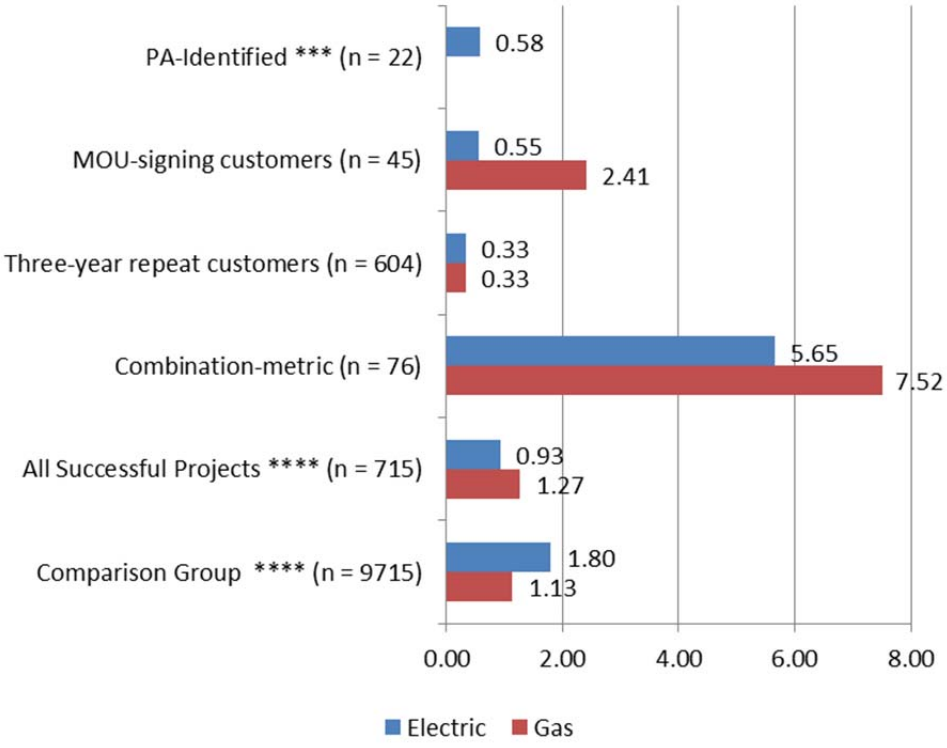
6.3 Defining Metrics and Success by Fuel Type

This study analyzed other project/customer characteristics besides PAs. It is useful to understand: 1) how meaningful the metrics are, 2) how success metrics vary across customer attributes, and 3) if there are any particular trends. The study considered customer characteristics such as type of fuel, initiative/program, building, end use, and project size. The following two sections look at fuel-type differences among successful and comparison-group projects by depth of savings and breadth of savings.

6.3.1 Depth of Savings and Other Success Metrics by Fuel Type

Figure 6-3 shows the average depth of savings for different groups of customers by fuel type. Two-thirds of the total 10,430 projects were electric, and one-third were gas. The figure shows that successful projects using gas have higher average depth of savings than projects utilizing electricity. However, the opposite is true for comparison-group projects. Please note that all PA-identified customer projects involved electricity, but data was missing to compute metrics on gas projects. Therefore the "gas projects" value is missing from the figure for PA-identified projects.

Figure 6-3: Average depth of savings for project groups by fuel type*



* Depth of savings was computed on one year of data, and thus is understated for repeat customers who spread projects out over multiple years.
*** PA-identified successful projects not available in 2012 tracking data are not included.
**** Overall, ~5,000 projects were dropped because customer size or project savings data were missing, and/or because the project's depth-of-savings score was greater than 10.0.

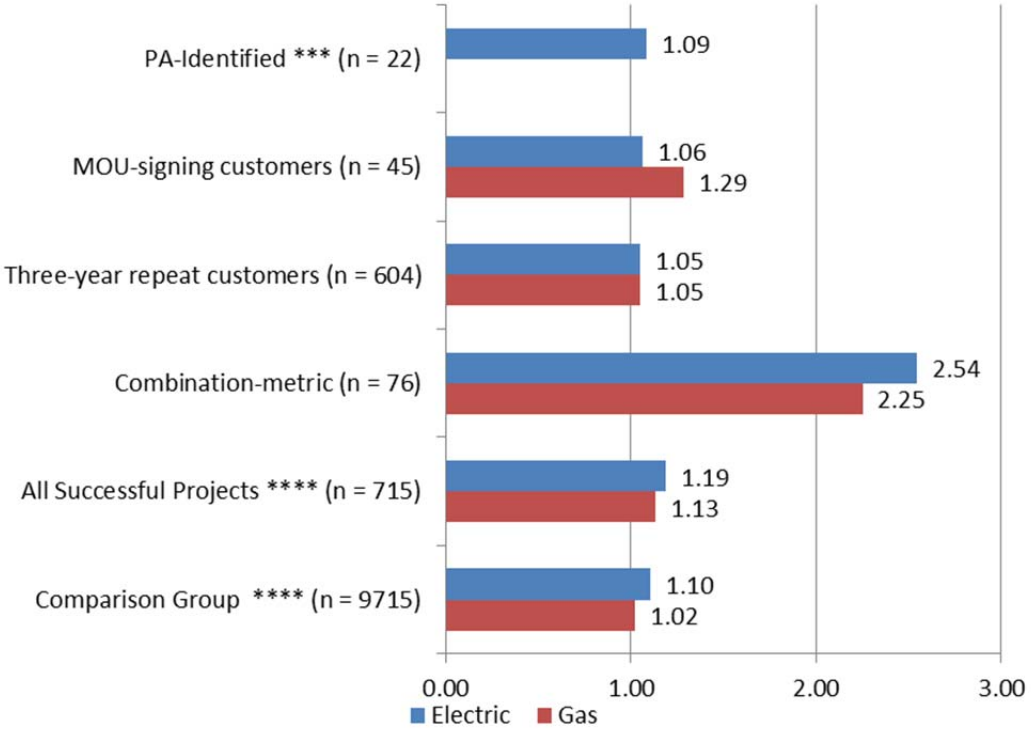
6.3.2 Breadth of Savings and Other Success Metrics by Fuel Type

Figure 6-4 shows the average breadth of savings for different group of projects by fuel type. Within each customer group, the average number of efficiency measures is similar across fuel types. For the combination-identified successful group, electric projects had an average of 2.54 measure types, whereas gas projects had 2.25.

Although average breadth of savings are comparable across fuel types, Figure 6-3 above showed that, among successful projects, gas projects have larger depth of savings than electric (1.27 vs .93).

All successful gas projects have higher breadth of savings (1.13) than comparison-group gas projects (1.02). Similarly, successful electric projects have greater breadth of savings (1.19) than comparison-group electric projects (1.10).

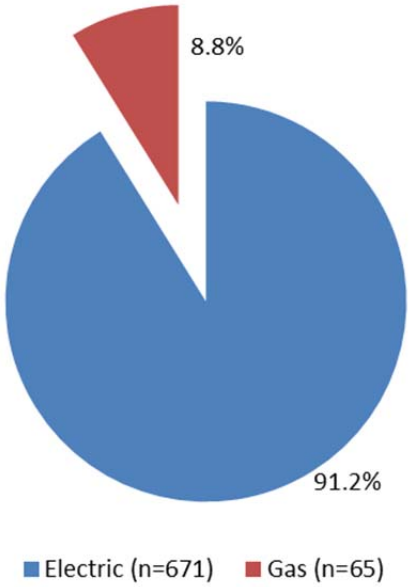
Figure 6-4: Breadth of savings for project groups by fuel type



* Breadth of savings was computed on one year of data, and thus is understated for repeat customers who spread projects out over multiple years.
*** PA-identified successful projects not available in 2012 tracking data are not included.
**** Overall, ~5,000 projects were dropped because customer size or project savings data were missing, and/or because the project's depth-of-savings score was greater than 10.0.

Figure 6-5 shows the distribution of three-year repeating participants by fuel type. Ninety-one percent of three-year repeaters are electric customers, and 9% are gas customers. This percentage of electricity projects is higher than the average (approx. two-thirds) for all projects in the dataset, showing a skewing away from gas and toward electricity for this customer group. It should be noted that this could simply be the result of there being fewer opportunities for repeat gas projects.

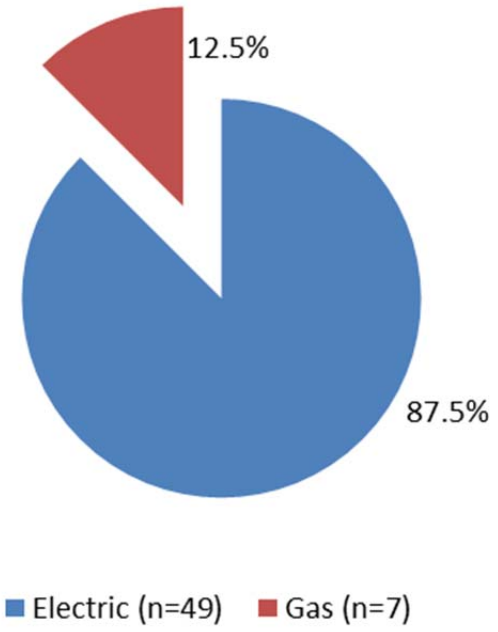
Figure 6-5: Three-year participants by fuel type *



* A single year of program tracking data (2012) used for customer also participating in 2011 and 2013.

Similarly, Figure 6-6 shows that MOU-signing customers are more likely (88%) to be associated with electric projects than gas (13%), despite the fact that electric projects are only about two-thirds of all projects in the dataset. Projects from MOU-signers and three-year repeaters are about twice as likely to be electric than is the case across all successful projects.

Figure 6-6: MOU-signing customers by fuel type



6.4 Defining Metrics and Success by Initiative/Program Type

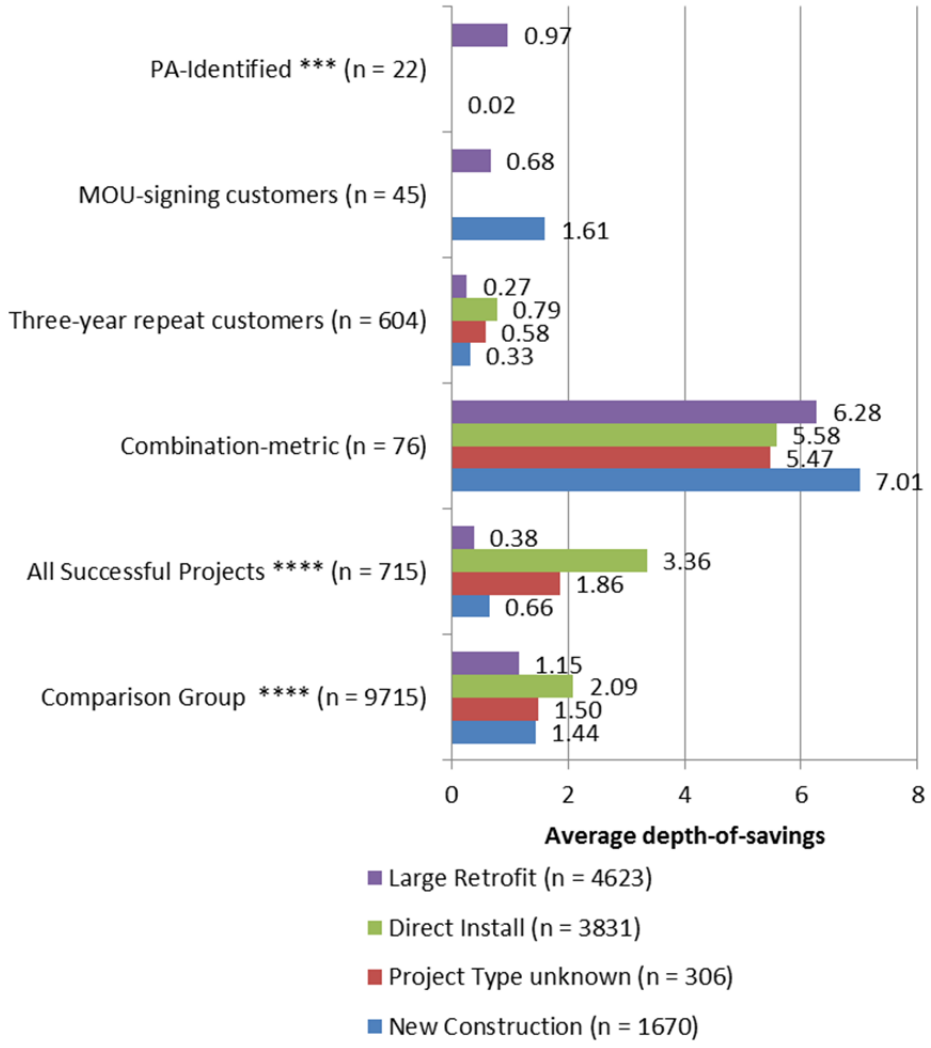
6.4.1 Depth of Savings and Other Success Metrics by Project/Initiative Type

This study analyzed the success metrics of projects by energy efficiency program/initiatives for different customer groups. The three Mass Save C&I programs/initiatives are New Construction (n=1,670), DI (n=3,831) and LR (n=4,623). There are 306 projects with unknown program/initiatives.

Figure 6-8 shows the average depth of savings by program type for different groups of customers. For all successful and three-year repeater projects, DI performs better than other initiatives. The average depth of savings for all successful DI projects is 3.36—much higher than it is for New Construction (0.66) and LR (0.38) projects. This is because a disproportionate number of high-scoring combination metric projects are also DI projects.

The average depth of savings for projects in the combination metric group is consistently higher than projects in other groups, since depth itself is a criterion for that metric and not the others. Within the combination metric group, the depth of savings by program type is highest for New Construction (7.01; n=8), followed by LR (6.28; n=3) and DI (5.58; n=60).

Figure 6-7: Average depth of savings for successful projects by initiatives/programs (N=10,430)*



* Depth of savings was computed on one year of data, and thus is understated for repeat customers who spread projects out over multiple years.
*** PA-identified successful projects not available in 2012 tracking data are not included.
**** Overall, ~5,000 projects were dropped because customer size or project savings data were missing, and/or because the project's depth-of-savings score was greater than 10.0.

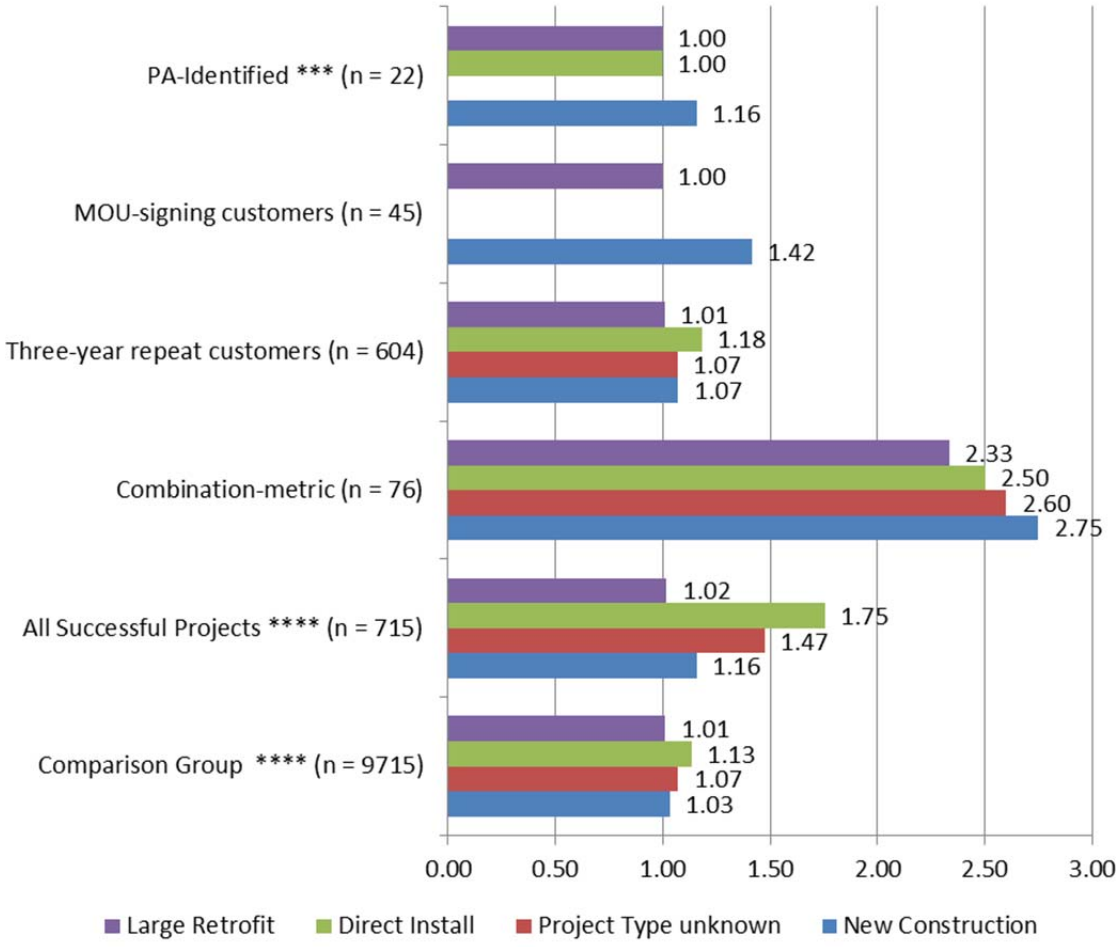
6.4.1 Breadth of Savings and Other Success Metrics by Project/Initiative Type

Figure 6-8 shows the average breadth of savings by program type. Among all successful projects, DI projects had the highest average breadth of savings (1.75), followed by New Construction (1.16) and LR (1.02). As noted earlier, DI projects had the highest depth of savings, as well.

The average breadth of savings for combination metric projects by program type varies between 2.33 (LR) and 2.75 (New Construction). Among three-year repeaters, DI projects had the highest breadth of savings reflected in the 2012 tracking data, averaging 1.18 measure types.

It should be noted that Figure 6-8 only looks at one year of program tracking data, and that averages could vary from year to year. This is especially true for customer groups and programs with a fewer numbers of projects.

Figure 6-8: Average breadth of savings for successful projects by initiative / programs *



* Breadth of savings was computed on one year of data, and thus is understated for repeat customers who spread projects out over multiple years.
*** PA-identified successful projects not available in 2012 tracking data are not included.
**** Overall, ~5,000 projects were dropped because customer size or project savings data were missing, and/or because the project's depth-of-savings score was greater than 10.0.

6.5 Defining Metrics and Success by Building Type

This study analyzed the four success metrics by customers' building type. The energy consumption pattern varies significantly by building type, so it is important to look at how success metrics vary across building characteristics and customer groups.

6.5.1 Depth of Savings and Other Success Metrics by Building Type

Table 6-5 compares average depth of savings among all project groups by building types. It also lists the number of projects associated with each building type. The distribution of projects indicates that most of the successful projects are associated with educational, manufacturing or industrial, and office building types.

Among all successful projects, storage buildings had the highest depth-of-savings score (8.77). This is followed by no-data (2.62), other (2.45), retail (1.64), food service (1.58), public assembly (1.30), and office (1.26). The lowest scoring building types among all successful projects were lodging (0.25), education (0.41), and industrial (0.44).

Table 6-5: Average depth of savings of project groups by building type* ##

Building Type	PA-Identified ***	n	MOU-signing customers	n	Three-year repeat customers	n	Combination-metric	n	All Successful Projects ****	n	Comparison Group ****	n
Education			0.96	21	0.21	147	3.41	5	0.41	158	1.40	622
Food Sales			0.42	7	0.33	37	3.81	11	1.04	55	1.17	565
Food Service					0.50	32	5.90	8	1.58	40	0.89	1746
Healthcare				0	0.29	42			0.29	42	1.18	251
Lodging					0.25	23			0.25	23	1.02	200
Manufacturing or Industrial	0.85	15	0.23	9	0.30	126	4.71	2	0.44	135	1.63	782
No Data				0	0.41	12	5.94	8	2.62	20	1.42	957
Office			1.12	3	0.42	113	6.90	17	1.26	133	2.26	1590
Other			2.02	3	0.93	18	7.24	6	2.45	27	1.30	334
Public Assembly	0.00	7		0	0.31	16	5.49	6	1.30	29	1.75	488
Retail			0.71	2	0.30	32	5.72	11	1.64	45	1.82	1879
Warehouse							8.77	2	8.77	2	2.87	89
Mean / Sum**	**0.58**	**22**	**0.80**	**45**	**0.33**	**604**	**5.75**	**76**	**0.95**	**715**	**1.56**	**9715**

* Filters all projects with combination metric scores greater than 10.0.
**Means apportioned to n's by PA.
*** PA-identified successful projects not available in 2012 tracking data are not included.
**** Overall, ~5,000 projects were dropped because customer size or project savings data were missing, and/or because the project's depth-of-savings score was greater than 10.0.
# The high score for warehousing and storage may be caused by the fact that lighting is often the largest electric load, and these programs do a lot with lighting. Also, the data is quite thin here, with only 2 projects, so a single outlier could skew the results.
Depth of savings was computed on one year of data, and thus is understated for repeat customers who spread projects out over multiple years.

6.5.2 Breadth of Savings and Other Success Metrics by Building Type

Breadth of savings was fairly consistent across building types for customer groups other than combination-identified success projects, which scored .higher than the other groups. Within combination metric projects, the food sales and public assembly sectors achieved the highest breadth of savings (3.00 for both). Storage (2.0), other (2.17), and office (2.24) had the lowest breadth of savings (see Table 6-6 below).

Table 6-6: Average breadth of savings of project groups by building type* ##

Building Type	PA-Identified ***	n	MOU-signing customers	n	Three-year repeat customers	n	Combination - metric	n	All Successful Projects ****	n	Comparison Group ****	n
Education	1.00	0	1.04	21	1.05	147	3.20	5	1.10	158	1.08	622
Food Sales			1.13	7	1.00	37	3.00	11	1.38	55	1.15	565
Food Service					1.14	32	2.38	8	1.33	40	1.07	1746
Healthcare			2.00	0	1.02	42			1.04	42	1.06	251
Lodging					1.07	23			1.07	23	1.10	200
Manufacturing or Industrial	1.00	15	1.00	9	1.01	126	2.50	2	1.03	135	1.04	782
No Data			1.00	0	1.17	12	2.50	8	1.67	20	1.06	957
Office	1.30	0	1.00	3	1.05	113	2.24	17	1.21	133	1.06	1590
Other			1.67	3	1.00	18	2.17	6	1.33	27	1.06	334
Public Assembly	1.00	7	1.00	0	1.09	16	3.00	6	1.39	29	1.07	488
Retail			1.00	2	1.03	32	2.36	11	1.34	45	1.07	1879
Warehouse							2.00	2	2.00	2	1.07	89
Mean/Sum**	**1.09**	**22**	**1.09**	**45**	**1.05**	**604**	**2.53**	**76**	**1.18**	**715**	**1.07**	**9715**

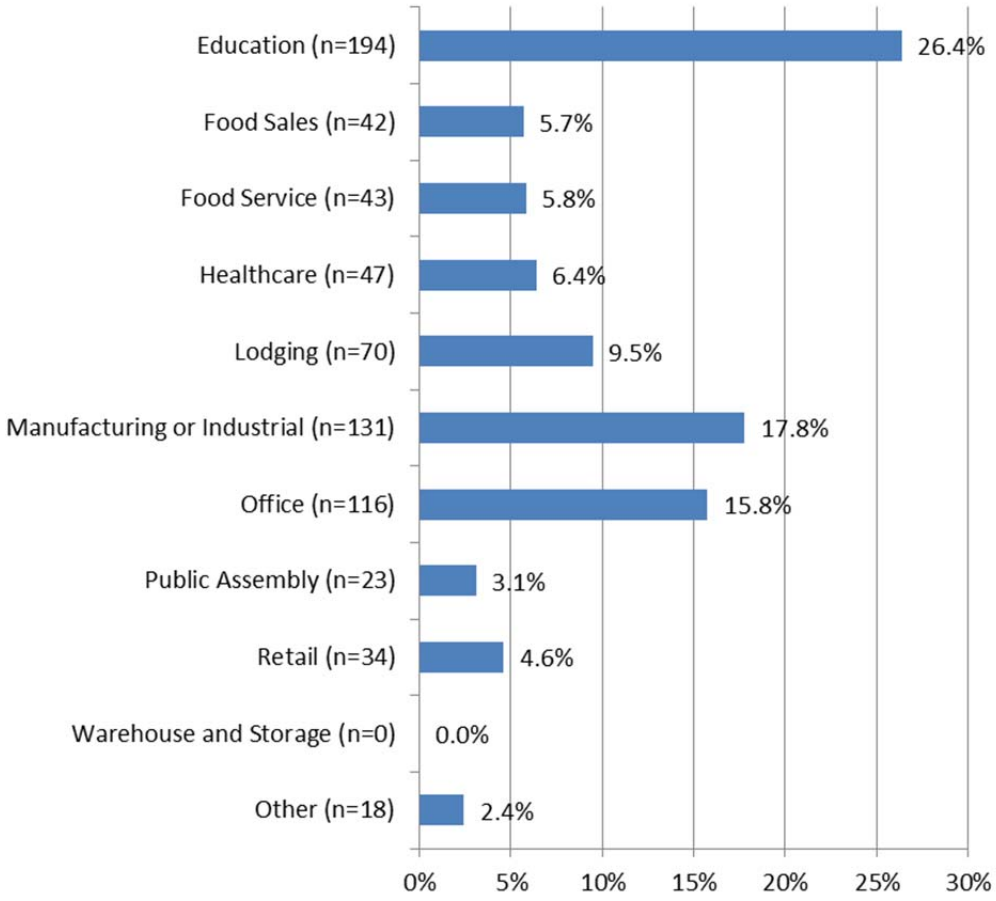
* Filters all projects with combination metric scores greater than 10.0.
**Means apportioned to n's by PA.
*** PA-identified successful projects not available in 2012 tracking data are not included.
**** Overall, ~5,000 projects were dropped because customer size or project savings data were missing, and/or because the project's depth-of-savings score was greater than 10.0.
Breadth of savings was computed on one year of data, and thus is understated for repeat customers who spread projects out over multiple years.

Figure 6-9 shows the distribution of three-year repeaters by building type. The figure shows an interesting trend about customers that are likely to continuously participate in the program. Even though the education building type represented only 7.5% of total projects (780 of 10,430), the figure shows that more than one quarter (26%) of projects from three-year repeating customers came out of the education sector. Educational facilities tend to be large, and they often use multi-year, step-by-step master plans for building maintenance and improvement. This means some projects are spread out over multiple years and show up in program tracking data in multiple years.

Conversely, 18.5% of the project-level dataset were retail customers (1,924 of 10,430), but they made up only 4.6% (34 of 736) of three-year repeating customers. Similarly, food services projects made up only 5.8% of three-year repeaters, despite constituting 17.1% of total projects.

It is interesting that nearly half (47%) of the education sector's projects among three-year repeaters were lighting projects. Lighting projects (among three-year-repeaters) occur at almost twice the rate (47%) within the education sector as they do across all building types for three-year repeaters (26%).

Figure 6-9: Three-year repeaters by building type*

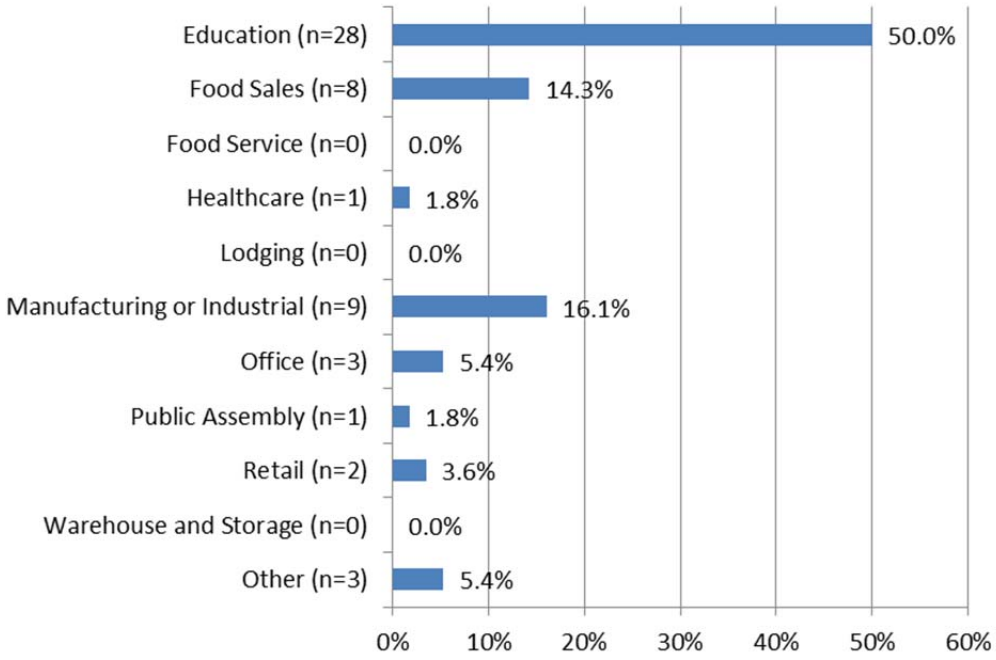


* A single year of program tracking data (2012) used for customer also participating in 2011 and 2013.

Figure 6-10 shows the number of MOU-signing projects by building type. Please note that MOU customers only belong to National Grid and NSTAR. Similar to three-year repeaters, the majority of MOU customers are from the education sector. Education building types represent 50% of total MOU customers. The previous figure illustrated the significance of the education sector among three-year repeaters. Figure 6-10, below, further illustrates the significance of these organizations for the MOU-signing metric; this makes sense, given that PAs reportedly target organizations with multi-year master plans to sign MOUs.

The other two significant building types among MOU-signing customers are manufacturing or industrial (16%) and food sales (14%). This is consistent with the thesis that MOU-signing customers are large and institutional players.

Figure 6-10: MOU signing customers by building type



6.6 Defining Metrics by End Use

Next, our study analyzed averages of four metrics by end use of energy efficiency projects. Table 6-7 shows the average depth of savings by end use. Lighting (41.3%), hot water (21%), and HVAC (18.6%) end uses made up more than 80% of all energy efficiency projects. In the "all successful projects" category, most of the end uses were lighting (37%), HVAC (19%), and multiple measure types (14.5%). There were only 15 hot water projects (2%) in the "all successful projects" category, even though hot water made up about 21% of the total dataset. Multiple measure projects yielded higher depth of savings than the other end uses across all successful customer groups, suggesting a correlation between depth and breadth of savings. All combination metric identified projects are multiple measure type projects, because this was a selection criterion for inclusion in this project group.

Depth of savings among all successful projects was highest for food service (1.32) and building shell (1.31) end uses, and lowest for hot water (0.12) and refrigeration (0.14). It should be noted that the data is quite thin here, so caution should be observed before drawing any conclusions.

Table 6-7: Average depth of savings of successful groups by end use* ##

End Use	PA-Identified ***	n	MOU-signing customers	n	Three-year repeat customers	n	Combination-metric	n	All Successful Projects ****	n	Comparison Group ****	n
Building Shell												0
CHP		0			1.31	2			1.31	2	4.39	12
Compressed Air	0.05	4		0	0.25	23			0.25	23	0.91	133
Custom Measure Type			0.32	2	0.14	4			0.15	5	1.03	19
Custom- Large Comprehensive Design	0.01	1	1.06	11							3.49	2
Food Service					1.32	3			1.32	3	1.02	85
HVAC		0			0.38	128			0.43	136	1.41	1807
Hot Water					0.12	15			0.12	15	0.88	2178
Lighting	5.64	2	0.89	16	0.30	251			0.38	265	2.15	4049
Motors/Drives	0.21	5	0.68	4	0.46	49			0.45	51	1.52	174
Multiple Measure Types		0	2.09	3	0.62	26	5.75	76	4.42	104	1.73	580
Other#					0.23	3			0.23	3	1.49	15
Process	0.07	3	0.17	3	0.39	50			0.38	51	1.29	67
Refrigeration			0.01	6	0.14	27			0.14	27	0.95	315
Unknown Measure Type	0.00	7			0.00	21			0.00	28	0.03	268
Whole Building					0.62	2			0.62	2	3.55	11
Mean/Sum**	**0.58**	22	**0.80**	45	**0.33**	604	**5.75**	76	**0.95**	715	**1.56**	9715

* Filters all projects with a combination metric score greater than 10.0.
**Means apportioned to n's by PA.
*** PA-identified successful projects not available in 2012 tracking data are not included.
**** Overall, ~5,000 projects were dropped because customer size or project savings data were missing, and/or because the project's depth-of-savings score was greater than 10.0.
# Projects classified as "other" are either "multiple" or "unknown" measure types.
Depth of savings was computed on one year of data, and thus is understated for repeat customers who spread projects out over multiple years.

Table 6-8 shows the average breadth of savings by end uses for different groups of customers. The table shows that all end uses except the "multiple measure type" have an average breadth of savings of 1.00, indicating that most of the customer projects addressed a single end use. Energy efficiency projects with more than one measure type fall into the "multiple measure type" end use. Among multiple measure type projects, combination metric identified successful projects averaged 2.53 (n=76) for breadth of savings, whereas three-year repeaters scored 2.06 (n=26).

The data displayed in Table 6-7 and Table 6-8 by end uses are particularly important for combination metric identified projects, as all 76 identified projects were multiple measure type projects. The results show that the inclusion of more than one measure type within a project yields greater energy savings per customer-usage than a single measure type.

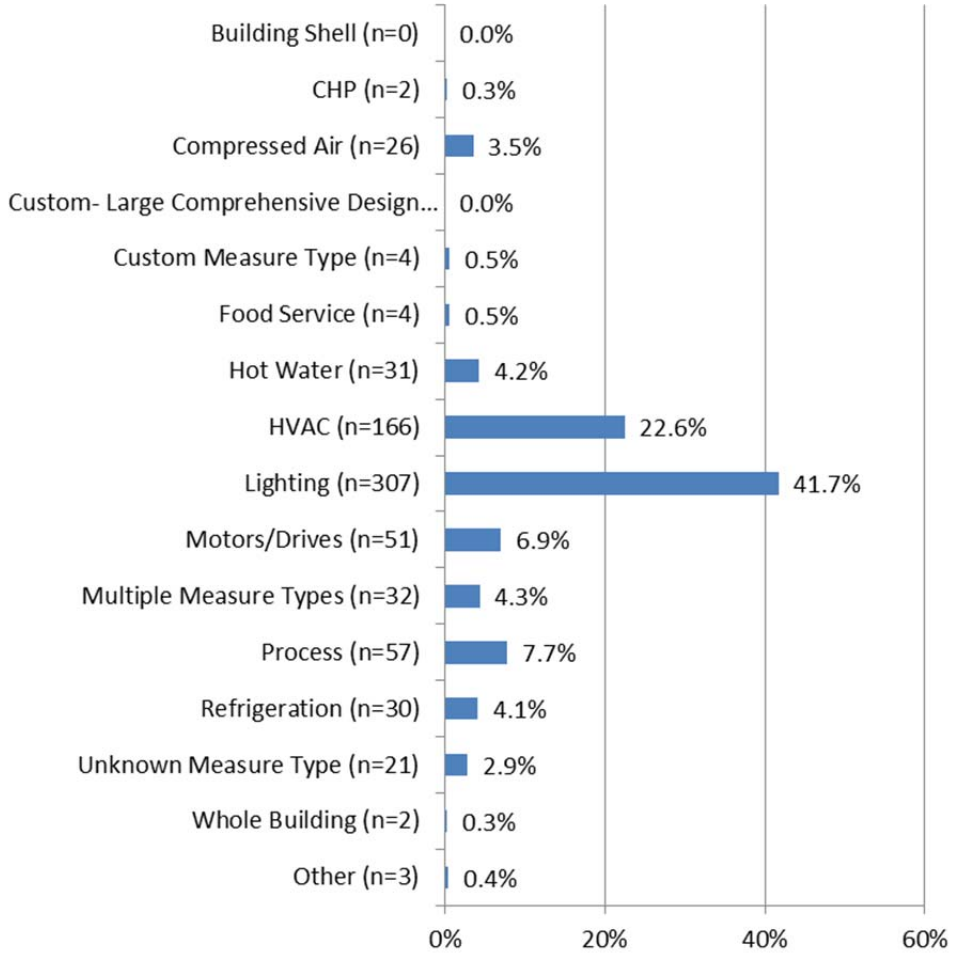
Table 6-8: Average breadth of savings of successful groups by end use* ##

End Use	PA-Identified ***	n	MOU-signing customers	n	Three-year repeat customers	n	Combination-metric	n	All Successful Projects ****	n	Comparison Group ****	n
Building Shell											1.00	0
CHP		0			1.00	2			1.00	2	1.00	12
Compressed Air	1.00	4	1.00	0	1.00	23			1.00	23	1.00	133
Custom Measure Type	1.00	1	1.00	2	1.00	4			1.00	5	1.00	19
Custom- Large Comprehensive Design											1.00	2
Food Service					1.00	3			1.00	3	1.00	85
HVAC		0	1.00	11	1.00	128			1.00	136	1.00	1807
Hot Water					1.00	15			1.00	15	1.00	2178
Lighting	1.00	2	1.00	16	1.00	251			1.00	265	1.00	4049
Motors/Drives	1.00	5	1.00	4	1.00	49			1.00	51	1.00	174
Multiple Measure Types	4.00	0	2.00	3	2.06	26	2.53	76	2.39	104	2.16	580
Other#					1.00	3			1.00	3	1.00	15
Process	1.00	3	1.00	3	1.00	50			1.00	51	1.00	67
Refrigeration			1.00	6	1.00	27			1.00	27	1.00	315
Unknown Measure Type	1.00	7			1.00	21			1.00	28	1.00	268
Whole Building					1.00	2			1.00	2	1.00	11
Mean/Sum**	**1.09**	22	**1.09**	45	**1.05**	604	**2.53**	76	**1.18**	715	**1.07**	9715

* Filters all projects with a combination metric score greater than 10.0.
**Means apportioned to n's by PA.
*** PA-identified successful projects not available in 2012 tracking data are not included.
**** Overall, ~5,000 projects were dropped because customer size or project savings data were missing, and/or because the project's depth-of-savings score was greater than 10.0.
# Projects classified as "other" are either "multiple" or "unknown" measure types.
Breadth of savings was computed on one year of data, and thus is understated for repeat customers who spread projects out over multiple years.

Figure 6-11 shows the percentage of three-year repeaters by end use. This was a one-year snap-shot from the 2012 program tracking data for end use. In 2012 the most common end uses among three-year repeaters were lighting (42%, n=307) and HVAC (23%, n=166). Other notable end uses among three-year repeaters were process (8%, n=57), motors/drives (7%, n=51), multiple measure types (4%, n=32), and refrigeration (4%, n=30). MOU-signing customers exhibited a similar distribution of end uses to three-year repeaters.

Figure 6-11: Three-year repeaters by end use*

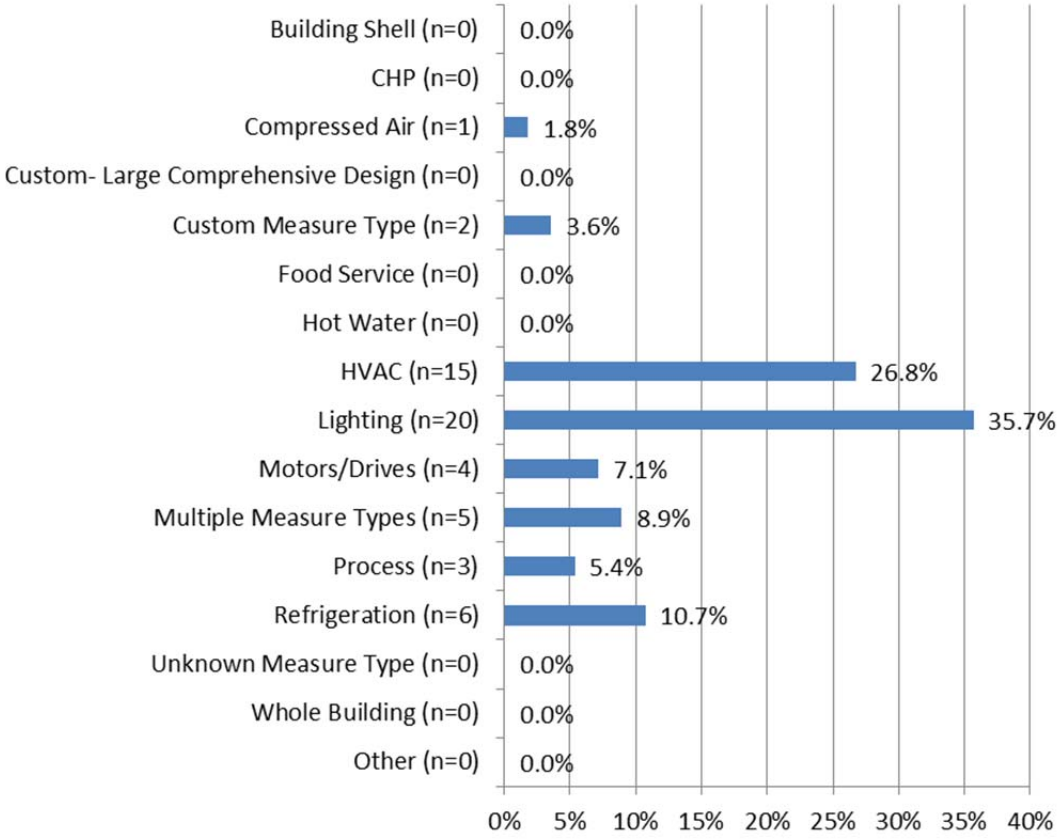


* A single year of program tracking data (2012) used for customer also participating in 2011 and 2013.

The distribution of MOU-signing customers by end use was also similar to that of the three-year repeaters. Figure 6-12 shows that lighting (35%, n=20), HVAC (27%, n=15), refrigeration (11%, n=6), and multiple measure types (9%, n=5) together constituted more than 80% of MOU-signing customer projects.[45]

[45] Again, this was a one-year snap-shot from the 2012 program tracking data for end use.

Figure 6-12: MOU-signing customers by end use



6.7 Defining Metrics by Customer Size

The study analyzes project success metrics by fuel type and customer size (a proxy for project size). Table 6-9 shows average depth of savings and number of projects by fuel type and customer size groups. At least two things are notable from the table: 1) More than 90% of successful projects were electric, even though one-third of total projects used natural gas as fuel; and 2) average depth of savings was higher for smaller project sizes.

For electric projects within the “all successful projects” category, the average depth of savings for small, medium, and large projects was 3.84, 0.77, and 0.25, respectively. Similarly, the data suggests a possibly inverted trend between project size and depth of savings for gas customers, and for the comparison-group category. Large customers have lower depth of savings scores at least in part because their size was the denominator of this metric.

The large customers are more likely to have already completed big projects because they are more likely to be repeat participants and MOU-signing participants. Smaller customers are usually one-and-done, and achieve a lot of savings in the single year in which they participate and show up in the program tracking data. This, along with smaller numbers in the denominator for depth of savings, makes smaller customers have higher depth of savings scores.

Table 6-9: Average depth of savings of successful projects by customer size* ##

Customer Size (Proxy of Project Size)	PA-Identified ***	n	MOU-signing customers	n	Three-year repeat customers	n	Combination-metric	n	All Successful Projects ****	n	Comparison Group ****	n
Small-Electric	0.93	8	8.50	1	0.71	36	6.06	59	3.84	104	2.38	3657
Medium-Elecric	2.00	2	0.62	11	0.52	141	4.16	10	0.77	164	1.14	2018
Large-electric	0.11	12	0.23	27	0.23	393	2.57	3	0.25	403	0.46	596
Small - Gas					1.02	5	7.71	3	3.53	8	1.63	1841
Medium - Gas			2.97	3	0.21	13			0.73	16	0.66	1186
Large - Gas			1.85	3	0.23	13	6.96	1	0.91	17	0.32	395
Very Large - Gas					0.15	3			0.15	3	0.19	22
Mean/Sum**	**0.58**	22	**0.80**	45	**0.33**	604	**5.75**	76	**0.95**	715	**1.56**	9715

* Filters all projects with a combination metric score greater than 10.0.
**Means apportioned to n's by PA.
*** PA-identified successful projects not available in 2012 tracking data are not included.
**** Overall, ~5,000 projects were dropped because customer size or project savings data were missing, and/or because the project's depth-of-savings score was greater than 10.0.
Depth of savings was computed on one year of data, and thus is understated for repeat customers who spread projects out over multiple years.

Table 6-10 shows the average number of measure types (breadth of savings) by fuel type and customer size (which is used as a proxy for project size). Among all successful projects, smaller projects had more efficiency measure types than larger projects in a single year. This seems counter intuitive; however, larger customers are more likely to do planned upgrades in stages spread out over multiple years, whereas smaller customers are more likely to do a lot of projects in a single program tracking year.[46] If many years of program tracking data were analyzed, larger customers would score higher on breadth of savings and smaller ones would score lower.

Small electric projects included an average of 1.78 measure types per project, while medium and large electric projects averaged 1.17 and 1.05, respectively. The lack of measure diversity is another possible reason why larger customers experience lower depth of savings.

Among combination metric identified projects, large electric projects were the most diverse, with an average of 3.33 measure types per project. Small gas projects were least diverse, averaging 2.00 measure types per project.

[46] Small customers are more likely to participate in the DI program which focuses on completing an extensive upgrade with multiple measures under a single project executed in a single year. Large customers are not eligible for DI, but have larger loads allowing investments by the PAs and customers over multiple years via other programs/initiatives.

Table 6-10: Average breadth of savings of successful projects by customer size* ##

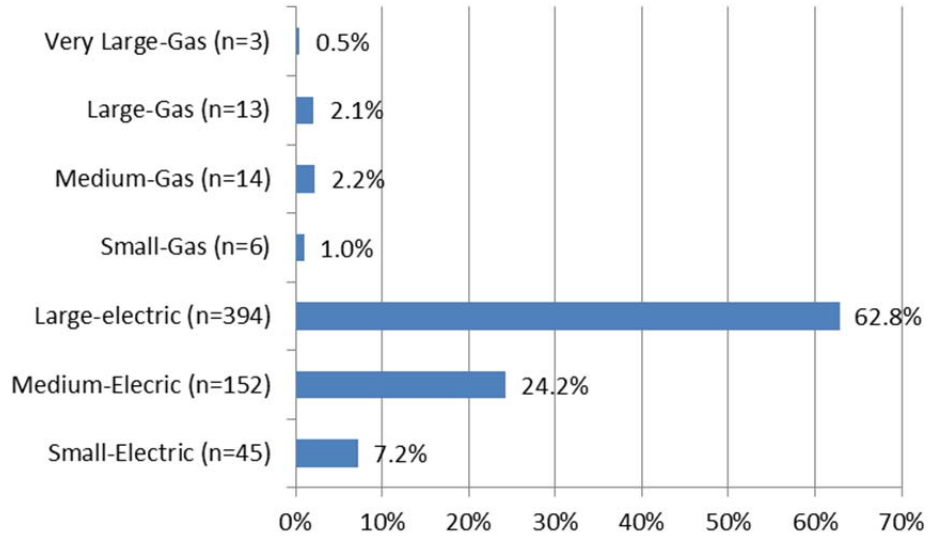
Customer Size (Proxy of Project Size)	PA-Identified ***	n	MOU-signing customers	n	Three-year repeat customers	n	Combination-metric	n	All Successful Projects ****	n	Comparison Group ****	n
Small-Electric	1.00	8	1.00	1	1.04	36	2.46	59	1.78	104	1.12	3657
Medium-Elecric	1.00	2	1.00	11	1.07	141	2.80	10	1.17	164	1.09	2018
Large-electric	1.00	12	1.04	27	1.04	393	3.33	3	1.05	403	1.02	596
Small-Gas					1.17	5	2.00	3	1.44	8	1.02	1841
Medium-Gas			1.67	3	1.07	13			1.18	16	1.01	1186
Large-Gas			1.00	3	1.08	13	3.00	1	1.18	17	1.03	395
Very Large-Gas					1.00	3			1.00	3	1.14	22
Mean/Sum**	**1.00**	22	**1.07**	45	**1.05**	604	**2.53**	76	**1.20**	715	**1.08**	9715

* Filters all projects with a combination metric score greater than 10.0.
**Means apportioned to n's by PA.
*** PA-identified successful projects not available in 2012 tracking data are not included.
**** Overall, ~5,000 projects were dropped because customer size or project savings data were missing, and/or because the project's depth-of-savings score was greater than 10.0.
Breadth of savings was computed on one year of data, and thus is understated for repeat customers who spread projects out over multiple years.

Figure 6-13 shows the distribution of three-year repeaters by project size, distinguishing between gas and electric projects. As noted earlier and as shown in this figure, three-year repeating customers mainly implement electric projects. Among three-year repeating projects, 63% were large electric. By comparison, only about 10% of comparison-group projects were large electric.

Large customers experienced greater energy savings due to their clear tendency to participate in multiple years. The extra savings that larger customers achieved because of multi-year participation is not reflected at all in the metrics for depth and breadth, because these metrics were only computed on a single year of program tracking data (CY2012) in this study.

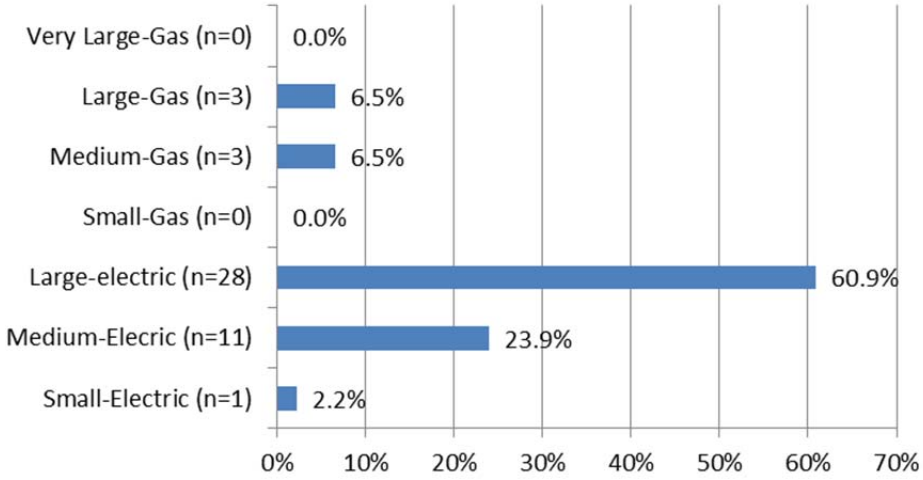
Figure 6-13: Three-year repeaters by project size and fuel type*



* A single year of program tracking data (2012) used for customer also participating in 2011 and 2013.

Figure 6-14 shows MOU-signing customers for NSTAR and National Grid by project size. Most MOU customer projects (87%, 40 of 46), are electric. The distribution of MOU-signing customers is similar to the distribution of three-year repeating customers; customers with large projects more often signed MOUs with PAs.

Figure 6-14: MOU-signing customers by project size



6.8 Summary of Findings for Data Mining and Metric Development

As noted above, DNV GL worked with the PAs and EEAC to develop agreed-upon metrics for defining and evaluating successful projects. As part of our effort to determine the factors affecting project success, we compared differences and similarities among successful and comparison-group projects based on factors such as customer group, PA, fuel type, initiative/program type, building type, end use, and customer size. Key findings are discussed below.

Comparisons by customer group

Combination metric identified customers averaged the highest number of energy efficiency measure types (i.e., breadth of savings), at 2.53. This is not surprising, since a project must achieve both high breadth and high depth of savings to be identified as successful, in the first place, using the combination metric. The average breadth of savings for all successful groups (including the combination metric group) is 1.18; breadth was lower (1.07) for the comparison-group projects.[47]

For repeat customers energy savings is spread out over time (more than one year) but this study only analyzed a single year (2012) of participant savings data. Also, repeat customers tend to be larger customers, and customer size is the denominator for the depth-of-savings metric. For these two reasons, the three-year repeating customer group had the lowest mean score for depth of savings (0.33). MOU-signing customers are also inherently larger institutional customers that spread project implementation out over multiple years. However, MOU-signing customers scored an average of 0.80 for depth of savings—the

[47] Though not statistically significant, the average successful project has greater measure diversity than those in the comparison group.

second highest score among the successful customer groups.[48] This validates the need for and use of multiple "success" criteria in this evaluation, because reliance upon a single quantitative metric is simply inadequate.

Comparisons by fuel type

Successful gas projects had higher average depth of savings than successful electricity-saving projects; however, the opposite was true for comparison-group projects (electricity projects have higher depth of savings). All successful gas projects had higher breadth of savings (1.13) than comparison-group projects (1.02). Similarly, successful electric projects had greater breadth of savings (1.19) than comparison-group projects (1.10).

Comparisons by initiative/program type

Looking at all successful C&I projects in aggregate, the depth of savings was much higher for DI projects (3.36) than it was for New Construction (0.66)[49] or LR (0.38) projects. DI projects also had the highest average breadth of savings (1.75), compared to New Construction (1.16) and LR (1.02) projects.

Comparisons by building type

Among all successful projects, storage buildings had the highest depth of savings (8.77), followed by other (2.45), retail (1.64), food service (1.58), public assembly (1.30), and office (1.26). The lowest scoring building types among all successful projects were lodging (0.25), education (0.41) and industrial (0.41).

Even though the education building type represented only 7.5% of total projects, more than one quarter (26%) of projects from three-year repeat customers came out of the education sector. Conversely, the retail (18.5%) and food service (17.1%) building types represented a larger percent of total projects, but a smaller percent of projects from three-year repeat customers (4.6% for retail, and 5.8% for food service).

Half (50%) of the MOU-customer projects also came from the education sector, and were mostly colleges and universities. This suggests customers from the education sector are more likely to both be three-year repeat participants and MOU-signing customers. Similarly, the industrial sector is well represented among three-year repeat customers, and should not be judged solely on this single criterion applied to a single year of program participation, because their savings are likely to be spread out over more years.

Comparisons by customer size

For successful electric projects, the average depth of savings for small, medium, and large customers was 3.84, 0.77, and 0.25, respectively. Similarly, the data suggests a possibly inverted trend between customer size and depth of savings for successful gas projects, as well as for the comparison-group category. Large customers have smaller depth of savings scores at least in part because their size is the denominator of this metric.[50]

[48] Findings from the PA identified successful customer group are mainly presented in the C&I customer interviews section of this report because few of these customers showed up in the 2012 program tracking data.

[49] The depth of savings was likely lower because prescriptive measures are more prevalent in new construction projects and inherently not "deep" saving.

[50] This means that for meaningful comparison of a project's depth-of-savings, it is necessary to view this in the context of customer size. Without this context, one might conclude that all small projects are successful and large ones all not so.

Among combination metric identified projects, large electric projects were the most diverse, with an average of 3.33 measure types per project. Small gas projects were least diverse, averaging 2.00 measure types per project.

Sixty-three percent of three-year repeat electric projects were from large customers. This compares to only about 10% of comparison-group electric projects that were from large customers. Similarly, 61% of MOU-signing customers were large electric. This suggests that the PAs are already doing a good job of obtaining projects from large customers, and may be able to increase participation by focusing efforts more on medium and smaller customers.

7 SUMMARY FINDINGS AND CONCLUSION

It is critical to understand what makes energy efficiency programs and initiatives successful. There is not one single metric responsible for success across the diverse array of Massachusetts C&I customer energy efficiency projects. Further, no matter how sophisticated quantitative analysis becomes, it is unlikely that it will ever be adequate for defining program success factors without qualitative analysis. However, the three quantitative metrics and one qualitative metric (PA-identified) described in this analysis provide useful insights to improve the design and delivery of energy efficiency programs.

7.1 The Program Administrator Perspective

PAs indicated that effective customer engagement involves finding organizational drivers and project champions. Contractors acting as a *de facto* sales force are especially valuable for smaller PAs. MOUs are powerful engagement tools with large and institutional customers to get long-term buy-in and commitment to energy efficiency projects. Case studies that accurately showcase large amounts of project-delivered energy savings are an important marketing tool.

Negotiated incentives and zero-interest loans are key tools for project financing. Talking to customers about the non-energy savings benefits of program participation that matter most to their business and the cost of not participating are also important. Leveraging free measures to get customer buy-in on other measures is effective for small customers who experience less frequent contact with PAs. Technical assistance is most important with smaller customers who lack internal resources. A streamlined program participation process, gas and electric PA collaboration, and high-velocity projects also contribute to success.

7.2 The Customer Perspective

All successful groups indicated completing additional projects at greater rates (50%-100%) than the comparison group (41%). Determinants of project success included catalysts such as; having a positive experience, achieving savings, reputable program staff and contractors, being “green,” and having an effective energy champion working on the project. Additional top factors included competent workers, accurate information throughout the project, minimal to no disruption to operations or customers, and the achievement of desired end results. How long it took to complete a project and turn-around time in communications between customers, PAs, and contractors were also critical.

The fact that customers completed more projects may be an indicator that they had a successful experience. There was a modest correlation between customer satisfaction, customer reporting of project success, and the metric that indicated successful projects. This lends some credence to the choice of metrics used to identify success in this analysis.

Customers who are harder to reach and who lack internal resource capacity appear to correlate with less success. Projects with lower ROI and customers with limited budgets are the main reasons cited for not going forward with projects. Customers with successful projects are more likely to track bill savings than those with comparison-group projects. Non-energy benefits experienced by the customer included improved operations and maintenance, comfort, health and safety, and the public perception of being concerned about the environment and doing their part to take care of it.

7.3 Data Mining Efforts and Metrics for Success

The average number of energy efficiency measure types (i.e., breadth of savings) for combination metric identified customers was 2.53. This is no surprise since the criteria for choosing combination metric projects is based on scoring high on breadth- and depth-of-savings metrics. The average breadth of savings for successful groups is 1.18, whereas the comparison group implemented an average of 1.07 energy efficiency measures.

The three-year-repeat customer group had the lowest mean score for depth of savings (0.33), at least in part because energy savings is spread out over more than one year for these customers and this study only considered a single year of savings. Also, repeat customers tend to be larger customers, and customer size is the denominator for this metric. The same can be said of MOU-signing customers, who are inherently larger institutional customers. Despite this disadvantage, MOU customers scored an average of 0.80 for depth of savings, second highest among the four successful subgroups.

Successful gas projects have higher average depth of savings than projects utilizing electricity. However, the opposite is true for comparison-group projects. All successful gas projects have higher breadth of savings (1.13) than comparison-group gas projects (1.02). Similarly, successful electric projects have greater breadth of savings (1.19) than comparison-group electric projects (1.10).

In looking at all successful projects in aggregate, the depth of savings is much higher for DI projects (3.36) than it is for New Construction (0.66) and LR (0.38) projects. Among all successful projects, DI also had the highest average for breadth of savings (1.75), followed by New Construction (1.16) and LR (1.02).[51]

Among all successful projects, storage buildings had the highest depth-of-savings score (8.77). This is followed by no-data (2.62), other (2.45), retail (1.64), food service (1.58), public assembly (1.30), and office (1.26). The lowest scoring building types among all successful projects were lodging (0.25), education (0.41) and industrial (0.41). One or more of these lower scoring sectors could be analyzed for ways to increase savings, and then appropriately targeted by the programs and initiatives.

Even though the education building type represented only 7.5% of total projects, more than one quarter (26%) of projects from three-year repeating customers came out of the education sector. Conversely, 18.5% of the project-level dataset was made up of retail customers, but they account for only 4.6% of three-year repeating customers. Similarly, food services projects made up only 5.8% of three-year repeaters, whereas they represented 17.1% of total projects. Education building types were associated with 50% of total MOU-signing projects.

For electric projects within the “all successful” category, the average depth of savings for small, medium, and large customers was 3.84, 0.77, and 0.25, respectively. Similarly, the data suggests a possibly inverted trend between project size and depth of savings for gas customers, as well as for the comparison-group category. Large customers have smaller depth-of-savings scores, at least in part because their size was the denominator of this metric. Among combination metric identified projects, large electric projects were the most diverse with an average of 3.33 measure types per project. Small gas projects were least diverse, averaging 2.00 measure types per project.

[51] This is due in large part because the DI program targets small customers.

Among three-year repeating projects, 63% were large electric. By comparison, only about 10% of comparison-group projects were large electric. Similarly, 61% of MOU-signing customers were large electric.

7.4 Conclusion

The in-depth interviews with PA staff and EEAC consultants, as well as those with customers conducting successful projects, indicated several generalizable themes that the PAs should consider replicating during the program participation process.

7.4.1 Communication & Engagement

Leverage trade ally customer relationships to increase customer engagement and communication. Both PAs and customers interviewed noted that the use of trade allies to engage customers was a key to project success. This holds true both for 1) the smaller customer segments, where the sheer number of customers makes it cost-prohibitive for repeated engagement from PA staff and for 2) larger PAs where the services of project expeditors are used to augment PA program staff and increase contact with large and medium sized customers. The PAs can continue to leverage trade allies to increase the likelihood of achieving any number of the success factors related to customer engagement and communication.[52]

7.4.2 Education & Training

Increase emphasis on vendor training.[53] Both PAs and customers interviewed noted that training was a key contributor to project success. By increasing the emphasis on training vendors and other technical staff, the PAs will encourage and support more frequent installation of energy saving measures. Also, increased trade ally training, support and competency are important because of the strong direct relationship trade allies have with customers.

Promote and leverage incentives. The PAs noted that it is important to educate customers about the totality of what they are getting from the programs. One Massachusetts program, the Bright Opportunities Program, provides upstream incentives to distributors to buy-down the cost of energy efficient LEDs and linear fluorescents; these incentives in turn get passed down to the retail and customer levels. Many customers don't know they are getting a discount for these lighting technologies. Program implementers can educate customers about all types of incentives as a way to increase the depth and breadth of energy efficiency measures included in projects.[54] When customers realize they are being offered additional discounting, they are more likely to feel more successful, decide to act, and install more measures and/or projects.

Explore ways for customers to build internal expertise and capacity to manage projects. This may take the form of a shared energy manager position to serve multiple mid-sized customers. The PAs suggested that more could be done to help customers build internal expertise needed to

[52] Some PEX wear multiple hats in the delivery of the efficiency programs in MA, and thus are very involved "partners." For example one PEX serves as a DI vendor for several PAs, as a QA/QC firm for one PA, and as a distributor in the upstream lighting program.

[53] Historically, there is a greater occurrence of electric measure installation. Other studies have indicated greater emphasis on gas measures in vendor training may be worthwhile. This is seen in the 2011, 2012 and 2013 Customer Profile projects as well as being reflected in the breadth metric discussed in Section 6 of this report. There are fewer opportunities (i.e., less end uses and measures) in gas. Most potential studies and even legislated goals show lower savings for gas compared to electric.

[54] Recommended on page 1-13 of Project-17 Final Report, Process Evaluation of the 2012 Bright Opportunities Program. June 14, 2013.

implement projects. A shared energy manager could help provide expertise for smaller and mid-sized customers, unable to afford a dedicated energy manager on their own.

7.4.3 Financial Incentives & NEBs

Emphasize the Value of NEBs and "Being Green". Both PAs and customers noted that NEBs, as well as a perception of "being green," are factors that influence a project's success. Oftentimes, the NEBs and "green" aspects of a given project will go unnoticed as stakeholders focus solely on the dollars saved. By marketing the NEBs and other intangibles associated with specific projects or specific project types, the PAs will increase the potential for project success. It should be noted that case studies are mentioned by both PAs and customers as training and education tactics that lead to project success. The PAs should consider producing case studies that emphasize both project NEBs and the greener aspects of energy efficiency.

7.4.4 Precision & Forecasting

Ensure the Accuracy of Technical Review and Assistance. PAs indicated the importance of "measure twice and cut once." By ensuring that the technical aspects of a project are as accurate as they can be, the PAs will ensure that the project is set up for success. A project that grossly overestimates project savings could still save a significant amount of energy, but will not be viewed as a success by the customer given the high expectations that were set at the outset of the project.

Leverage the results of EM&V site reports. For PAs not doing so already, the results of individual EM&V site evaluations may be used as a mechanism for quality assurance, accuracy and project specific feedback. For example the PAs could follow up with a project receiving a particularly low (or high) realization rate to determine if there were any issues with the project that went unaddressed. It should be noted, however, that the EM&V work is driven by a random sample of projects and this type of exercise would not replace program QA/QC efforts.

7.4.5 Program Execution & Delivery

Focus on Eliminating Project Delays and Intrusions. It comes as no surprise that projects that are completed on time and with little hassle are viewed more favorably by all parties involved, including both customers and PAs. While the PAs can only exert so much control over the participation process, it is worth assessing the participation at regular intervals to determine if there are any improvements to be made. PAs could explore what causes project delays and develop tracking mechanisms and processes to monitor and continually improve services to ensure customer schedules are maintained.

7.4.6 MOUs

Small PAs should adopt a simpler form of the MOUs used successfully by larger PAs. Having a signed MOU was one of the metrics used to identify customers with successful projects, and it was cited as a criterion for success during PA interviews. The PA Differences project found that the smaller PAs have very few large customers that can implement large projects, which are historically a key to achieving savings goals. To increase the critical savings stream from large customers, we recommend that smaller PAs consider adopting a process similar to the formalized MOU that focuses on planning for energy efficiency over time.

8 APPENDIX A: DETAILED VERBATIMS FROM C&I CUSTOMER INTERVIEWS

Table 8-1: How project assistance from market actors impacted projects

Customer group	Impacts of third party involvement on customer projects	n
PA identified successful	Despite a change in building ownership, the PA made the project happen during a remodel	1
	Energy Advisor and PA provided assistance	1
MOU-signing	Implementation contractor handled most everything	1
3-year repeat participants	Implementation contractor did most of the work	3
	Implementation contractor and free light bulbs impacted decision to do project	1
	Implementation contractor and products supplier were instrumental on project	1
	PA administered and implementation contractor did work	1
	PA rep informed customer of program and implementation contractor did work.	1
	The PA rep and implementation contractor stayed with the project from start-to-finish	1
Combination-metric identified	Implementation contractor did the work	4
	Happy with role of all market actors, all customer had to do was approve project	1
	Implementation contractor did the work and PA audited it	1
	Implementation contractor did the work and PA funded it	1
	Implementation contractor started work and PA finished it	1
	PA initiated project and contractor did the work	1
Comparison Group	Implementation contractor did the work	2
	Implementation contractor did the work and PA audited and funded	2
	Consultant handled rebate	1
	Implementation contractor did the work and PA funded it	1
	Manufacturer handled program paperwork	1
	Program staff and energy advisors provided info and tech support	1

Table 8-2: C&I customer process for identifying energy efficiency opportunities (detailed)

Customer group	C&I customer process for identifying energy efficiency opportunities*
PA identified successful	Internal expertise used to identify projects
	PA representative identifies projects
	The business case for projects is made internally first, then projects may
	Trade ally audits identify opportunities
MOU-signing	Internal expertise used to identify projects (n=2)
	Energy manager internally identifies opportunities
	ESCOs and contractors identify projects
	Internal expertise used to identify projects
Repeat participants (3yrs)	PA representative identifies projects (n=2)
	Trade ally audits identify opportunities (n=2)
	Internal expertise used to identify projects, PA representative identifies projects
	Projects identified during building renovation
Combination-metric identified	Trade ally audits identify opportunities (n=3)
	Codes and standards dictate energy efficiency improvements
	External party audits initiate projects
	Projects identified during building renovation
Comparison Group	Trade ally audits identify opportunities (n=2)
	Consultant and rebate identifies opportunity
	Contractor audits identify opportunities
	Determine ease and cheapness of retrofit, then decide to act or not.
	External party audits initiate projects
	External party monitored energy use to determine actions to take
	Projects identified during building renovation
	Rebates covering 60-70% of cost, impossible to refuse.
	Replace aging & failing equipment, rebate just icing on the cake.
	Trade allies come to us with energy efficient products (usually lighting) with rebate form in hand.
	Vast majority of projects identified internally

* n=1, unless otherwise specified

Table 8-3: Customer perspective on process steps to implement projects (Table 1 of 2)

Customer	Process steps to implement a project* (Tabel 1 of 2)
PA identified successful	External market actor did audit, proposal and work.
	Internal energy manager contacted PA during project scoping.
	Internal staff, along with PA staff and state employees involved in CHP project.
	PA conducted audit & identified opportunities, customer analyzed results, PA offered incentive.
	Project Expeditor approached customer, conducted audit and presented proposal. Customer agreed to smaller project first (as a test), then onto bigger ones.
MOU-signing	Customer approached PA for incentives after internal audit performed.
	Customer has internal energy manager who works with contractors to ID opportunities, then energy manager approaches utility for rebates.
	Customer identified areas with older lighting, contacted lighting vendor who did assessment (including cost and savings) and then installed.
	Customer uses external consultant to do TAs. Large projects are put in budget cycle and competitive bids sought from contractors. Smaller projects are done in-house.
3-year repeat participants	Audits, both free and copay preceded lighting installations.
	Consultants helped with paperwork.
	Contractor did all the paper work and installation work.
	Customer initiated contact with PA after coming up with project idea. PA did audit and contractor installed work.
	Customer signed off on project and contractor did paperwork and installation.
	Customer signed paperwork, audit occurred, then installation and PA verifies work.
	PA and equipment supplier approached customer and perfumed audit and submitted results. Once underway, project expanded to other measures.
	PA initiated contact and performed audit. Electric contractor did work, PA did post installation inspection and customer signed paperwork.
	PA rep introduced customer to preferred vendor, who did assessment and installation.
	Project scoped and specified internally, then paperwork submitted to PA.
Combination-metric identified	After lighting upgrade, customer signed-off on the completion of the work.
	Contractor and PA initiated contact with customer.
	Contractor initiated and installed project and handled all paperwork.
	Contractor installed sample of lighting before larger installation was allowed.
	Customer called PA after seeing program flyer. Auditor came to facility and made recommendations, customer approved, then lighting and faucet aerators installed.
	Customer contacted PA, PA sent rep to perform audit and propose work, customer signed-off, work was done and customer paid PA.
	Customer received proposal and did financial analysis and financed project with energy savings from it.
	Engineers and architects engaged customer during design stage.
	External audit done, then work completed and PA verified installation.
	Lighting installed by contactor after customer approval.
	PA did audit and showed up later with contractor to do work. Customer believes contractor handled paperwork on their behalf.
	PA initiated project and was heavily involved throughout the whole process.

Table 8-4: Customer perspective on process steps to implement projects (Table 2 of 2)

Customer	Process steps to implement a project* (Table 2 of 2)
Comparison Group	As lighting fixture began to fail, customer had; 3rd party engineer design lighting retrofit, then looked on-line for rebates, obtained bids, computed ROI and did project.
	Contractor did entire implementation process and was only point-of-contact with customer (n=2).
	Contractor did entire implementation process and was only point-of-contact with customer.
	Contractor did entire implementation process, on both fully funded direct rebate projects and partially incented ones.
	Contractor initiated project and installed measure, but customer did not get refrigeration rebate anticipated.
	Contractor initiated project.
	Contractor; initiated contact with customer, proposed and implemented work, did all paperwork. Customer never interacted with PA.
	Customer called PA, vendors handled all program paperwork and pre and post inspections were performed.
	Customer contacted consultant who did research, customer bought materials, and contractor did rebate paperwork.
	Customer met with PA of both fuels types, with contractor and engineer, and scoped work.
	Customer ordered bulbs through the program, used internal electrician, installed the bulbs. For lighting rebate application, did fixture counts with annual run-hours and wattages.
	Customer responded to program advertisement.
	In-house Energy Conservation manager did; project conception, outline scope and specifications, bids, contractor selection and acceptance testing.
	PA contacted customer, contractor did work and signed-off on it.
	PA initiated lighting audit, with cost and savings estimates and installations completed 1 month later.
	PA kept project going despite a change in contractor.
	Project initiated with audit and PA rep, implementation plans completed in 1 week, contractor installed lighting, PA inspected and signed-off. Excellent experience with process.

9 APPENDIX B: EXCERPTS FROM INTERIM REPORT

9.1 Detailed Work Plan Goals and Stage 1 Assessment of C&I Data

Introduction

In an effort to define "project success" across a variety of MA PAs, the project proposes an initial project research phase, and additional discussion, before completing this project. Stage one of the research includes two tasks: first, DNV GL completed in-depth interviews with PA program implementers to gather qualitative data about what C & I project "success" means within their program and their PA. The second task is for us to examine program tracking and billing data to quantitatively define success, through reported, available program information.

In the final project planning meeting about research specifics, PA representatives advising DNV GL on this research were vocal about the importance of normalizing energy savings across projects when evaluating project success quantitatively. They suggested we normalize data by examining energy saved by project cost and / or size. PAs further emphasized that relaying information about energy savings without benchmarking it to project size and / or cost may be not useful. Assessing available data and proposing a way to normalize data then, is the first step within the data mining task.

Defining project success – by the numbers

Our first project data assessment activity was to assess in-house data relating to energy use and/or savings, and understand variables that reflect project size and/or cost. The project work plan indicates the research will "examine and consider customer size as it did in the Mid-Sized Customer Needs Assessment" (Project 19), segmenting into small, medium, and large customers.[55] That project used peak demand values of 300 kW and 750 kW as the dividing lines between small, medium, and large customers. These categories already exist in the 2011 billing data. About 70% of all accounts in the billing database have '0' or missing for peak demand. We will likely assume any participants lacking peak demand data are 'small', as discussions with PAs through other projects have indicated that in general, the customers that do not have the infrastructure necessary for these kinds of measurements are generally small.

Per the P32 project work plan, one of the likely 'success' metrics is electric savings claimed through programs as a percentage of electric usage. This comparison is proposed to be done using 2011 billing (usage) data and 2012 tracking data. For their draft report, Project 31 successfully linked roughly 92% of electric accounts in the tracking data to the billing data, representing roughly 77% of savings claimed in the tracking data. The P31 team is currently attempting to increase those figures before submitting the final report. While imperfect, using this already-established link for this project would save time and budget by avoiding project duplication.

[55] Project 19 further segmented accounts into additional categories beyond size, based on whether they are 'managed' or part of a chain or franchise.[55] It is unclear at this time whether this additional segmentation would prove beneficial to the P32 analysis, but it is available if the project and research advisory teams choose that route.

There are multiple ways the data mining team could normalize energy savings across projects. However, the initial recommendation – after evaluating available data and testing variables for completeness across the PAs – is to express energy savings ($ per kWh or $ per therm) as a percent of cost to the PA. Said another way, DNV GL recommends we examine savings per project incentive dollar as the best quantifiable measure of success within available data.

Billing and tracking data must be linked at the account level, as that is the identifying and common field in the billing database. However, P32 team members have the opportunity to define ‘customer’ or ‘project’. For example, single customers may be responsible for multiple accounts (for instance, in the case of manufacturing facilities, meters might be placed on individual buildings or machines). Unfortunately, ‘Customer ID’ and ‘Premise ID’ fields are very sparsely populated. Where possible, and on a limited basis, we can determine where single customers have multiple accounts on the same premise or (same address), and possibly use those fields to combine accounts.

Conversely, single accounts may be responsible for multiple projects. The ‘Project ID’ field is very well populated for all PAs except Cape Light (which has no project IDs), with roughly 9,400 projects for 7,400 accounts within the other PA’s tracking data. The possibility exists that we may be able to divide individual accounts into different projects, and analyse at the project instead of customer level.

9.2 Project Metrics Achievable and not Achievable, Early 2014 Stage 1 Research

The P32 project team has re-visited activities scoped in the final "Learning from Successful Projects" work plan and confirmed what is possible given actual 2012 program tracking and 2011 customer billing data available in-house from the PAs.[56] Table 9-1 shows are proposed project actions and goals, and the project data mining team's evaluation of the feasibility of each item.

Table 9-2 shows project actions and goals that may not be achievable through data mining, given the current in-house data DNV GL has from the PAs.

Under the data mining effort, the project team examined a number of potential measurement activities that were scoped in the final Learning from Successful C&I Projects work plan in order to confirm which measurements are possible given actual 2012 program tracking and 2011 customer billing data available in-house from the PAs.[57] Table 9-1 shows the proposed project measures and goals, and the project data mining team's evaluation of the feasibility of each item.

Table 9-2 shows the project actions and goals that may not be achievable through data mining, given the current in-house data DNV GL has from the PAs.

Table 9-1: Proposed Project Measurement Activity: Currently Achievable

Project Measurement Activity	Stage One Project Assessment
Define 'savings' in terms of kW, kWh, or a combination	A large majority of observations (measures) have populated kW and kWh savings fields, with a similar proportion of missing values for each field. Either field, or some combination of the two, can be used in determining savings per project.
Analyse and compare lifetime, in addition to annual, savings across customers for most measures.	Roughly 15 percent of all observations (measures) in the 2012 tracking database have measure life fields missing. Consequently, lifetime savings from those measures cannot be calculated. However, this means that 85 percent DO have lifetime savings values, which can be compared across customers.
Determine which projects had comparatively lower savings and/or cost per kWh within market sector and program.	The 2012 tracking data includes fields for 'cost to customer', 'cost to PA', and 'total project cost', making such an analysis possible for many accounts. This can be done within different market sectors (whether that means customer size categorizations or business types – for which we have ~10 classifications, including healthcare, office, and manufacturing). It can also be done within programs, as the tracking database includes fields for custom vs. prescriptive projects, retrofits vs. new construction, and direct install.
Determine which projects involve linked products (e.g. large unitary HVAC installations leading to RTU controller installations).	The 2012 tracking database includes end-use descriptor fields for each measure that are well-populated. However, they are inconsistent across PAs in terms of their form and level of detail. Targeted searching for specific linked measures could be successful on a case-by-case basis, but we should be careful about making larger generalizations about the participant population.

[56] This verification is a valuable exercise at this project crossroads, as these data were not available at the time the work plan was created and the project was scoped.

[57] This verification is a valuable exercise at this project crossroads, as these data were not available at the time the work plan was created and the project was scoped.

Table 9-2: Proposed Project Goals: Not Currently Achievable

Project Measurement Activity	Stage One Project Assessment
Determine reliably whether participants receive gas / electric services from an integrated utility or from separate electric and gas entities.	The vast majority (80%) of observations in the 2012 electric tracking data do not have valid data for the gas PA field. While there is some data available and whether a participant had different electric and gas providers can be determined on a limited case-by-case basis, we should not make any generalizations of the participant population.
Determine if projects realized both gas and electric savings. Account ID's don't match, but Project ID might.	The 2012 electric and gas tracking databases are not linked at this time. With a much lower overlap between distinct account numbers in either database than would be expected, it is likely that most participants that realized both gas and electric savings have different account numbers for each fuel type, even if they have the same provider for each. This linkage could hypothetically be done through text fields or through GIS based on address field. If done, the results could apply across multiple MA projects, but would require significant budget to complete.
Determine kWh or kW savings per square foot for projects.	Neither the tracking nor billing databases include a field for square footage of the premises that measures are installed, so this analysis is not possible. A savings by size analysis is not likely given data we have in-house.
Examine tracking data for opportunities to isolate comparison group projects, if desired.	The team does have incentive payment information for some PAs, but not all. The preliminary examination of this data opportunity indicates there is a lack of data, and there would be limited use of this metric.
Examine tracking data to verify if MOUs are clearly indicated in the tracking data.	While PA representatives involved in either the Work Plan scoping process or the initial in-depth interviews (or occasionally, both) feel MOUs between the PAs and C&I Customers is key element of project success, DNV GL does not have a clear indicator of an MOU within the program tracking data available in-house.

10 APPENDIX C: PA IN-DEPTH INTERVIEW GUIDE

Data Mining 12 Results	Analysis by Measure Type	Metrics	Building Type x Measure Type	a47	In the final report it would be good to see in the appendix charts that are "Building Type" specific. So a chart for lodging, a chart for healthcare, etc.	This is helpful information/input for our final report.
Data Mining Results	Analysis by Program Type	Metrics	Program Type x Measure Type	a49	More on this point – can cost effectiveness by measure type and then by Program type be shown in the report?	This is helpful information/input for our final report.

MA LCIEC – PROJECT 32 LEARNING FROM SUCCESSFUL PROJECTS

IN-DEPTH INTERVIEW GUIDE FOR PROGRAM MANAGERS AND OTHER RELAVANT PROGRAM STAFF OF MASSACHUSETTS DIRECT INSTALL AND LARGE C&I PROGRAMS

1. Program Staff In-Depth Interview Guide

Call Log

Interviewer		Survey Length (min.)	
Completion Date			

Respondent Information

Contact Name	
Company Name/ Contractor	
Phone	
Email	

Call Tracking

Date/Time	Notes/result/actions: (Who spoke to, new contact info, when to call back, etc.)

[NOTES TO INTERVIEWER]

Introduction

PRIMARY PROJECT GOAL:
Determine what factors repeatedly contribute to a "successful" C&I energy efficiency project.

PRIMARY INTERVIEW OBJECTIVES:

1. **Determine the PA and EEAC Consultant views of the customer's project decision making process.**
2. **Identify key factor(s) that encourage or impede project success.**
3. **Determine appropriate measure(s) of project impact (aka success).**
4. **Solicit input on integration of Commercial and Multi-family programs.**

LEAD-IN:

Hello, my name is <NAME>. I work for DNV GL, an energy consulting firm. As you may be aware, we have been hired by the Massachusetts electric and gas utilities' Energy Efficiency Program Administrators to conduct research on energy efficiency programs serving commercial and industrial customers.

Today, we would like to talk with you about your experience specifically with successful energy efficiency projects. This conversation will cover:

1. Your understanding of and view on the project decision-making process for customers.
2. Key project implementation strategies that encourage or impede success.
3. Your view of potential project success factors.

In addition, we are looking to identify up to three specific recent projects that meet your definition of a successful project.

IF ASKED WHY WE WANT THIS INFORMATION:

We plan to review the project files and possibly speak directly to the customers who have completed successful projects with the Mass Save Program Administrators in order to better understand what provides the foundation for "successful" projects from the customer's perspective. Anything you say in this interview will remain confidential, and, if you prefer, we will reach out to your company again before speaking to any customers.

RB. Roles and Background

[PLEASE READ]

I would like to start by asking you a few questions about your position at <COMPANY>. This will help us to put the rest of your answers in context.

RB1. What is your job title at <COMPANY>? How long have you been in this role?

RB2. How many years of experience do you have with energy efficiency program implementation/sales?

RB3. What are your primary job responsibilities?

[IF NOT INDICATED IN PRIMARY JOB RESPONSIBILITIES IN RB3 ASK RB4]

RB4. Which commercial and industrial programs do you work on in Massachusetts?

[PROBE] Are you specifically involved in Direct Install and/or large C&I programs?

[IF LARGE C&I PROBE] Are you involved with the retrofit program? Are you involved with the new construction/major renovation program?

[PROBE] For which programs do you work most frequently?

[PROBE] Which equipment types are you most familiar?

[IF NOT INDICATED IN PRIMARY JOB RESPONSIBILITIES IN RB3 ASK RB5]
RB5. What types of customers do you work with in Massachusetts?

[PROBE] Are you specifically involved with small businesses and/or large commercial and/or large industrial?

[PROBE-BUT NOT FOR NU] Where in Massachusetts are your customers located? [Try to get metro areas, north, east, south, west, or counties]

DS. Defining Project Success

[PLEASE READ]

First, I'd like to spend a little time discussing what project success means to you within the Commercial & Industrial sector.

DS1. In your own words, what makes an energy efficiency project successful?

[PROBE] Is there anything aside from energy savings (i.e. comprehensiveness of measures installed, depth of savings, use/quality of audits or project size, customer satisfaction, smooth implementation,

contractor effectiveness, good coordination between PAs where gas & electric measures/territories overlap)?

DS2. What are the top three to five factors that contribute to the success of a project?

DS3. Next, based on your definition of success and the factors that contribute to it, how would you measure a successful project?

[PROBE] What are the metrics by which we can gauge a project's success?

[PROBE] 1) from PA perspective, (2) from Customer perspective, (3) from Contractor perspective, and (4) any other perspective

DS4. Are there specific contributors to a project that would make the project ***un***successful?

SP. Identifying Specific Projects that Meet the Definition of Success

[PLEASE READ]

Now I'd like your help to identify some recent projects that meet these criteria.

SP1. Thinking about the definition of success and the factors that contribute to success that we just talked about, can you think of any recent Commercial or Industrial projects (completed in 2012 or 2013) that met the definition? *(if Yes, skip to PD1)*

> [IF YES PROBE] Customer Name, Project Location, Short Project Description for up to 3 projects.
>
> [NOTE TO INTERVIEWER: We may need to reiterate that information will be kept confidential.]

IF NO ASK:

SP2. Can you think of any recent projects (completed in 2012 or 2013) that demonstrated one or more of the factors you listed above that contribute to project success?

> [IF YES PROBE] Customer Name, Project Location, Short Project Description for up to 3 projects.

IF NO ASK:

SP3. Would you like to revise your definition of a successful project so that we can identify one or more projects that meet that definition?

[IF YES, RECORD NEW RESPONSES FOR DS1 AND DS2 THEN PROBE FOR] Customer Name, Project Location, Short Project Description for up to 3 projects.

IF NO, ASK SP4, THEN PROCEED WITH SECTION CD "Customer Decision-Making Process" OF THE INTERVIEW REFERENCING SUCESSFUL PROJECTS IN GENERAL AS OPPOSED TO A SPECIFIC PROJECT AFTER READING THE FOLLOWING:

It will still be helpful to me to ask you some questions about customer decision making, project implementation and project impacts for successful projects *in general.* So thinking about your definition of a successful project and the factors that contribute to that, let's proceed with the interview.

SP4. What are the main reasons you are unable to come up with any recent successful projects?

[NOTE TO INTERVIEWER: If you are getting the sense there may be a person better suited for this interview with the PA, feel free to inquire here with your interviewee]

[Repeat Sections PD through PI for <PROJECT 2> and <PROJECT 3> identified in Section SP above.]

PD. Project Details of the Specific Successful Projects

[PLEASE READ]

Next I'd like to gather some more details about the specific successful projects you identified. Thinking about <PROJECT 1>, please answer the following questions.

PD1. Did the project involve working with another gas or electric program administrator? Why or Why not?

PD2. Did the project overcome any perceived barriers by the customer?

> [IF YES PROBE] What were the specific barrier(s) the customer overcame? How was this accomplished? Was it done in a way that you would consider innovative or "out-of-the-box"?

PD3. Did the project include measures or technologies that will enable the customer to understand their energy usage and/or become more active in managing and monitoring their energy use?

CD. Customer Decision-Making Process

[PLEASE READ AND COMPLETE THIS SECTION AS-IS IF THE RESPONDENT WAS ABLE TO NAME AND DESCRIBE SUCCESSFUL PROJECTS ABOVE, IN QUESTIONS SP1 AND/OR SP2. IF THE RESPONDENT WAS NOT ABLE TO PROVIDE SUCCESSFUL PROJECT SPECIFICS EARLIER IN THE INTERVIEW, RE-WORD THIS SECTION TO DISCUSS CUSTOMER DECISIONS *IN GENERAL*]

Now I'd like to talk to you about the customer's decision-making process when it comes to each of the specific successful projects. Thinking about <PROJECT 1> you mentioned above, let's focus on the process that led up to the customer deciding to move forward with the project.

CD1. First, how did the customer first learn about the Mass Save energy efficiency program options?

[PROBE] Did they have a conversation with an Account Rep or other representative of a program administrator?

[PROBE] Had they done an energy efficiency project in the past?

[PROBE] Did they hear about the energy efficiency programs from a colleague or other word of mouth?

[PROBE] Were they approached by a vendor or other market actor?

[PROBE] Did they have an internal need/desire to reduce their energy costs?

[PROBE] Did they have a desire to minimize their carbon footprint, improve customer relations…?

CD2. What process was used to identify the available energy efficient opportunities?

[PROBE] Did the customer receive an audit or TA study?

CD3. Were there other energy efficiency opportunities that the customer did not pursue?

[IF YES PROBE] What was the primary reason for choosing only the opportunities that were implemented?

CD4. What were the key drivers involved in the decision to implement the project?

[IF NOT PREVIOUSLY MENTIONED, PROBE: Did the customer receive an incentive payment or other incentive (i.e. free or reduced cost measure) from the program in order to complete the project?

CI. Customer Implementation Process

[PLEASE READ AND COMPLETE THIS SECTION AS-IS IF THE RESPONDENT WAS ABLE TO NAME AND DESCRIBE SUCCESSFUL PROJECTS ABOVE, IN QUESTIONS SP1 AND/OR SP2. IF THE RESPONDENT WAS NOT ABLE TO PROVIDE SUCCESSFUL PROJECT SPECIFICS EARLIER IN THE INTERVIEW, RE-WORD THIS SECTION TO DISCUSS CUSTOMER PROCESSES *IN GENERAL*]

Again, focusing on <PROJECT 1>, I'd like to spend a little time talking about the customer's project implementation process itself.

CI1. Walk me through the steps the customer took in order to implement the project.

CI2. What type(s) of assistance or services did the participant receive from the following parties?

CI2a. Energy Advisory (such as an energy engineering firm)

CI2b. Program Implementation Contractor

CI2c. Program Administrator Staff (such as Account Reps; Technical Service Reps)

CI2d. Trade Ally (such as project expediters)

CI3. Did the participant receive project assistance or services from any other parties?

[IF YES PROBE] Who and what was the nature of the assistance or services received?

[PROBE] Was any of this assistance provided by contractors or advisors not associated with the program?

CI4. For each of the parties that provided assistance or services for the project, what impact did the party in question have on the success of the project?

[PROBE] Did the party in question play an essential role in moving the project or a piece of the project forward? If yes, how so?

[PROBE] Did the party in question have any negative effect on the project? If yes, probe for details.

PI. Project Impact Assessment

[PLEASE READ – ADJUSTMENTS IN WORDING MAY BE NECESSARY IF THE RESPONDENT DOES NOT HAVE SPECIFIC SUCCESSFUL PROJECTS IN MIND.]

Next I'd like to talk about the impact of each project. Again, focusing on <PROJECT 1>, let's discuss some of the results or effects that the project has had on the customer.

PI1. Has the participant (or the PA) tracked energy or energy bill savings since the project completed?

[IF YES PROBE] What, if any, savings have been realized?

IF SAVINGS WERE REALIZED, CONTINUE WITH Q PI2. If not, skip to PI3.

PI2. Did the savings (energy savings or bill savings) match expectations compared to expectations at the outset of the project?

PI2a. Were these tracked savings weather normalized or normalized in another way?

PI3. Would you say that the customer was satisfied with the project overall?

[PROBE] Why or why not?

PI4. Did the project produce any other financial benefits beyond the bill savings?

[Possible PROBES or examples:]

- The perception of using "green" technology results in an increase in customer sales
- Energy efficiency measure installation results in increased equipment performance and consequently increases production

PI5. Did the project produce any non-energy benefits?

- [Possible PROBES or examples:]
  - Operations & Maintenance, labor-related savings
  - Job creation and/or business retention
  - Increased comfort and/or health and safety factors
  - Reduced carbon footprint and/or environmental/sustainability factors
  - General customer/PR benefits

PI6. Did the project achieve deeper savings relative to projects of similar size, scope and customer type?

PI7. Did the customer complete a higher percentage of the recommended measures relative to projects of similar size, scope and customer type?

PI8. After the experience of <PROJECT 1>, did the customer complete additional energy efficiency projects?

[IF YES PROBE] What factors led to the customer's decision to do so?

PI9. Are you aware of any additional energy efficiency projects completed by the customer that did not receive an incentive from the Mass Save programs?

PI10. Did the customer become an advocate or partner of the Mass Save programs?

[PROBE] Did the customer ever volunteer for case studies or speak publicly about the project or otherwise support the Mass Save programs?

PI11. Did the customer sign an MOU agreement with the program administrator as a result of this project?

[PROBE] Could you please explain the benefits of the MOU arrangement to both the customer and the program administrator?

[Repeat Sections PD through PI for <PROJECT 2> and <PROJECT 3> identified in Section SP above.]

Closing Comments

CC1. Do you have any other input regarding successful projects and the definition of success that we haven't already discussed?

PI. Program Integration - Multifamily and Commercial program portfolio

[PLEASE READ] *We're almost finished. Thanks for staying with me. For the last few questions, I'd like to switch gears and briefly get your input about integration of the Multi-family program with the Commercial program portfolio.*

PI1. As you may be aware, the Three-Year Energy Efficiency Plan 2013-2015 called for "enhancements to the Multi-family program including integration of commercial and residential services that result in increased penetration." What is the current status of better integrating the Multi-family program with the Commercial program portfolio at your company?

PI2. What are your company's plans for any additional actions to further these integration efforts?

PI3. Do you think challenges will emerge from additional integration of the multifamily program with the commercial portfolio program?

P13a. [IF YES] What kind of challenges?

PI4. In what ways do you think the integration might help or hinder the availability, promotion, and sales of energy-efficient products in the multifamily market?

PI5. What additional changes, if any, would be required to integrate the Commercial and Multifamily programs at your company? [PROBE: program delivery, roles of PAs/vendors, customer enrollment, etc.]

PI6. Which customer types, if any, do you think will be better served by integration of Commercial and Multifamily programs?

P16A. Why do you think so?

PI7. Do you think certain customer types, may NOT be better served by integration of Commercial and Multifamily programs?

[IF YES] P17A. Which types?

P17B. Why do you think so?

Those are all the questions I wanted to ask. Thank you for your time and participation.

11 APPENDIX D: C&I CUSTOMER INTERVIEW GUIDE

MA LCIEC – PROJECT 32 LEARNING FROM SUCCESSFUL PROJECTS

IN-DEPTH INTERVIEW GUIDE FOR C&I PROGRAM PARTICIPANTS

7. Participant In-Depth Interview Guide

Call Log

Interviewer		Survey Length (min.)	
Completion Date			

Respondent Information

Contact Name	
Company Name/Contractor	
Project Name	
Measure types included in project	
Site/Facility Address	
City	
Phone	
Email	

Call Tracking

Date/Time	Notes/result/actions: (Who spoke to, new contact info, when to call back, etc.)

Introduction

PRIMARY PROJECT GOAL:
Determine what factors repeatedly contribute to a "successful" C&I energy efficiency project.

PRIMARY INTERVIEW OBJECTIVES:

1. Gain insight into what provides the foundation for 'successful projects' from the customer or participant perspective.

Please track call-backs on an Excel spreadsheet and enter response data into the appropriate column associated with each question in the Excel Data Matrix.

LEAD-IN:

Hello, my name is <NAME>. I work for DNV GL, an energy consulting firm. We have been hired by the Massachusetts electric and gas utilities' Energy Efficiency Program Administrators to conduct research on energy efficiency programs serving commercial and industrial customers.

Today, we would like to talk with you about your experience with…..

4. **…<Project Name>** at **<Facility Name>** on **<Street Address>** in **<City>**

Are you familiar with this project?

- If no, ask to be referred to who might know about the project
- If yes, proceed to next question

IF ASKED WHY WE WANT THIS INFORMATION:

We want to speak directly to the customers who have completed successful projects with the Mass Saves Program Administrators in order to better understand what provides the foundation for "successful" projects from the customer's perspective. Anything you say in this interview will remain confidential.

Roles and Background

I would like to start by asking you a few questions about your position at <COMPANY>. This will help us to put the rest of your answers in context.

1. What is your job title at <COMPANY>? How long have you been in this role?

2. What are your primary job responsibilities?

Review Project Research and Initiation (aka Decision-Making Process)

3. How did you first learn about the energy efficiency programs available to you?
    a. [PROBE] Did you…
        - Have a conversation with an Account Rep or other representative of a program administrator?
        - Hear about the energy efficiency programs from a colleague or through word of mouth?
        - Were you approached by a vendor or other market actor?
        - Do any energy efficiency projects in the past?
        - Have an internal need/desire to reduce your energy costs?
        - Have a desire to minimize your carbon footprint, improve customer relations…?

4. What process(es) did you use to identify your opportunities for energy efficiency improvements?
    a. [PROBE] Did you receive an audit or Technical Assessment (TA) study?

5. Were there other energy efficiency opportunities (other than the ones completed through this project) that you did not pursue?
    a. [IF YES] What were the primary reasons for choosing the project that was implemented, and not pursuing other opportunities?

6. Did you receive a financial payment or other incentive (i.e. free or reduced cost measure) from the program to complete the project?
    a. [IF YES] What were the incentives?

7. What were the key drivers (if not incentives) involved in your decision to implement the project?

8. Were there any barriers that you perceived before the project that were overcome?
    a. [IF YES] What were the specific barrier(s) you overcame? How was this accomplished?

Discuss Project Implementation

9. What process steps did you take in order to implement the project?

10. What project assistance did you receive from any / all of the following parties?
    a. Energy Advisor (such as an energy engineering firm)
    b. Program Implementation Contractor
    c. Other program staff or account representatives (such as Account Reps, Technical Service Reps)
    d. Trade Ally (such as project expediters)

11. How did each of those involved parties impact the project?

12. Did the project involve electric and gas measures being implemented? If so, did you work with different gas and electric program administrators?
    a. How was that experience different than working with one PA?

Assess Project Impacts

13. Have you tracked your energy or energy bill savings since project completion?
    a. [IF YES] What savings have you realized?
    b. Do the savings (energy or monetary) match your expectations compared to the project initiation stage?

14. Did the project produce any other financial benefits beyond the bill savings?
    a. [PROBE] Such as…
        - The perception of using “green” technology results in an increase in sales
        - Energy efficiency measure installation results in increased equipment performance and consequently increases production

15. Did the project produce any non-energy benefits? [Possible PROBES or examples:]
    a. Operations & Maintenance, labor-related savings
    b. Job creation and/or business retention
    c. Increased comfort and/or health and safety factors
    d. Reduced carbon footprint and/or environmental/sustainability factors
    e. General customer/PR benefits

16. Did the project enable you to understand your energy usage and/or become more active in managing and monitoring your energy use?

17. On a scale of 1 to 5, where 1 is very dissatisfied and 5 is very satisfied, how satisfied are you with the project overall? Why do you rate it an X?

18. After your experience with this project, did you complete additional energy efficiency projects?
    a. [IF YES] What factors led to your decision to do so?
    b. Did those projects get assistance from the Mass Saves programs?

Memorandum of Understanding (MOU)

19. *(Ask only **IF flagged as MOU** customer)* Our records indicate that your organization signed an MOU with the utility/PA. Are you familiar with this agreement?
    - *If Yes*, What effect has the MOU agreement had your organization?
    - *If No or DK,* skip to next section.

20. *(Ask **IF NOT flagged as MOU** customer)* Since project completion, did you sign an MOU agreement with the (utility) program administrator as a result of this project?
    a. [PROBE] Could you please explain the benefits of the MOU arrangement?

Net-to-Gross (Free-ridership)

21. *How likely would you have been to implement this project without the incentive provided by the PA utility? Would you have been…*

1) …Very likely,
2) Somewhat likely,
3) Somewhat un-likely, or
4) Not very likely at all …to have gone ahead with the project?

Defining Project Success

22. In your own words, what makes an energy efficiency project like the one you implemented successful? *[Probe for; A] project champions (could be PA, trade ally, internal staff, external competitors), key people that make things happen, a designated energy manager B) were they inspired by case studies, other customers doing projects, C) does the organization have formal or informal energy efficiency guidelines when purchasing equipment, etc.?]*

23. What are the top three to five factors that contribute to the success of a project?

24. On a 1 to 5 scale, where 1 is very unsuccessful and 5 is very successful, how successful would you rate this project(s)?

25. Are there specific contributors to a project that would make the project ***un***successful?

Firm-o-graphics

26. Own/rent?
27. Who pays utility bill (owner/renter)?
28. Building square footage?
29. Confirm market sector already in data (i.e. retail healthcare, office, etc.), though you will probably know this from the conversation.
30. Number of full-time equivalent employees?

Closing Comments

Do you have any other input regarding your project(s) and the definition of success that we haven't already discussed?

Those are all the questions I wanted to ask. Thank you for your time and participation.