

CAUSALITY AND ATTRIBUTION EVALUATION FOR MARKET TRANSFORMATION PROGRAMS: INTEGRATING PROGRAM IMPLEMENTATION WITH IMPACT EVALUATION^a

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Introduction

Impact analysis of Market Transformation (MT) programs poses considerable challenges for energy efficiency program evaluators. This is especially true in cases where the mid-market actor is the focus of the program intervention and limited information is available on the end use customer (EUC) facility where the measures have been installed. This paper provides information on examples of evaluations from the New York State Energy Research and Development Authority's (NYSERDA's) **New York Energy SmartSM** program portfolio. In all three examples, the evaluation team is employing an Integrated Data Collection (IDC) approach where surveys of key market actors and end-use customers (EUCs) are conducted in "real time" as close to the key intervention points as possible. By mapping the communications during the course of program implementation, key points at which the program interacts with actors and participants are identified (prior to participation, following participation, or both), and evaluators are able to determine how to best obtain responses to impact evaluation survey questions while the decision process is still fresh in the minds of those involved. This technique could provide more reliable results than retrospective evaluations that, by their nature, rely on respondents to recall decisions and influences that may be more than a year old.

Background

In May 2003, NYSERDA contracted with Summit Blue Consulting to perform Market Characterization, Assessment, and Causality (MCAC) evaluation for the **New York Energy SmartSM** program portfolio. The work undertaken by Summit Blue was the first major causality/attribution evaluation effort for the **New York Energy SmartSM** Program. Being the first major evaluation, the team had to conduct retrospective survey efforts to assess the true impacts of the programs from inception through December 2003. Lessons learned during the first-year's evaluation effort led to an enhanced second-year effort which couples retrospective surveys with IDC surveys to assess program impacts through December 2004.

The IDC efforts employed by NYSERDA focus primarily on impact evaluation issues. Impact evaluations usually involve an assessment of causality/attribution defined as the net energy savings that are due directly to the program intervention. Assessing these net savings is a complex exercise that involves determining and subtracting out "free-ridership" or "naturally occurring adoption," which would have occurred absent the program, and adding in the impacts of "spillover" activities, which occur without direct program funding but are influenced by program interventions. Equation 1 provides the basic formula for using free-ridership and spillover for calculating the net savings attributable to the program.

^a The views expressed in this paper are those of the authors and do not necessarily reflect the views of the New York State Energy Research and Development Authority.

$$\text{Net Savings} = \text{Gross Savings} \times [(1 - \text{Free-ridership}) \times (1 + \text{Spillover})] \quad (\text{Eq. 1})$$

Estimating spillover is an especially complex evaluation task because the program may influence additional energy efficiency activities by the participants and the market-at-large in many ways. Estimating spillover is critical for any program aimed at transforming the market, *i.e.*, the essence of the program is to influence the overall market. As part of the NYSERDA work, three types of spillover are assessed:

- (1) Within Project Spillover in which participants implement additional energy efficiency measures as part of the same project but do not receive incentives for these additional activities or report them to the program;
- (2) Outside-Project Spillover in which participants implement additional energy efficiency measures as part of another project in the same or another facility; and
- (3) Non-Participant Spillover in which non-participating end-use customers and market actors are influenced by the program to adopt similar energy efficiency measures in projects that do not go through the program.

The IDC efforts are focused on program participants and are, therefore, primarily designed to address the first two types of spillover.

For the most part, the IDC surveys are brief because they can focus in on attribution topics and generally do not cover market characterization and assessment questions in any depth. Questions center on what the respondent would have done had they not been involved in the NYSERDA program and additional actions they have taken (either as part of the project or at a later date) that were not funded by the program but were influenced by NYSERDA. Both sets of questions are asked in different ways to probe decision making and help provide confirmation and double checking of responses.

NYSERDA IDC Examples

The three examples of IDC applications that will be discussed in this paper are highlighted below. Each program employs a different approach to IDC depending on the particular needs and opportunities. Determining the evaluation approach in each of the cases described below began with an inventory of communication points between the program and market actors and the creation of a communications map. Then, each point was assessed to determine whether it was an appropriate time for gathering information for the evaluation and the information that could best be collected at that point.

Commercial/Industrial Performance Program and IDC Description

The Commercial/Industrial Performance Program (CIPP), which began in 1999, provides incentives to energy service companies (ESCOs) and other contractors to promote energy efficiency capital improvement projects. In this program, NYSERDA executes a standard performance contract with ESCOs.^b Final payment is based on savings that were verified in accordance with a pre-determined

^b Other contractors that are not ESCOs are also eligible to participate.

measurement and verification plan. The performance period for each contract is two years and includes up to two measurement and verification (M&V) reports.^c

While the CIPP is not considered one of NYSERDA's main MT programs, it does have a market development component in that it fosters growth in the ESCO industry and promotes energy efficiency as a business enhancement opportunity for ESCOs. In addition, the fact that ESCOs are the recipients of NYSERDA's incentives also gives the program a mid-market focus and makes impact evaluation more challenging.

The IDC effort for the CIPP includes the following elements:

- Application-phase (AP) survey of ESCOs,
- Application-phase survey of EUCs,
- Post-project survey of ESCOs,
- Post-project survey of EUCs.

Under the IDC plan, CIPP implementation staff are responsible for tracking applications and incentive payments and forwarding a weekly list of new applicants and incentive recipients, with appropriate contact information, to Summit Blue Consulting. Summit Blue mails the application-phase surveys and the post-project surveys, receives these surveys back, enters the data, and analyzes the results. The mapping of the CIPP process, communications points, and selection of the IDC efforts are shown in Figure 1.^d The shaded boxes on the right of Figure 1 illustrate the IDC data collection efforts.

Premium-Efficiency Motors Program and IDC Description

The Premium-Efficiency Motors Program is designed to induce lasting structural changes in the motors market, resulting in increased use of National Electrical Manufacturers Association (NEMA) Premium™ motors in commercial buildings, institutions, industries, and municipal applications. The program targets vendors offering motors for sale to customers in the **New York Energy SmartSM** service area. The program employs a multi-faceted approach to encourage vendors to increase their sales of qualified premium-efficiency motors. NYSERDA and its vendor assistance contractor work closely with participating vendors, providing them with information, tools, workshops, and marketing materials. The program also offers incentives to participating vendors for the sale of qualifying NEMA Premium™ motors.^e The Premium-Efficiency Motors Program is considered one of NYSERDA's mid-market MT programs. The Program's focus on vendors presents a special challenge for evaluators because of the indirect relationship with the EUCs.

The basic process for the IDC effort for the Premium-Efficiency Motors Program followed steps similar to those used on CIPP, *i.e.*, map the delivery process, identify program communications with market actors, and select appropriate points for gathering information for evaluation. However, the IDC plan for the Premium-Efficiency Motors Program was one of the more "opportunistic" of the many IDC efforts. This IDC plan was able to utilize NYSERDA's vendor assistance contractor, Applied Proactive Technologies (APT), to help administer EUC surveys.

^c Program description from: NYSERDA, *New York Energy SmartSM Program Evaluation and Status Report*, May 2004.

^d Figure 1 was adapted from: NYSERDA Program Opportunity Notice (PON) 855.

^e Program description from: NYSERDA, *New York Energy SmartSM Program Evaluation and Status Report*, May 2004.

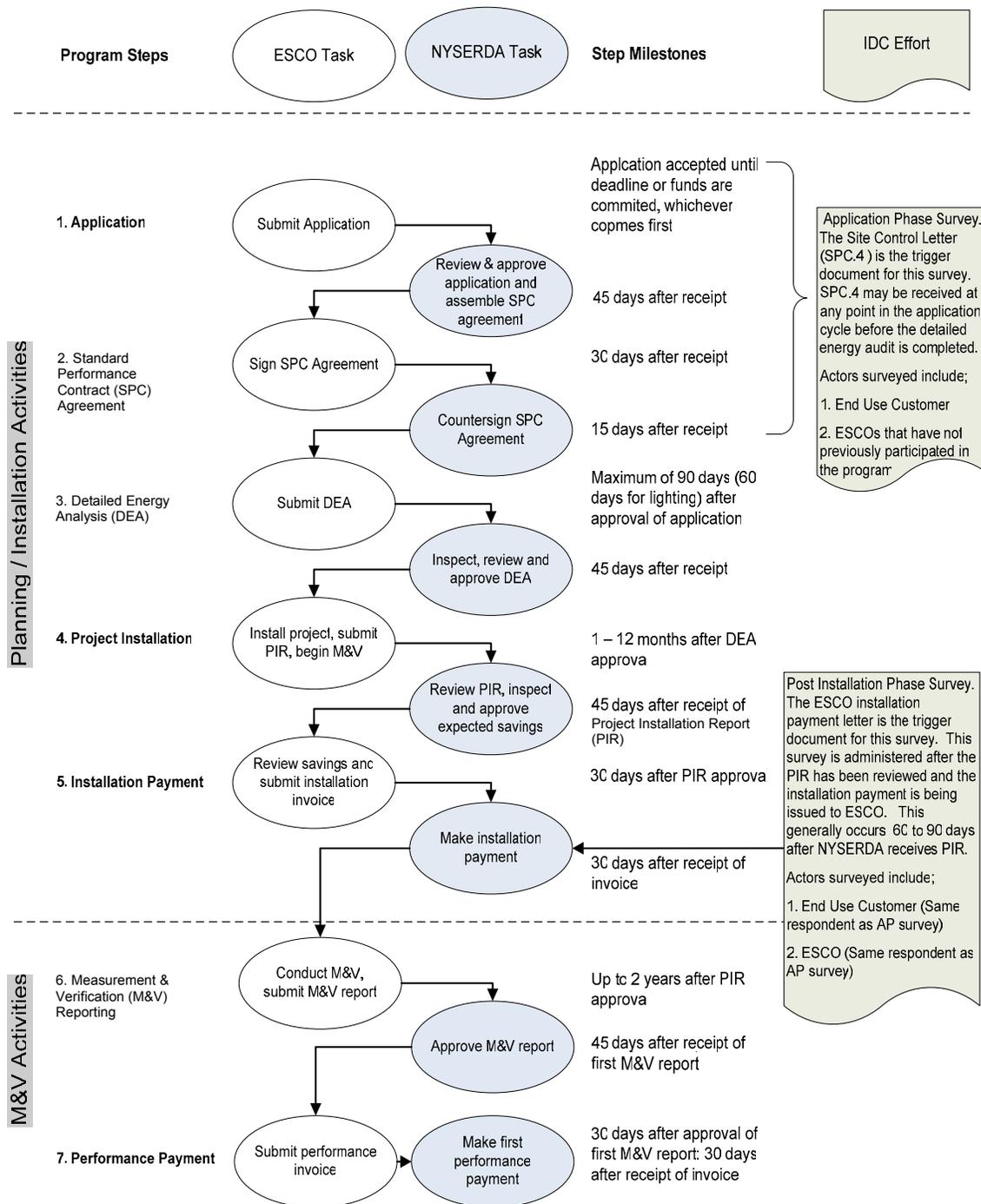


Figure 1: Commercial/Industrial Performance Program Process Diagram and IDC Efforts

The Premium-Efficiency Motors Program requires vendors to supply contact information for every 20th motor they submit for program incentives. Given that thousands of motors are now receiving program incentives each year, this provides a robust sample of EUCs for program implementers and evaluators to survey and maintain follow-up contacts. NYSERDA has always required APT to perform follow-up visits and conduct a small survey with these customers about their experience and interactions with the participating motor vendor. After discussions with program staff and APT, it was agreed that the current

survey would be expanded to cover attribution issues. APT is now conducting these site visits covering the attribution questions designed by Summit Blue. The data are passed along to the MCAC evaluation team to analyze and report the results.

New Construction Program and IDC Description

The New Construction Program (NCP) began in September 1999. The program is designed to assist architects and engineers (A&Es) in adopting energy-efficient design and construction practices and to encourage them to inform owners about the advantages of building to higher energy standards. The target audiences for the program are A&E firms, building owners, and lease holders constructing new commercial buildings and undertaking substantial renovations in existing structures. To qualify for incentives, the projects must exceed the energy efficiency levels of standard design practices and the minimum requirements of the New York State Energy Conservation Construction Code. The program offers performance-based equipment installation incentives for pre-qualified equipment, custom measures, and whole-building design to help offset a portion of the incremental capital costs. The program also offers technical assistance incentives that support energy-efficient building designs, building commissioning, and green building services.^f

This is one of the few programs where NYSERDA had experience implementing an IDC-type approach in past evaluations, and it has worked well. Previously, NYSERDA program staff mailed a survey when the incentive check was sent to the building owner upon completion of the project. The survey was followed by a reminder postcard, and the survey had an overall response rate in excess of 70%. Surveys of building owners at the end of their projects will continue in an enhanced form and will be supplemented by three other surveys to round out the data collection. The entire complement of four IDC surveys for the NCP includes:

- Application-phase building owner survey,
- Application-phase A&E survey,
- Post-project building owner survey, and
- Post-project A&E survey.

Under the IDC plan, program implementation staff are responsible for tracking applications and incentive payments and sending the list of each new applicant and each incentive recipient, along with appropriate contact information, to the evaluation contractor on a weekly basis. Summit Blue mails the surveys to participants, receives surveys back by mail, enters the data, and analyzes the results. This process is outlined in Figure 2.^g Shaded boxes represent the IDC activity.

^f Program description from: NYSERDA, *New York Energy SmartSM Program Evaluation and Status Report*, May 2004.

^g Figure 2 was adapted from: Dethman & Associates and Research Into Action, Inc., *Process Evaluation New Construction Program Interim Report*, June 2004.

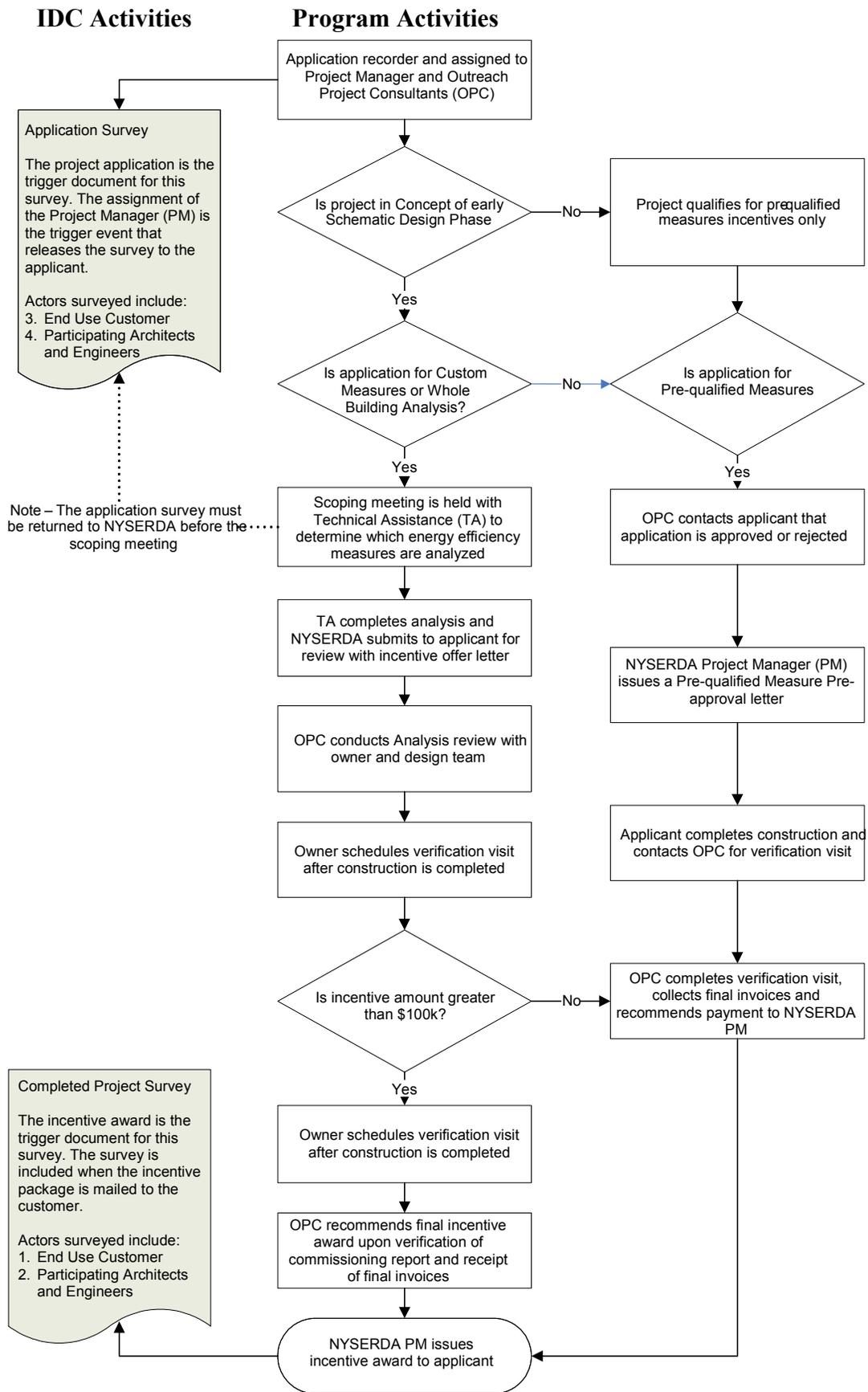


Figure 2: New Construction Program Process Diagram and IDC Efforts

Benefits of the Integrated Data Collection Approach

The benefits of using an IDC approach are numerous. As has been stated above, the main benefit is that the IDC approach is believed to result in higher quality, more reliable data on attribution. This and other expected benefits are discussed below.

More Reliable Attribution Data

The IDC approach directly addresses the important “recall” issue typically confronted by causality and attribution assessments. Recall is an especially important issue in commercial sector programs where projects can take years to complete. It is not uncommon for large commercial construction projects to take two years to complete. Nor is it out of the question for the results of a technical assistance study to play out over five years as decision makers at the facility consider what improvements to make, budget for the improvements, and finally install them. Over such a long time period, the key influences and reasons behind the decision to install energy-efficient measures, and the relative importance of these influences, can be forgotten. Finding the most appropriate person to survey (*i.e.*, the person who was most involved and made the decision to apply for the program many years ago) is often very difficult and time consuming. Furthermore, employee turnover is only exacerbated as more time passes. When evaluators have to speak with the second-most knowledgeable person, the quality and reliability of the results might suffer.

Greater Depth of Data Set

Many of the IDC evaluations employed by NYSERDA involve obtaining a matched set of information. That is, both the mid-market actor and the end-use customer respond to a survey at each stage. With information on the same project from both market actors, evaluators can do more with the data in terms of identifying inconsistencies, determining key influences, and addressing the true level of savings that are due to the program interventions. Many of the IDC plans also employ a pre- and post-project survey approach which also adds depth to the data.

Real-Time Attribution Data Feed into Proactive Program Management

NYSERDA’s evaluation approach is highly integrated with program implementation and management. Evaluation plans, approaches, and preliminary and final results are shared with program staff on a regular basis. Staff provide feedback on the approaches and their needs, and evaluators provide information and feedback from the field to staff as quickly as they can to inform program management. This feedback loop, from evaluators to staff, can be improved by the IDC efforts because more information is available on an ongoing basis, and staff do not have to wait until the end of a two-year evaluation cycle to see how their program benefits and net-to-gross ratio estimates may have changed. It is hoped that the IDC evaluation approach will help evaluators and staff stay abreast of how the program is influencing the market. If changes are made to the program, evaluators and staff can examine data before and after the changes to identify impacts. Evaluators also have a responsibility in the IDC approach to make sure that data are not used prematurely.

Longevity

One of the attractive aspects to NYSERDA of the IDC approach was the potential longevity of this mechanism for evaluating programs. The IDC efforts were designed with simplicity in mind so that they can carry on in the future, with minimal staff time and effort, even with different evaluation

contractors and different resource levels. Much of the time and effort for the IDC approach is in the set up and once it is routine in each of the programs resource requirements should be low. The final key benefit, cost savings, is discussed below.

Cost Savings

The last key benefit of the IDC approach is cost savings. Most of the IDC surveys are being administered by mail, which has definite cost advantages over phone surveying. In a couple of cases, program staff actually agreed to modify their applications and solicitations so that mailing the survey is completely avoided. Modification of applications and solicitations is a highly-desired outcome of this effort since it would result in a 100% response rate. Cost savings also accrue by avoiding all the challenging issues associated with phone surveys occurring some time after the project is complete (*e.g.*, employee turnover, recall issues meaning that a highly skilled interviewer must refresh the respondent on what was done under the program, etc.).

Requirements of the Integrated Data Collection (IDC) Approach

A few key requirements must be borne in mind when considering whether an IDC evaluation approach will work for another organization. The manner in which programs are administered and evaluated at that organization may have bearing on whether the requirements can be easily met. First and foremost, the program in question must lend itself to the IDC approach. This type of evaluation approach is not applicable or appropriate for every program. For example, programs that do not have regular points of interaction with market actors or appropriate points in their processes to insert survey work may not be good candidates for this approach. Programs with very few participants also might not be good candidates because evaluators may choose to do more in-depth qualitative work in these instances. Several **New York Energy SmartSM** programs were considered and ruled out for inclusion in the IDC effort because, for the above and other reasons, their processes do not lend themselves to this type of approach.

Secondly, but perhaps most important, the IDC approach requires significant support and participation from program staff and implementers. The needed support and participation include, but may not be limited to, the following and are described in more detail below.

- Program staff and implementers must see the value of this type of activity and agree to give evaluators access to their customers and allies at various points during the program process, not just at the end of their participation.
- Program staff and implementers must be willing to help with the design of the evaluation since they are the closest to and most knowledgeable about the decision-making process employed by their target market.
- Program staff and implementers must be committed to assisting with the day-to-day logistics involved in implementing the IDC approach including letting the evaluators know which customers should receive surveys and when.

NYSERDA's program staff and implementers have been very supportive of this IDC approach and see the value in receiving real-time information that they can use to help improve their programs. The IDC approach sometimes requires high levels of trust between program staff, including implementers, and evaluators because evaluators must be given access to customers that are still in the program "pipeline,"

not just completed projects. Staff and implementers need to trust that the evaluation will not discourage customers or cause complaints about the hardships of completing more paperwork. In NYSERDA’s case, the IDC efforts engendered this trust by involving staff in the design.

Program staff have been integral to the design of the various IDC efforts undertaken by NYSERDA for its **New York Energy SmartSM** programs. Several meetings were held with key program staff to ensure that the evaluators understood the program processes and all the steps involved from application through completion. In many cases, program process diagrams were obtained or drawn up and discussed with staff to identify the proper “trigger” point for IDC efforts. The “trigger” point is a stage in the process where decisions are being formed or the project is nearing completion. These are thought to be the points where decisions, influences, and intentions are freshest in the minds of those involved and are thereby the best places to ask about the impact the NYSERDA programs had on participant actions. Figures 1 and 2 are examples of the diagrams that were obtained or created by the MCAC evaluators and extensively reviewed with staff to understand program processes, identify appropriate trigger points, and determine how to integrate impact evaluation data collection.

Logistical issues that may involve program staff and implementers run the gamut from passing contact information to the evaluators, modifying program applications or solicitations to include survey questions, and collecting impact data through short participant surveys during field visits. In many cases, NYSERDA program staff are being asked to track program applications, payments, and other “triggers” and pass participant contact information and status on to the evaluators in a timely manner.

2004-2005 IDC Efforts at NYSERDA

Since these IDC research efforts are being launched, the actual results of the attribution survey work are not available for this writing. However, status information on the progress of the design and implementation process is presented below. A presentation of the full complement of IDC efforts employed by NYSERDA this year follows.

Status of the IDC Examples: Commercial/Industrial Performance Program

The CIPP IDC survey instruments are currently in the final stages of development and mechanisms are being put into place with staff to make sure the IDC sample is available and ready. Table 1 summarizes population size, expected response rate, and completion goals.

Table 1: CIPP IDC Survey Plans

| | | Expected Annual survey completions (Steady State) | | 4 th Quarter 2004 completion targets | |
|--|-------------------|---|-------------------|---|-------------------|
| Annual Projects Participating in CIPP* | IDC Response Rate | Application | Post Installation | Application | Post Installation |
| 100 | ~70% | 70 | 70 | 18 | 18 |

* Appendix A of the NYSERDA, *New York Energy SmartSM Program Evaluation and Status Report*, May 2004.

The CIPP is also undergoing a complementary retrospective evaluation of attribution and impacts this year. Therefore, the retrospective questions and the IDC questions will be similar and both data sets will be used to determine net impacts of the program. One of the challenges of the CIPP evaluation effort is the fact that many program projects are large and require significant time to complete. It is hoped that potential recall issues with the retrospective surveys can be balanced out by IDC responses.

Status of the IDC Examples: Premium-Efficiency Motors Program

The Summit Blue Market MCAC evaluation team developed an on-site IDC survey for the Premium-Efficiency Motors Program covering the following issues:

- Importance of energy efficiency and company policy;
- Knowledge of energy efficiency;
- Motor purchasing/vendor influence on decisions;
- Market barriers; and
- Attribution/causality issues.

The IDC effort for this program is unique in that it is the sole means of collecting MCAC data from end-use customers that are “participating” in the program by buying a qualified motor from one of NYSERDA’s ally vendors. Given that this is the only opportunity to collect these data from EUCs, and the fact that these surveys are implemented on-site, NYSERDA and the Summit Blue evaluation team decided that a longer survey was justified and reasonable.

Table 2 summarizes population size, expected response rate, and completion goals. The Premium-Efficiency Motors Program IDC effort with end-use customers is underway. APT began scheduling site visits in early October 2004.

Table 2: Motors IDC Survey Plans

| | | IDC Response Rate | Expected Annual survey completions (Steady State) | 4 th Quarter 2004 completion targets |
|--|---|-------------------|---|---|
| Annual Motor Incentives Provided (2003)* | Expected Number of Motor Customer Inspection Sites Identified | Close to 100% | Up to 140 | 40 |
| 2,874 | ~140 | | | |

* Appendix A of the NYSERDA, *New York Energy SmartSM Program Evaluation and Status Report*, May 2004.

Status of the IDC Examples: New Construction Program

The NCP IDC survey instruments are currently in the final stages of development and mechanisms are being put into place with staff to make sure the IDC sample is available and ready. Table 3 summarizes population size, expected response rate, and completion goals.

Table 3: NCP IDC Survey Plans

| | | Expected Annual survey completions (Steady State) | | 4 th Quarter 2004 completion targets | |
|---------------------------------------|-------------------|---|-------------------|---|-------------------|
| Annual Projects Participating in NCP* | IDC Response Rate | Application | Post Installation | Application | Post Installation |
| 80 | ~70% | 56 | 56 | 14 | 14 |

* Appendix A of the NYSERDA, *New York Energy SmartSM Program Evaluation and Status Report*, May 2004.

The IDC effort will provide significant value to the NCP impact and attribution evaluation due to the duration of a customer’s participation in the program. It is not uncommon for the construction of a large commercial office building to take up to two years. Therefore, loss of recall was viewed as one of the most significant risks to the validity of survey data on NCP attribution. In last year’s retrospective

evaluation of the NCP, the Summit Blue team went to great pains to ensure that survey respondents were reminded about the various energy-efficiency measures they used in their projects and the incentives and other assistance they received. However, this endeavor was resource intensive, and it is hoped that the IDC approach will help alleviate time and resource requirements and provide better data.

Other IDC Efforts Underway

The type of IDC efforts described in this paper can be beneficial for many different types of programs, both commercial and residential. IDC efforts are also being applied to NYSERDA's Photovoltaics (PV) on Buildings Program in the research and development area. Table 4 shows the various IDC efforts that are either under way or being launched at NYSERDA for 2004 and beyond.

Table 4: IDC Efforts Underway/Planned at NYSERDA

| Program | IDC Approach Summary |
|--|---|
| Commercial/Industrial Performance Program | <ul style="list-style-type: none"> • Application phase survey of EUCs and ESCOs • Post-project survey of EUCs and ESCOs |
| New Construction Program | <ul style="list-style-type: none"> • Application phase survey of EUCs and A&Es • Post-project survey of EUCs and A&Es |
| Technical Assistance Program | <ul style="list-style-type: none"> • Application phase survey of EUCs and technical service providers • Post-project survey of EUCs and technical service providers |
| Smart Equipment Choices Program | <ul style="list-style-type: none"> • Payment phase (post-project) survey of EUCs |
| Premium-Efficiency Motors Program | <ul style="list-style-type: none"> • EUC surveys administered by program implementation contractor with design and analysis by evaluation contractor |
| Residential Comprehensive Energy Management Program | <ul style="list-style-type: none"> • Post-project survey of EUCs and vendor/contractors |
| ENERGY STAR [®] Homes Program | <ul style="list-style-type: none"> • Post-project survey of builders • Call center survey of participating and non-participating EUCs |
| Low-Income Assisted Multifamily Program | <ul style="list-style-type: none"> • Post-installation survey of building owner at time of audit |
| Home Performance with ENERGY STAR [®] Program | <ul style="list-style-type: none"> • Post-project survey of contractors • Call center survey of participating and non-participating EUCs |
| PV on Buildings Program | <ul style="list-style-type: none"> • One-time application phase survey for new participating PV installers • Post-installation inspection phase survey for PV system owners |

Summary and Next Steps

As discussed in this paper, numerous benefits can accrue from integrating causality and attribution evaluation research into day-to-day program implementation. NYSERDA has found ways to apply this evaluation approach to several commercial/industrial, residential, low-income, and research and development programs. Many of the IDC efforts are just getting under way at NYSERDA, and staff have been amenable to the effort since they see the direct value that near real-time results can provide to them. Having experience from more than one full year with in-depth MCAC evaluation of the **New York Energy SmartSM** program portfolio, the evaluation team believes that coupling the IDC approach with appropriate retrospective evaluation surveys will lead to reduced costs and more reliable results.

With time and experience implementing the IDC efforts, the true extent of the expected benefits in the areas of reliability, cost savings, and longevity will be better assessed. NYSERDA intends to examine the IDC results and approach at the six-month and one-year marks to assess whether this method provides more reliable results than the typical retrospective attribution evaluation model. However, it is anticipated that some programs, especially those with IDC plans seeking pre- and post-project measurements, will need more time than this to fully assess the IDC approach. At the same time this IDC approach is being initiated, surveys of past participants are being conducted focused on impact evaluation and the net savings estimates. In some cases, these evaluations are using program records that are two years old, and it might be possible to show changes over time, as well as examine some hypotheses about biases in data collection (*e.g.*, respondent forgets about some of the benefits that were provided by program participation) that may influence the accuracy of results from retrospective survey approaches.