NYSERDA INDUSTRY AND PROCESS EFFICIENCY PROGRAM

FINAL Evaluation, Measurement, and Verification Plan

August 31, 2009

I. Introduction

The detailed evaluation plan presented in this document builds upon the brief evaluation plan included in NYSERDA's August 22, 2008 filing of the *System Benefits Charge Supplemental Revision for **New York Energy $mart**SM Programs (2008-2011)* for the Industry and Process Efficiency Program. In order to revise and add detail to its original evaluation plan submittal, NYSERDA has incorporated feedback provided by the Department of Public Service (DPS) and the EEPS Evaluation Advisory Group (EAG), and has worked closely with its team of independent evaluation contractors to select the most appropriate evaluation approaches based on the current design of the program. This plan was developed to conform to the DPS evaluation guidelines released on August 7th, 2008 and to provide the highest level of rigor possible within the available resources.

As the Industry and Process Efficiency Program ramps up to meet the aggressive EEPS goals, NYSERDA and its evaluation contractors will closely monitor aspects of that process such as participation levels, achievement of near-term goals, and other programmatic issues in order to adapt this plan, as needed, to provide the most relevant and useful evaluation. For example, adjustments may be needed to sample sizes or research issues if assumptions about the program do not develop as initially anticipated. As such, NYSERDA views this plan as a flexible, living document that will be updated, as necessary, with appropriate notice to DPS and other interested parties.

II. Summary of Goals, Cost and Schedule for Evaluation Activities

The overarching goals of NYSERDA's **New York Energy $mart**SM and EEPS program evaluation efforts are to: (1) conduct credible and transparent evaluations, and (2) provide NYSERDA program staff and managers, the New York State Public Service Commission (PSC), Department of Public Service (DPS) staff, and other stakeholders with timely and unbiased information regarding program implementation. Specifically, the goals for the Industry and Process Efficiency Program evaluation include:

(1) Establish rigorous and defensible estimates of the energy savings that can be attributed to the program;

(2) Develop a comprehensive understanding of current and emerging markets (*e.g.*, market structure and market actors);

(2) Provide baseline and background information required by NYSERDA to define and deliver the program to target markets;

(3) Track changes in the market over time with a specific focus on market indicators that are likely to be impacted by program offerings;

(4) Examine and document program progress and make recommendations for program improvement;

(5) Assess the effectiveness of the program outreach, marketing and education efforts; and

(6) Identify reasons for participation and for measure implementation.

The Industry and Process Efficiency Program budget is approximately $93 million in EEPS funds. The proposed evaluation budget is $2.84 M, or 3% of program funding.[1] NYSERDA believes this level of funding for evaluation is justifiable and adequate to achieve a high level of confidence and precision related to program impacts as well as address key process and market evaluation issues. The primary driving factors supporting an evaluation budget of 3% for this program are: the expectation that a large majority of the total expected savings from the program will come from a relatively small percentage of the participating projects; and the fact that the overall population of industrial facilities in the State is small compared to commercial or residential markets. Evaluation budgets are detailed in Table 1.

Table 1. Industry and Process Efficiency Program Evaluation Schedule and Budget

Evaluation Element	Estimated Budget and Completion						% of Total Budget
	2009	2010	2011	2012	2013	Total	
Market Characterization & Assessment	$165,000	--	$155,000	--	--	$320,000a	11%
Impact Assessment	$249,000	$747,000	$666,000	$685,800	--	$2,347,800b	80%
Process Evaluation	$61,000	$63,000	$38,000	$99,000	--	$261,000c	9%
Total	**$475,000**	**$810,000**	**$859,000**	**$784,800**	**--**	**$2,928,800**	**100%**

a. Primary data collection costs represent approximately 30% of the total proposed evaluation budget.
b. Primary data collection costs represent approximately 65% of the total proposed evaluation budget.
c. Primary data collection costs represent approximately one third of the total proposed evaluation budget.

III. Industry and Process Efficiency Program Description and Goals

Through the New York Energy $mart^{SM} Program, NYSERDA offers incentives through its Enhanced Commercial and Industrial Performance Program and Peak Load Reduction Program for process efficiency projects. While there has been substantial industrial customer participation to date, the majority of projects have been for non-process upgrades. There has been limited industrial process efficiency activity, leaving considerable opportunity for increased energy efficiency gains. Industrial and process improvements are complex projects with large energy, economic development and productivity benefits. Potential for process improvements will be predominantly in industrial facilities and data centers.

NYSERDA has a well established research and development process and product innovation program and has built a large and nationally recognized knowledge base of the marketplace needs of the customers and service providers in these sectors. As a result of SBC III efforts, valuable, innovative demonstrations of

[1] This evaluation budget includes only external contractor costs. Other overarching evaluation costs, including NYSERDA's internal evaluation management and statewide study costs, are additional; however, the total evaluation costs will not exceed 5% of program funding at the portfolio level.

under-used technologies were pursued. These demonstrations were relatively small in scale due to funding limitations, leaving unrealized potential that will be the focus of this Fast Track effort.

In response to market feedback and increased funding, NYSERDA developed an additional component to its Existing Facilities Program that will provide performance-based incentives for cost-effective process improvements that reduce energy use per unit of production. This industrial and process efficiency component is the implementation path for process improvement projects developed through the FlexTech Program, or brought to this program independently.

The process efficiency component will focus on key manufacturing sectors in New York such as chemicals (including pharmaceuticals), printing and publishing, automotive, food processing and forest products. Data centers are included as their process energy consumption is similar to manufacturing consumption in its load shape, process oriented characteristics, economic development impact, power quality requirements, mission critical nature and load growth potential. In addition, agriculture, mining, extraction and water/wastewater also have similar process orientated missions and expectations. Incentives will be offered for energy efficiency projects in all of these sectors that reduce energy use per unit of production.

Industry and processes require customized approaches to energy efficiency. Production lines and processes often have unique characteristics and functions. Site and sector-specific approaches will be used to ensure that the best energy efficiency opportunities are identified and addressed. This approach will maximize process and energy reliability, productivity and energy savings. NYSERDA will increase its engagement of service providers who are experts in particular industrial processes and data centers. Credibility and quality of technical assistance are essential to program success as are customer and stakeholder engagement.

Anticipated MWh savings for the Industry and Process Efficiency Program are shown in Table 2.

Table 2. Projected MWh Savings for Industry and Process Efficiency Program (2008-2013)

	2009	2010	2011	2012	2013	Total
MWh	122,500	197,969	257,031	213,281	49,219	840,000

Source: NYSERDA, *System Benefits Charge Supplemental Revision for* ***New York Energy $mart***^{SM} *Programs (2008-2011)* As Amended, August 22, 2008, Page 7, Table 2-3.

IV. Logic Model/Theory

The Industry and Process Efficiency Program is a new program for which a logic model has yet to be developed. As program evaluation efforts begin, a first step in the process will be to develop a logic model. Logic model development will be part of the Market Characterization & Assessment work described in this plan. The resulting logic model will be used by all of NYSERDA's evaluation contractor teams to refine the evaluation approach.

Logic modeling activities will occur early in the evaluation process after completion and approval of the Detailed Evaluation Plan. NYSERDA's evaluation contractors convene logic model "workshops" with program staff to discuss program inputs, activities, outputs, outcomes, external influences and other elements that need to be documented in the logic model. The evaluation contractors then document these

discussions in a brief program theory/logic report, which includes a logic model diagram for the program. NYSERDA will invite DPS Staff to participate in logic model workshops and review draft program theory/logic reports.

V. Market Characterization & Assessment Plan

This section presents the Market Characterization and Assessment (MCA) evaluation plan for the Industry and Process Efficiency Program.

Research Goals

The primary goals of the MCA evaluation effort are: (1) to develop a comprehensive understanding of current and emerging markets (*e.g.*, market structure and market actors); (2) to provide baseline and background information required by NYSERDA to define and deliver programs to target markets; and (3) to track changes in markets over time with a specific focus on market indicators that are likely to be impacted by program offerings.

The proposed MCA evaluation plan was structured to accommodate these overarching research goals with a specific focus placed on the market and context within which the Industry and Process Efficiency Program operates. Given that this is a new program, the plan was designed to validate program assumptions regarding market characteristics, provide additional details regarding market structure and opportunities, and establish baseline measurements of key indicators that can be used in subsequent evaluations to assess progress towards meeting the Public Service Commission's public policy goals under which NYSERDA operates, as well as the institutional goals NYSERDA has established to move markets towards improved energy efficiency. In addition, the evaluation results can be used by NYSERDA program staff and managers to adjust program implementation as needed to ensure maximum market interest and uptake of program offerings.

Activities

The proposed MCA evaluation plan for the Industry and Process Efficiency Program consists of multiple activities (blue arrows) and associated research tasks (bulleted lists), as shown in Figure 1. The approach is centered on the development of a Program Logic Model Report that will then be used to guide program-specific evaluation activities. A variety of primary and secondary data sources will be used to generate information on a number of topics relevant to the Industry and Process Efficiency Program including: energy savings potential within the key market sectors targeted by the program[2], sector-specific organizational structures and decision-making processes, and the most active and respected[3] service providers within the specific market sectors. In addition, the approach is intended to encourage a high degree of interaction between the MCA Team and NYSERDA program and evaluation staff as well as DPS staff and other project stakeholders via project planning activities and deliverable review cycles. The MCA Team welcomes active engagement by these parties but is cognizant of the possibility that other demands may limit the parties' contributions during certain points in the evaluation process. Each activity and the associated research tasks are discussed in more detail in the following sub-sections.

<u>Project Planning</u>

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[2] The Industry and Process Efficiency Program focuses on the following market sectors: manufacturing/industrial, data centers, municipal water and wastewater, agriculture, mining and extraction.

[3] Previous research has demonstrated that third-party service providers must possess substantial knowledge of and expertise with customer-specific business activities and processes to be accepted by many industrial customers.

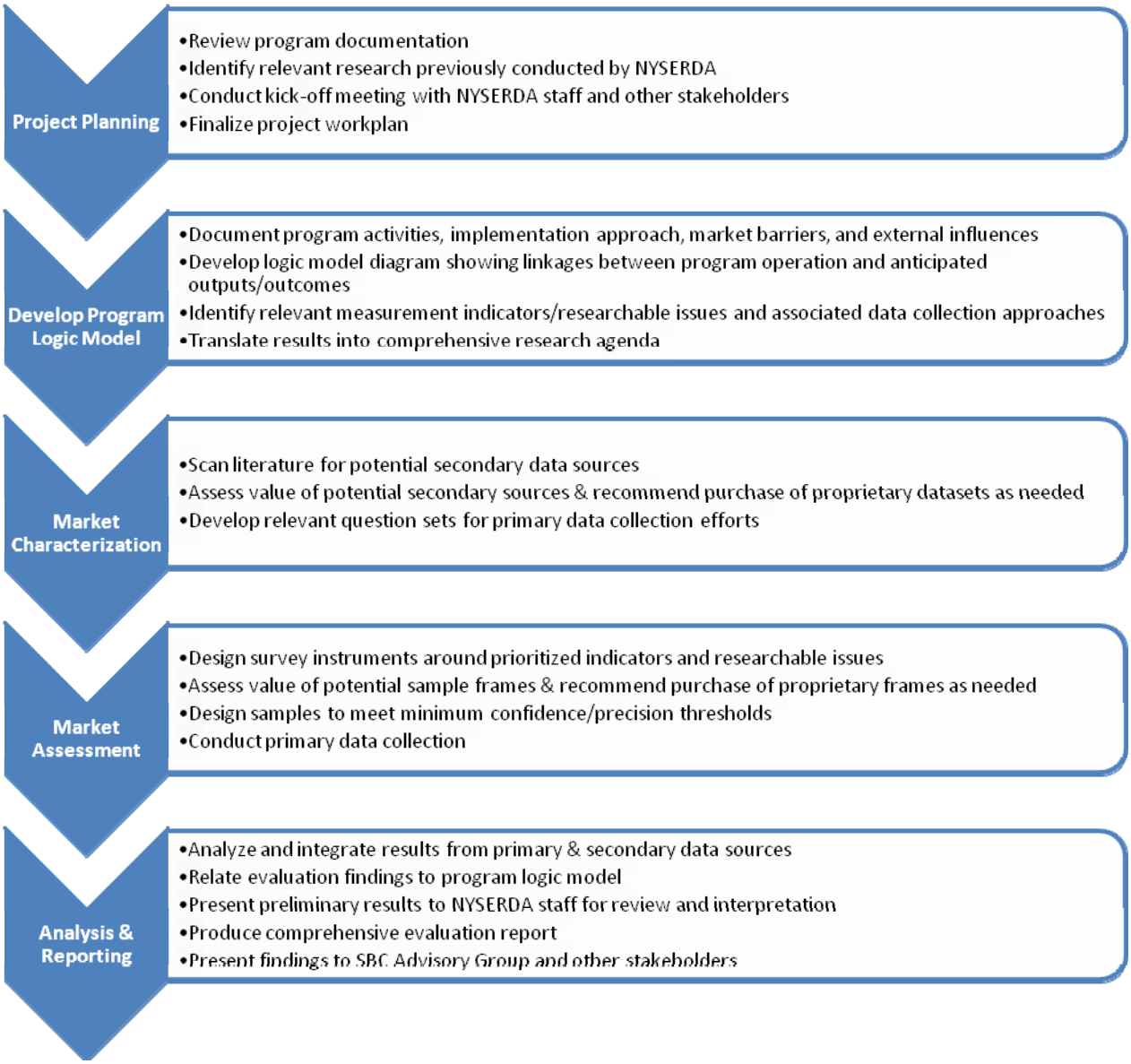
This task encompasses a variety of project planning activities including review of available program documentation, meetings and discussions with NYSERDA evaluation staff and other evaluation contractors, a project kick-off meeting with Industry and Process Efficiency Program staff and other project stakeholders, and the development of the final project workplan. Important components of this initial phase of the project include identifying relevant research previously conducted by NYSERDA that can be leveraged in the current study[4] and providing program staff an opportunity to discuss research items of interest to ensure development of a research agenda geared toward overcoming any existing gaps in staff's knowledge of current market conditions and opportunities. The collaboration with NYSERDA program and evaluation staff and other project stakeholders will continue throughout the evaluation as iterative processes are used to review and finalize interim and final project deliverables (*e.g.*, survey instruments, summary memos and reports, etc.).

Develop Program Logic Model

The Industry and Process Efficiency Program is a new program; thus, a Program Logic Model Report does not yet exist for the program. Given the importance of the Logic Model Reports in guiding NYSERDA's program-specific evaluation activities, an initial activity undertaken by the MCA Team will be to develop a Program Logic Model Report. The Logic Model Report will: summarize the context within which the Industry and Process Efficiency Program operates; discuss the market barriers and inefficiencies that the program seeks to address; describe the program implementation approach and anticipated outputs and outcomes; develop a logic model diagram showing the linkages between program operation and anticipated outputs/outcomes; and identify relevant measurement indicators and researchable issues. The Logic Model Report will also summarize the designs and implementation schedules of complementary energy efficiency programs being administered by utilities and other parties to identify potential leveraging opportunities wherein NYSERDA and the other program administrators can possibly collaborate to achieve broader and deeper program impacts.

[4] For example, NYSERDA's Focus on Municipal Water and Wastewater Facility Energy Efficiency Program recently commissioned a statewide energy assessment of the water and wastewater sector that used publicly-available datasets and mailed surveys to assess sector-level energy use throughout New York.

Figure 1. Synopsis of MCA Evaluation Activities and Research Tasks



Market Characterization

Market characterization results will be generated primarily from secondary data sources, supplemented by information gathered during primary data collection efforts. Key data sources to be used for this activity include the Industry and Process Efficiency Program tracking database, McGraw-Hill Construction Dodge databases, U.S. DOE's Commercial Buildings Energy Consumption Survey (CBECS) and Manufacturing Energy Consumption Survey (MECS) data, U.S. Census County Business Patterns Reports, membership lists and other publicly-available data from relevant professional organizations (*e.g.*, the Manufacturers' Association of Central New York and the Business Council of New York State), and other sources identified and deemed valuable during a scan of relevant literature. Where possible, market

characterization results will be segmented on an upstate-downstate regional basis and by market sector[5] to identify spatial variations in program and market opportunities and barriers throughout New York.

Example market characterization metrics to be developed pending data availability include:

- Sector-specific building stock, energy use patterns, and related firmographics;
- Sector-specific supply chains, business cycles, and organizational structures;
- Sector-specific rankings of energy consumption by organization[6];
- Identification of organizations within the targeted market sectors that do not pay System Benefit Charge funds[7];
- Sector-specific technical service delivery channels and related firmographics, including the most active and respected service providers; and
- Other metrics as identified.

Market Assessment

Market Assessment results will be generated through primary data collection efforts with end-use customers and technical service providers eligible to participate in the Industry and Process Efficiency Program (specific details regarding the proposed data collection efforts are discussed in more detail in the following sections).[8] The data collection instruments will be structured around the measurement indicators and researchable issues identified during the development of the Program Logic Model Report.[9] Care will be taken to ensure that questions are structured in a manner that allows them to be consistently used in subsequent program evaluations so that temporal trends in the measurements can be assessed. Market assessment results will be segmented on an upstate-downstate regional basis and by market sector to identify spatial variations in responses and associated market conditions.

Examples of possible indicators to be measured during the market assessment work include:

- Market perceptions regarding value of technical assistance services to identify, prioritize and implement efficiency upgrade projects and strategies;
- Market awareness of NYSERDA program offerings and broader energy efficiency opportunities;
- Customer decision-making processes including financial and other non-energy considerations;

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[5] A sector-specific approach will enable unique technology needs, planning horizons, and operating conditions to be explored in greater detail.

[6] For this task to be accomplished, access to utility data, formatted to maintain existing confidentiality agreements, will be essential. If utility data are not made available to support this task, proxy metrics (*e.g.*, staff size, annual revenues, etc.) could be used to rank the organizations; however, the results would be relatively imprecise and therefore of limited value to program staff for targeting the highest possible energy saving opportunities.

[7] Access to utility data will likely be important for this task as well.

[8] Given that this is a new program, there are currently no program participants; thus, the data collection efforts will target market actors eligible to participate in the program. Subsequent evaluation efforts will explore differences between participant and non-participant comparison groups.

[9] Other evaluation contractors will be able to suggest additions to the instruments to collect data relevant to separate studies and the MCA Team will endeavor to accommodate such requests balancing the additional survey components against the need to minimize impacts on survey respondents.

- Technical service provider expertise with energy efficiency measures and services related to complex industrial/process project opportunities; and
- Others indicators as identified.

Analysis and Reporting

Data analysis and reporting will be conducted by NYSERDA's MCA Evaluation Contractor Team using methods approved by NYSERDA. As discussed above, the analytic process will make use of both primary and secondary data sources to generate comprehensive and unbiased information regarding the market eligible to participate in the Industry and Process Efficiency Program as well as the success of program intervention strategies. All data sources used in the analysis and reporting phase of the project will be clearly cited to ensure a transparent record of activities undertaken. In addition, evaluation findings will be related back to the outputs and outcomes anticipated by the program logic model to help NYSERDA staff and other project stakeholders better assess program accomplishments to date.

Before preparing the final evaluation report, the MCA Team will present preliminary results to NYSERDA evaluation staff, Industry and Process Efficiency Program staff, and other project stakeholders to review key findings, clarify discussion points as necessary, and ensure accurate interpretation of results. Feedback generated during this presentation will be incorporated into the initial draft final report submitted to NYSERDA. An iterative process will then be used to finalize the report whereby the MCA Team will address feedback received during the report review cycle(s) until the report is deemed final by NYSERDA staff and other project stakeholders. Final evaluation results will also be presented to DPS and other project stakeholders during scheduled meetings.

Populations/Samples

As discussed previously, the MCA evaluation of the Industry and Process Efficiency Program will involve primary data collection with non-participating end-use customers and non-participating technical service providers eligible to participate in the Program.[10] Program staff has indicated that they expect the majority of program activity and associated savings to occur in the manufacturing/industrial, data centers, and mining/extraction market sectors. Staff has also indicated that they would like to target the largest energy consumers within each sector to exploit substantial energy savings opportunities that may exist among these sub-populations or organizations. By interviewing end-use customers and technical service providers in those market sectors, it will be possible to assess the baseline level of awareness and understanding and other relevant measurement indicators, while also collecting data to explore broader researchable issues indentified in the program logic model.

The MCA Team will work closely with NYSERDA's data collection contractor, APPRISE, to identify potential end-use customer and technical service provider sample frames and to develop sampling procedures to effectively represent the targeted sectors.[11] The most efficient approach to the sample

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[10] The MCA Team will explore opportunities to aggregate primary data collection efforts across programs into sector-wide or market-wide efforts. Doing so may help 1) avoid duplication of effort in interviewing sets of market actors common to many programs and 2) hedge against the risk of overlooking certain market sectors not explicitly targeted by specific program offerings. In addition, NYSERDA evaluation staff and the MCA Team will remain aware of the activities of the EAG's subcommittee on statewide studies to again avoid potential duplication of effort but also to determine how best to supplement any statewide studies approved by the DPS. Results of these efforts will be discussed in the final project workplan.

[11] It is expected that technical service providers participating in other NYSERDA programs would be likely to furnish Industry and Process Efficiency Services. For that reason, it would be appropriate to develop an initial sample frame of providers from NYSERDA's databases for other energy efficiency programs.

frame development will be to identify potential list frames for each market sector and to use a hierarchal list frame development procedure that will maximize the coverage of the eligible populations, while also ensuring the efficiency of sample frame development. If data are available to develop sector-specific rankings of energy consumption by organization, a proportional sampling approach based upon total energy consumption will be used to ensure that the largest energy consumers, those the program intends to focus on, are adequately represented in the samples. The sample allocation will be designed to furnish 90/10 confidence/precision on an upstate-downstate regional basis.[12]

Current estimates regarding estimated sample sizes, expected sampling precision, and anticipated survey fielding dates are summarized in Table 3.[13] These estimates will be finalized prior to undertaking the planned evaluation and once the MCA Team more thoroughly analyzes program implementation strategies and participation data.

Table 3. Industry and Process Efficiency Program MCA Evaluation Specifics

Target Group	Estimated Population Size	Estimated Sample Size	Expected Sampling Precision[1]	Survey Administration By	Expected Start of Fielding
Eligible End-use Customers	TBD	140[a]	+/- 7%	Survey Contractor	Fall 2009
Each Region (Upstate/Downstate)	TBD	70	+/- 10%	Survey Contractor	Fall 2009
Eligible Technical Service Providers/Contractors	TBD	140[a]	+/- 7%	Survey Contractor	Fall 2009
Each Region (Upstate/Downstate)	TBD	70	+/- 10%	Survey Contractor	Fall 2009

[1] Assumes proportional sampling, two-tailed test, finite population correction.

[a] Should NYSERDA be directed that MCA data collection efforts achieve 90/10 confidence/precision levels on a utility territory basis, the sample sizes and associated data collection costs will increase accordingly. If this occurs, the results would benefit all EEPS program administrators and NYSERDA would propose that the data collection efforts be undertaken in a jointly-funded manner with all program administrators contributing.

The MCA Team will be conducting research during the 2009/2010 timeframe on a number of different programs targeting Commercial and Industrial organizations. For each program, the research will include an analysis of program participation. After comparing participant groups among the different programs, the MCA Team may find that there is substantial overlap among the businesses participating in the different programs. If so, the team will plan a single end-use customer survey covering those programs that are substantially overlapping to minimize respondent burden and reduce design and implementation costs. Similarly, the team may also find that there is substantial overlap in the contractors participating in the different programs. If so, the team will plan a single contactor survey covering those programs that are substantially overlapping. In addition to minimizing respondent fatigue, this will also provide significant economies in terms of the overall evaluation budgets for the affected programs. The single

[12] Should NYSERDA be directed that MCA data collection efforts achieve 90/10 confidence/precision levels on a utility territory basis, the sample sizes and associated data collection costs will increase accordingly. If this occurs, the results would benefit all EEPS program administrators and NYSERDA would propose that the data collection efforts be undertaken in a jointly-funded manner with all program administrators contributing.

[13] Similar estimates were used to develop budget estimates for the proposed 2011 MCA evaluation. Final metrics, including corresponding budget estimates, will be developed prior to launching the 2011 evaluation.

survey option cannot be decided on at this stage, so this evaluation plan may need to be updated if that option is selected based on further examination of participant groups prior to embarking on these evaluations.

Data Collection

Primary data collection with each market actor group will be managed by NYSERDA's Survey Contractor. The data collection process will be conducted by telephone[14] and will consist of the following steps: 1) format the final survey instruments and program them into a CATI system, 2) pretest the final instruments with subsets of the market actor group samples and consult with the MCA Team as needed to resolve any issues that are identified[15], 3) conduct full-scale data collection efforts and provide regular progress updates to the MCA Team during implementation, 4) process the raw survey data into final data files including coding of open-ended responses and general data cleansing, and 5) deliver to the MCA Team final data files in SPSS and SAS formats including all variable names, variable labels, value labels, and weights relevant to each data collection effort along with the associated codebooks.

In addition, the MCA Team will coordinate with NYSERDA's other evaluation contractors to fully leverage other planned data collection efforts. Doing so will ensure consistency of approach and question wording to facilitate comparison of results across evaluation efforts as well as minimizing the burden placed on different respondent groups active in the market. One important area of coordination will be with the process evaluation team. The process team will be contacting participants, and could help address key MCA research issues or indicators with that population.

The proposed MCA evaluation schedule and budget for the Industry and Process Efficiency Program are shown in Table 4. The initial study will be completed in 2009 and a follow up study to look at time series changes on key indicators and track program toward key logic model driven goals will be completed in 2011.

Table 4. Industry and Process Efficiency Program Evaluation Schedule and Budget

Evaluation Element	Estimated Budget and Completion					
	2009	2010	2011	2012	2013	Total
Market Characterization & Assessment	$165,000a	--	$155,000a	--	--	$320,000a
a Primary data collection costs represent approximately 30% of the total proposed evaluation budgets.						

VI. Impact Evaluation Plan

The Industry and Process Efficiency Program is a new program designed for EEPS. Consequently, refinement to methods to evaluate program impacts will need to be an ongoing effort with periodic adjustments to meet the actual conditions found in the field and findings from prior evaluation methods. As a part of this effort, the Impact Evaluation Team will work with program staff to establish a process for conducting pre- and post-installation on-site measurement for the larger industrial process projects, where feasible and appropriate. To allow for sufficient post-retrofit data collection and analysis, impact

[14] Surveys will be designed to be completed in approximately 15 – 20 minutes.
[15] Pretest interviews will be included as completed interviews unless major revisions to the instruments are made.

evaluation reports for this program are expected to be completed in late 2010 for 2009 participants and late 2012 for 2010 and 2011 participants. If the pre-post evaluation design is found to be unworkable in 2010, then an alternative action plan will be prepared by the end of 2010 to guide impact evaluation efforts for this program.

Research Objectives

The purpose of impact evaluation is to establish rigorous and defensible estimates of the savings and costs that can be attributed to the efficiency program. One part of this process is to determine the realization rate, *i.e.*, the ratio of the actual verified gross savings to the NYSERDA-reported gross savings (*ex ante* savings estimates). The net effects of the program (attribution) are also necessary to separate the program impacts from naturally occurring efficiency. In both of these aspects of the impact evaluation, the evaluators need to determine how to achieve the desired sampling precision, minimize the possibility of bias in the results, and assess the validity of the results. Each of these key aspects of impact evaluation is discussed briefly below.

Determine Realization Rates for Gross Savings

A critical component of the impact evaluation is to develop rigorous estimates of the realization rates for gross electricity and demand savings, which will entail verifying the installation of efficiency measures and the estimation of savings for a representative sample of program participants in comparison to an established baseline. The gross savings realization rate is then applied to the NYSERDA-reported gross savings of the program population to derive the final savings estimates (evaluation-based estimates, or *ex post* savings). Realization rates adjust the program-reported savings upward or downward, to account for differences between actual savings and predicted savings. A primary objective of the 2009 evaluation efforts for this program will be to work with program staff to establish an effective mechanism for obtaining both pre- and post-installation measurements for this program.

Attribution

An equally important element of assessing impacts is to construct solid and defensible estimates of all impacts that are program-induced (rather than naturally occurring). This is often accomplished through estimation of the ratio of impacts for those that would have taken the actions without the program (free-riders) compared to program savings and the ratio of the savings from actions taken outside NYSERDA programs but due to the program (spillover). The combination of these components in the form of a net-to-gross (NTG) ratio becomes the adjustment factor to derive net impacts.

For the Industry and Process Efficiency program in 2009, free-ridership will be measured for participating customers and vendors. As Industry and Process Efficiency is a new NYSERDA program, participant spillover assessment will not be part of the 2009 evaluation effort. Spillover-related baseline questions may be asked to lay the foundation for future analysis. Non-participant spillover could easily overlap with NYSERDA's other programs targeting the commercial/industrial (C/I) sector (*e.g.*, Existing Facilities, Flex Technical Assistance, and Business Partners), and these effects are planned to be measured through a study of the entire C/I existing facilities market scheduled for 2009. Future estimates of non-participant spillover could be done as joint studies with all EEPS program administrators to ensure consistent methods and avoid overlap in claimed savings. Therefore, future estimates of non-participant spillover resulting from this program, beyond the study scheduled for 2009 that will look at program years 2007 and 2008, are not planned as part of this evaluation.

Precision and Bias

Sample sizes will be designed to achieve 90/10 confidence/precision or better at the program level based upon DPS' preliminary *Evaluation Plan Guidance for Program Administrators*. The primary evaluation outcomes will be specifically identified for these precision targets as the sample design is specified.[16] Although no formal attempt will be made to achieve the 90/10 confidence/precision target at the utility level, utility-specific savings can be easily reported for all projects in the census stratum, which are likely to include a high percentage of the total program savings. The proposed analysis methods will also be considered as part of developing the sample size requirements. Methods will be selected to minimize self-selection, non-response, and other sources of bias, to the extent possible. For example, the non-response rate for telephone surveys can be reduced by ensuring that several attempts are made to contact each potential respondent at different times of the day.

Activities

Gross Savings Impact Evaluation

The program schedule includes modest savings and numbers of completed projects in 2009 relative to later years. Since the program is currently in its start-up phase, the Impact Evaluation Team has little information for the purposes of establishing the impact evaluation methodology in detail. Currently, there is insufficient program experience to determine the types of projects and geographical distribution of the projects. It is likely that the I&PE customers and projects could be quite diverse and unique, given that the largest SBC-contributing industrial users are the primary program targets. Due to the expected size and complexity of these projects, many are expected to require one or more years to complete.

Given the lack of history with this program design, the impact evaluation approach relies on dividing the I&PE projects into categories based on the type of measurement that will be required, as described below.

- Post-Only Projects: these projects either do not require pre-installation measurements to estimate savings or are relatively small in size (less than 300 MWh per year of savings). A boiler economizer is a good example. The retrofit is unlikely to change the way in which the boiler is used and the amount of heat recovered can usually be determined after the installation by measuring the water-side temperatures and flow rate.
- Pre-Post Projects: these projects receive performance-based incentives and require pre-installation measurement or are sufficiently large to warrant pre-installation metering or measurement (savings of 300 MWh/year or more). Two examples are a compressed air system upgrade that reduces air demand and a steam recovery system that re-routes low pressure steam.

For the first group, the Impact Evaluation Team will select the projects for the sample after the installation has been completed, establish a site-specific M&V plan, and conduct post-installation metering or measurement as necessary. The sampled projects will be subject to one of three levels of evaluation to determine the program gross savings realization rate:

- Inspection or review-only verification, for the smallest savers

[16] The sample size depends on the type of statistical analysis being conducted and the variability of the specific parameters to be estimated. For example, a simple random sample required to achieve 90% confidence and 10% sampling precision for a yes/no question is about 67 for a large population. However, if the variable of interest is the realization rate and the coefficient of variation is 0.75, a simple random sample would require a sample size of 152 to achieve the same precision and confidence level.

- IPMVP Option A-level analysis if the project delivers moderate savings and the evaluation engineer finds that the implementation-side M&V was conducted in a sufficiently rigorous and objective manner to permit leveraging the data.

- IPMVP Option B or D-level analysis, for moderate savings projects that lacked prior evaluation-grade analysis through the program.

For projects with pre-qualified incentives the Impact Evaluation Team will assess and directly implement the most effective approach to verification of savings. To the extent possible, the gross savings findings related to the pre-qualified measures may be incorporated into the Tec Market Works Manual.[17]

The evaluation of the second group is more complex. One of the most rigorous impact evaluation designs is pre-/post-retrofit measurement. Most program designs and procedures make this research approach difficult to implement. Obtaining pre-installation measurements to estimate the baseline is particularly critical for this program for the following reasons:

- The population is likely to be diverse and the potential savings for each project are high.
- These are complex projects and there is often no simple method to estimate the baseline.
- Savings will be based on the energy reduction per unit of production, which are more accurately calculated with pre-installation measurements.

These characteristics suggest that it is worth attempting to create a pre-post research design which allows the collection of primary data during both the pre- and post-installation periods. Given the expected low incidence of process efficiency projects, this program component provides a good opportunity to allow the evaluation contractors and program staff to determine if a pre-post evaluation measurement study can be designed to work alongside program operations. The goal would be to create more reliable independent savings estimates without hampering program activities or significantly affecting customer satisfaction.

Successfully measuring pre-installation conditions requires close coordination with program implementation staff and the facility owner, and this additional M&V effort may affect the schedule of the installation. There is often only a brief period when the measurements can occur, indicating that M&V evaluation contractor staff will need to be available on short notice. In addition, the projects must be selected prior to installation, and due to natural attrition, some of these projects will not be completed; therefore, generating additional M&V site work that cannot be used to estimate the program impacts.

Projects with performance-based incentives are required to have site-specific M&V plans under the current program design. In some cases, these M&V plans will incorporate independent third-party measurement, funded by NYSERDA and paid directly to the Technical Review contractor. The evaluation team will work with implementation staff and these contractors to incorporate evaluation-grade techniques into their scope of work. The 2009 evaluation effort will include exploring the extent to which this effort can be drawn upon to maximize evaluation cost-efficiency and customer service. Starting in 2010, full impact evaluations will be completed, relying in part on the pre-installation data collection planned for 2009. The full scope of these evaluations will be developed as the program is fielded and more information regarding participation and savings levels becomes available.

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17 The latest version of this manual is "New York Standard Approach for Estimating Energy Savings from Energy Efficiency Measures in Multifamily Programs" dated July 9, 2009.

Developing the specifics of a pre-post evaluation design for the Industry and Process Efficiency Program is the primary impact evaluation effort planned for 2009. The Impact Evaluation Team will work with NYSERDA program implementation staff to establish routine lines of communication that allow implementation staff to inform the evaluation team as leads turn into commitments and then installed projects. Baseline conditions will be assessed from the pre-installation measurements in combination with program data, which could include design reports, pre-metering and program forms required by NYSERDA, and (if needed) data obtained from the participant, including existing equipment, production volume, and operating schedule.

As projects are completed, savings will be calculated and compared to original NYSERDA estimates using a combination of short-term pre- and post-installation measurements and modeling of baseline and as-built systems. In many cases, the most reliable M&V methods for process improvements involve measuring and providing savings estimates according to IPMVP Option B recommendations. This method will likely be used for the largest sites where equipment and metering configurations allow for it. In addition, billing data will be needed for all projects to allow for calibration of savings to pre- and post-installation consumption.

Baseline Issues and Overlap with Attribution

There are at least four complicating factors that evaluators must address in industrial process projects:

(1) **Minimum efficiency is not regulated.** Many aspects of manufacturing are unregulated in terms of energy efficiency. Energy use required per cubic foot of compressed air produced is limited only by what the market chooses, for example.[18] This contrasts with the commercial environment, where the NY ECCC generally applies. Industrial baseline efficiency is often defined by terms such as "minimum generally available" or "standard practice for industry." Both the program staff and evaluators must address this baseline issue.

(2) **An energy efficiency measure may increase energy use at the meter.** Some projects allow manufacturers to increase annual production at the same time as they reduce the amount of energy used per unit of production. If production increases enough it will cause the energy use at that particular plant to increase, not decrease. For projects that increase production the baseline must consider the other options for increasing production than the one installed through the NYSERDA program, *i.e.*, installing different equipment, increasing use of existing equipment or increasing the rate of production through other mechanisms or at other sites.

Savings will be based on the energy use intensity (EUI) reduction per unit of production. The baseline definition of annual production will be determined on a site-specific basis.

(3) **Some upgrades are not equipment-driven.** Some projects may involve a change in practice. Industrial engineering philosophies such as lean manufacturing, six sigma, pull-through production, and floor space consolidation all can reduce production energy use intensity (EUI) in a lasting fashion without new hardware or software. Evaluation will be based on production EUIs. Each such project will be subject to evaluation on measure life.

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[18] The Compressed Air and Gas Institute (CAGI) has a test standard that manufacturers have agreed to follow and for which they publish standardized energy efficiency performance specifications, but there is no minimum allowable efficiency.

(4) **Gross savings realization rates and free-ridership factors can be difficult to separate.** Decision-making on projects that integrate efficiency and production can blur the line between realization rate and free-ridership. The Impact Evaluation Team will investigate these issues for the sample projects and consider whether they are best addressed through establishing the baseline for gross savings or through the analysis of attribution (NTG). To the extent possible, evaluators intend to account for the discretionary aspects of the upgrades in attribution.

These issues complicate the calculation of the baseline. The evaluation team will develop a set of baseline definition guidelines as part of the evaluation work plan. The guidelines will include a logical flow chart to use to determine how to define the baseline. They will not deem minimum efficiency levels for particular equipment. The logic will address the differing circumstances described above. Evaluation staff will communicate with implementation staff so that all parties understand evaluation baseline guidelines before most projects are funded.

The evaluation plan does not include funding for primary research on a baseline definition for particular technologies. Evaluation staff will work selectively and on an *ad hoc* basis with implementation staff on baseline definitions.

Attribution

The savings attributed to an efficiency program should be the savings induced by the program effort, above and beyond what would have occurred in the absence of the program. For program participants, assessing attribution involves estimating the program measures (or the proportion of the savings) they would have adopted within the same time frame but without the program inducements (free-ridership). Program participants can also take additional efficiency actions due to what they learned or experienced through the program even when these actions are not explicitly recognized or directly supported by the program (spillover).[19] There are two types of participant spillover:

- "Inside" spillover occurs when, due to the project, additional actions are taken to reduce energy use at the same project site, but these actions are not included as program savings.
- Outside project spillover occurs when an actor participating in the program initiates additional actions that reduce energy use at other sites that are not participating in the program. This includes industrial customers that then install/adopt the efficiency measure or operations changes at their other facilities or participating vendors that see the benefits and then sell or install the program supported measures for their other customers.

In addition, the program can also influence non-participants. For the Industry and Process Efficiency program this could easily occur with customers operating similar industrial processes who hear about the changes made and their impacts from participants themselves. There are only a finite number of facilities that undertake similar manufacturing or production efforts. As such, it is much more likely for them to be in contact with one another periodically than the general commercial population. This unique type of spillover will be investigated separately from the impact evaluation planned for this program.

NYSERDA intends to explore participant free-ridership for the Industry and Process Efficiency Program using an enhanced self-report survey method with key decision-makers (customers, service providers, etc.) for specific measures and state of the art survey instruments. Direct query is preferable for industrial process due to the high number of projects that will have decision points unique to those projects.

[19] Methods will also be developed to ensure there is no double-counting of savings between one program's spillover estimates and another program's gross or spillover estimates.

Initially, the survey instruments will be based upon NYSERDA's long-term refinement of these questionnaires with its evaluation contractors, including additions to ensure construct validity and other potential reliability issues to best ensure the highest, most cost-efficient rigor levels.

Given the small number of participants expected to initiate projects in 2009, it may be possible to implement a project-specific investigation into attribution issues. Particular areas of interest are discussed below.

- During the pre-installation site visit, it may be possible to assess the other equipment found on site and gain some insight into the standard practice at each facility for replacement of equipment on failure and early replacement of substandard equipment. This approach could provide concrete evidence of the site-specific baseline for the purchase of efficient equipment.
- The Megdal & Associates Impact Evaluation Team is currently implementing an enhanced attribution analysis for the "Largest Energy Saver" project that involves review of the project-level information by multiple team members and arriving at project-specific free-ridership and spillover factors through consensus. If this approach is found to be valuable for the Largest Energy Savers project, it could be adapted to this program, as appropriate.

The Impact Evaluation Team will assess the feasibility of conducting a small scale, enhanced assessment of attribution incorporating some or all of these components as part of the process of refining this aspect of the evaluation for fielding of data collection.

The reliability for attribution relies more on construct validity than on sampling precision. The alternative of what would have occurred cannot be known with certainty. Survey inquiry can be challenging in that it typically asks about conjecture of a theoretical alternative. Prior survey experience for specific question wording, measuring free-ridership in more than one way, and obtaining market or other comparatives are several ways to increase the reliability of the attribution estimate. Measuring free-ridership in multiple ways can increase the construct validity of the estimate.

A more detailed design and timing of the free-ridership and spillover evaluations will be developed once the outcome of the pre-post evaluation design exploration in 2009 is completed. If a pre-post evaluation design is found to be reasonable, the attribution timing and approach will be refined to work within that effort. For example, the free-ridership inquiry might be most appropriate at the time of post-retrofit measurement, regardless of whether these are conducted on-site by senior evaluation engineers or a telephone survey conducted around the same time. Letting customers know what to expect from the evaluation, such as when different components are going to happen and getting multiple components done around the same time would be less intrusive then undertaking these independently.

Populations/Samples

Since this program is new, it is difficult to know exactly how many projects will take advantage of NYSERDA's incentive offer. The Impact Evaluation Team assumes that the number of participants is likely to be limited in 2009, since the program will be ramping up and this type of project tends to require a substantial amount of time to evaluate the site and prepare the technical study.

For the purposes of sampling, projects will be divided into three categories:

- Post-Only Projects are those small projects with savings less than 300 MWh per year, and any project that does not require pre-installation measurement;

- Medium Pre-Post Projects are those receiving performance-based incentives with savings between 300 MWh and 1 GWh per year and requiring pre-installation measurement; and
- Large Pre-Post Projects are those with savings greater than 1 GWh per year, receiving performance-based incentives and requiring pre-installation measurement.

Post-only projects will be treated as commonly done in evaluation, with a sample drawn from the list of completed projects. Efficient sample sizes will be chosen using stratified ratio estimation (SRE) to estimate the realization rate to the 90/10 confidence/precision level statewide. Projects will be stratified by the magnitude of the energy savings. Previous evaluations of the Enhanced Commercial/Industrial Performance Program (ECIPP) suggest that the error ratio is 0.30. Compared to ECIPP, the Industry and Process Efficiency Program is new, expected to have more unique projects for which there is little historical basis to consider when estimating savings, and will have difficult factors to consider such as productivity-normalized savings. Because of these differences, evaluators expect greater variability in the savings estimates and thus determined the sample size using a 0.40 error ratio. The sample size necessary to meet or exceed the 90/10 sampling precision target is estimated to be approximately 40 projects, allowing for some leeway to account for the possibility that the M&V on some projects will not be completed due to non-response and project attrition.[20]

The Impact Evaluation Team plans to include a census of large pre-post projects in the M&V sample. Initially, medium pre-post projects will also be included in the census-attempt stratum. Should this program generate more medium pre-post projects than can reasonably be handled on a census-attempt basis, the Impact Evaluation Team will develop a plan for rolling sampling to accommodate the unique aspects of this program offering.[21] The Impact Evaluation Team will review program participation on a quarterly basis to assess whether medium pre-post project sampling will be necessary to keep within the allocated impact evaluation budget. The same projects will be used to evaluate both gross savings and attribution.

Since real time sampling is required due to the need for obtaining pre-installation data, the actual size of the sample frame will be unknown and systematic sampling is likely to be the best alternative.[22] If this strategy is pursued, the systematic sample will be reviewed quarterly to ensure that the process does not appear to be introducing bias by omitting or including groups of participants with specific characteristics.

Given that this program is new and the composition of the projects is uncertain, there is no clear indication how the projects will be distributed with respect to utility territory or upstate/downstate regions. The Impact Evaluation Team assumes that the majority of the activity is likely to occur in the upstate region given that the program is targeted toward large industrial customers. Since the large pre-post and possibly the medium pre-post groups will be evaluated on a census basis, these results can be broken out by utility and by upstate/downstate region without concerns regarding sampling precision. The Impact Evaluation Team is not planning to develop individual savings estimates for the upstate/downstate regions for the smaller post-only projects at this point, due to the uncertainty regarding

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[20] This estimate assumes the total population of projects is approximately 150 during 2009 and it incorporates the finite population correction factor.

[21] A total of fifteen projects are expected to receive pre-installation measurement in 2009. If it appears that more than fifteen large and medium pre-post projects will be initiated in 2009, a sampling plan will be developed for the medium projects.

[22] Systematic sampling is a form of cluster sampling in which the observational units (projects) are listed, a random number of units are skipped, and then every n^{th} project is chosen. The value of n is selected based on the best available information to obtain the desired sample size.

the actual distribution of projects. If there is sufficient participation among downstate customers, an installation verification rate at a 90/10 sampling precision will be developed upstate/downstate.[23]

The evaluation of participant free-ridership and spillover will be from self-report surveys with multiple decision-makers, as applicable. Where the decision-makers and the site visit contacts/interviewees are the same individual, the participant surveys will be conducted while on-site. Observations by site visit engineers will be collected to provide additional indications concerning the customer's efficiency decision-making behavior in general. Telephone surveys will be conducted for sampled participant firms (or those in census-strata) with the influential decision-makers not interviewed on-site and for the supplemental NTG sample. The goal for the number of projects interviewed for participant free-ridership and spillover will be those needed to target 90/10 sampling precision both upstate and downstate for the participant free-ridership and spillover factor estimates.[24]

Data Collection

Approach

Engineers will perform field instrumentation to determine the gross savings realization rate, defining the instrumentation requirements in M&V plans in accordance with IPMVP terminology. They will estimate and consider engineering uncertainty and the cost associated with increasing or decreasing it for each plan. The menus of possible approaches to be used are listed below. The approach used will be dependent on the types of projects completed and as such is unknown at this time.

- Short-term equipment metering of all key parameters, extrapolated to annual performance, with or without pre-retrofit metering (IPMVP Option B)
- Use of program-collected long-term energy performance data (IPMVP Option B)
- Spot and short-term metering of selected parameters (IPMVP Option A)
- Building or system energy use simulation, calibrated to bill data, equipment sub-metering or both (IPMVP Option D)
- Site-specific billing analysis (IPMVP Option C)
- Prior savings claims methodology and data review (Engineering review)

Participant and developer interviews will supplement observed data. The data collection approach will be modified as necessary if a statewide protocol is established, as is anticipated in the *Evaluation Plan Guidance for Program Administrators*.

Resources

Evaluators will collect much of the data directly through measurement, interviews and review of program tracking data. To meet the level of rigor described in the *Evaluation Plan Guidance*, evaluators also will need billing data for participants and potentially a sample of non-participants. Evaluators also will request savings estimates developed by implementation-funded third party Technical Review contactors,

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[23] The impact evaluation budget includes 40 additional verification site visits to supplement the gross savings evaluation site visits in order to accomplish the 90/10 sampling precision upstate/downstate for the verification rate.

[24] The impact evaluation budget includes 40 additional participating firms, with a total of 80 decision-maker surveys, to supplement the NTG interviews with the gross savings evaluation sites to accomplish the 90/10 sampling precision upstate/downstate for participant free-ridership and spillover.

by applicants and their vendors. To be able to conduct the sampling and proceed with the evaluation, the Impact Evaluation Team will need the following information at a minimum, in addition to primary data collected:

- Project level information, including address, contact information for the site owner, vendor and/or engineering consultant, the type of project, type of business
- Measure level information, such as a description of the measure/process improvement, validated quantity installed, the electricity and demand savings, measure life, measure cost and installation costs
- Production levels, hours of operation, number of shifts, etc.
- Utility consumption data (electricity and natural gas), covering the date of the read, account number, premise number, amount of energy used, tariff, rate class, whether the read was estimated or actual, city or zip code, and (if available) weather station
- Weather data, which may be available from the utilities or from the national weather service.
- Excel workbooks, building and system simulation input files (.PD2 and .INP files in the case of DOE2), and other documentation of savings calculations developed by applicants and TA review contractors.

Table 5 shows the surveys planned for 2009 participants to be included in the 2010 evaluation report. For the 2012 evaluation, the Impact Team assumed that the sample sizes will increase by 50% across the board. The samples for the 2012 evaluation will be drawn from 2010 and 2011 participants. Given that this program is a new offering and there is no historical basis for estimating the program population, the Impact Team will assess the actual progress toward the survey targets on a quarterly basis throughout 2009 and 2010. The sampling plan for the 2012 evaluation will be adjusted as needed.

Table 5. Industry and Process Efficiency Impact Evaluation Survey Specifics

Target Group	Estimated Population Size	Estimated Sample Size	Expected Sampling Precision	Survey Administration By	Expected Start of Fielding
2009 Participating Customers - Post-only Projects	~150 projects/year [1]	40	90/10	Impact Evaluation Team	Fall 2009
2009 Participating Customers - Medium and Large Pre-post Projects Pre-installation Measurements	~15 projects initiated	15	Census-attempt	Impact Evaluation Team	Fall 2009
2009 Participating Customers - Medium and Large Pre-post Projects Post-installation Measurements	~5 Projects Completed	5	Census-attempt	Impact Evaluation Team	Fall 2009
2009 Participating Customers - Verification-Only Site Visits	~150 projects/year	40	To complete 90/10 upstate/downstate on verification rate	Impact Evaluation Team	Winter 2010
Participating Customers Decision-Maker NTG Surveys	~150 projects/year	40a	To complete 90/10 upstate/downstate on NTG	Survey Contractor	Winter 2010

1. Estimated from completed industrial projects in CIPP and PLRP. *Source:* Buildings Portal.

a. Customers surveys are assumed to total 80 for the 40 due to interviewing multiple decision-makers for the largest projects. The incremental cost for any additional customer surveys is $100 per complete.

Table 6 outlines the Impact Evaluation budget by year for the Industry and Process Efficiency program.

Table 6. Industry and Process Efficiency Impact Evaluation Schedule and Budget

Evaluation Element	Estimated Budget and Completion					
	2009	2010	2011	2012	2013	Total
Impact Assessment	$249,000	$747,000	$666,000	$685,800	--	$2,347,800

Key impact budget assumptions, especially those associated with the unit cost-related efforts are enumerated in Table 7. Unit costs for data collection constitute approximately two-thirds of the total costs for the proposed impact evaluation. The balance of costs are for instrument development, data collection preparation and training, further sample/population analyses, management, and reporting. These categories constitute the other third of the total cost per program evaluation.

Table 7: Impact Budget Basis

Budget Element	Cost
Small, prequalified, or post-retrofit only projects	$9,200 average per completed site
Medium or large, performance-based project with pre/post metering - Full M&V conducted by evaluators (33% of sites) - Leverage use of third-party M&V (67% of sites)	 $26,000 average per completed site[1] $8,300 average per completed site
Telephone expert phone interviews	$420 per complete
1. This budget includes a site-specific impact plan and multiple visits to the site to install and then remove metering equipment in the pre and post time periods.	

The budget is based on conducting pre-installation measurements on fifteen projects and post-retrofit analysis on five projects in 2009. Since pre-retrofit measurement is planned and some projects will not matriculate, the evaluation budget includes funding for pre-measurement at some projects that do not follow through to project completion. For planning purposes, the Impact Evaluation Team assumed that the sample would increase by 50% for the 2012 evaluation.

Unit costs include escalation for the later-year budgets to best approximate the costs to be incurred at that time. Fixed costs such as those associated with design, reporting, and management include both escalation and discounts recognizing that replicating a study is less expensive than executing it for the first time.

Special Issues - Ensuring No Real or Perceived Conflict of Interest

One of the Megdal Team's multiple engineering subcontractor firms, ERS, is also under contract to assist NYSERDA's program implementation staff in performing quality assurance reviews and other programmatic activities. The Impact Evaluation Team will avoid any real or perceived conflict of interest by creating project teams to ensure that evaluation work is not undertaken by any individual that worked on the evaluated project in another capacity. If an Impact Evaluation Team firm or employee of the firm supported implementation of a specific project in any way (*e.g.*, implementation or quality review/assurance), that firm will be excluded from leading evaluation of the impact of that individual project. In the event that any team member provides NYSERDA implementation staff with other assistance that is subject to evaluation during the evaluation period and could present a real or perceived conflict of interest, Megdal & Associates will notify the NYSERDA Impact Evaluation program manager.

VII. Process Evaluation Plan

The process evaluation of the Industry and Process Efficiency Program will focus on the industry - specific features of the Existing Facilities Program. This evaluation is designed as a formative evaluation, but will also obtain self-reports on decision-making processes for use by the Impact Evaluation team for possible use in assessing free ridership.

The process evaluation will include interviews with NYSERDA program staff and technical consultants supporting the program. Process questions will also be provided to the Market Characterization & Assessment (MCA) team for their surveys of eligible nonparticipants. The first data collection and analysis period will focus on activities scheduled for the late 2008-2009 program year and will begin in fall 2009, about 10 months after program initiation and carry into 2010. The second data collection and analysis period will focus on the 2011 program year, begin in winter 2011, and carry into 2012. This approach will result in approximately 18 months between data collection periods. Another process evaluation cycle should begin in 2014 if the program continues beyond 2011.

Research Objectives

The research objectives noted below reflect issues specific to the Industry and Process Efficiency Program. In order for the process evaluation to provide the greatest value, other relevant or necessary objectives may be added or objectives listed below modified as the timing for the research draws closer.

(1) Assess the effectiveness of the program outreach, marketing and education efforts including but not limited to:
   a. How did participating industrial firms become aware of NYSERDA and its program opportunities?
   b. What led the industrial firms to pursue process efficiency improvement opportunities?

(2) Examination of program processes and operations including but not limited to:
   a. Assess the program processes for opportunities to facilitate more industrial firm engagement by streamlining the program operations
   b. Assess customer satisfaction with program experience, perceptions of cost-share agreement, perception of quality of program services,
   c. Assess the Program's coordination processes with other programs
   d. Assess perceptions of M&V requirements
   e. Assess perceptions by industrial firms of the value of participation in the NYSERDA program

(3) Identify reasons for participation and for measure implementation including, but not limited to:
   a. Assess reasons for participating, barriers to participation, perception of the program as a means to reduce barriers
   b. Assess knowledge, awareness and barriers to energy efficiency investment with and without program participation
   c. Assess process by which customers make decisions to participate, in the program and implement measures, in contrast to the decision to participate in other programs
   d. Assess how other factors, such as certification or standards, affect interest in the program
   e. Identify ways to reduce free ridership and to maximize spillover of program benefits

(4) Document program progress and make recommendations for program improvement
   a. Assess the effectiveness of the program in increasing technical assistance capability and capacity for industrial process improvements
   b. Assess whether NYSERDA Technical Consultants are considered effective and competent by industrial firms
   c. Assess whether there are sufficient Technical Consultants available for the industrial market

Activities

The process evaluation will use a combination of program database and document review, along with participant/stakeholder interviews. The first step in the process will be to analyze the program database to identify participants and determine their status in the stages of program participation and follow-up activities. Interviews with program staff and Technical Consultants will be conducted during this period to assess their experience with the program and its processes.

The database analysis will be used to select a sample of participants and partial-participants that are in the program pipeline in 2009. Going forward in 2011, the sample will include a portion who have completed their projects, as well as those who are still in the program pipeline. Interviews will be conducted with participants and partial-participants and with the customer-selected technical assistance providers for those participants selected to be interviewed. In late 2011 the same steps will be repeated for a second phase, focusing on projects in the pipeline in 2011.

The process evaluation will be closely coordinated with both the Market Assessment and Characterization and Impact Assessment evaluation activities described earlier in this plan so that surveys with both participants and non-participants ask common questions and address research issues in a similar or complementary manner where applicable. In addition to overall process analysis, a key outcome of each of these phases will be to obtain self-reports on decision making on project options for use by the impact team.

Populations/Samples

Six populations are the focus of data collection as shown in Table 8. The process evaluation team will interview the program manager and staff involved in working with industrial customers and industrial Technical Consultants. To better understand the program experience, the process team will interview a sample of participating and partial participating industrial firms and their selected technical assistance providers. The sample of industrial firms selected will be based on an analysis of the database to ensure that projects at different stages of participation are selected. The sample will also be stratified based on location, number of employees and NAICS code, and the team will try to reach a census of the largest projects in the pipeline. When conducting interviews with participants and partial participants, where other members of the firm have been involved in the decision making process about the measure and about participation in the program, the process team will seek to interview those other members of the firm as well.

Data Collection

As shown in Table 8, data collection will begin in early summer 2009 when the process evaluation team will conduct interviews with program staff and Technical Consultants. These interviews will last about one hour each. The interviews with participants and partial-participants will begin in September 2009 and will likely be completed by February 2010. Interviews with participants will be structured to last between 30-45 minutes; interviews with partial participants will last between 15-20 minutes. The precise number of interviews for participants is difficult to estimate as multiple contacts may be interviewed for a large percentage of the projects. During this same period interviews will be conducted with the technical assistance providers associated with selected customer projects. These interviews will last about 30-45 minutes as well. The analysis and report will be prepared and completed by March 2010.

Table 8. Industry Process & Efficiency Program Process Evaluation Specifics (2009-10)

Target Group	Estimated Population Size	Estimated Sample Size	Expected Sampling Precision	Administration By	Expected Start of Fielding
NYSERDA Program Staff	5	2	NA	Process Team	June 2009
Technical Consultants	4	4	NA	Process Team	July 2009
Customer Selected Technical Assistance Providers	30	21	90±10%*	Process Team	Sept 2009
Participants, smaller projects	150	46	90±10%*	Process Team	Sept 2009
Participants in pipeline, large and medium projects	30	21-40	90±10%*	Process Team	Nov 2009
Partial-Participants	10	9	90±10%*	Process Team	Nov 2009

*Assumes absolute precision, proportional sampling, 2-tailed test, finite population correction

The second process evaluation study will begin in winter 2011 with interviews with staff and Technical Consultants will be conducted. Interviews with participants, partial-participants and customer selected technical assistance providers will begin in March 2012 and be completed by early summer 2012. The duration of the interviews will be the same as those for the 2009-2010 evaluation. Sample sizes and sampling precision are expected to be similar to the first process evaluation. However, this will be reassessed as the timing of the second study draws closer. The precise number of interviews for participants is difficult to estimate as multiple contacts may be interviewed for a large percentage of the projects. The analysis and report will be prepared and completed by July 2012.

Special Issues

To support the Impact evaluation, the customers who are interviewed will be notified of their possible inclusion in additional studies. Data collected from the process evaluation will be provided to the impact team to facilitate their analysis of net savings. The process evaluation team will coordinate with the market characterization team to include process questions in the survey of eligible non-participating industrial firms and technical assistance providers.

Schedule and Budget

Table 9 displays the schedule and budget allocation by year and evaluation element.

Table 9. Industry Process & Efficiency Program Process Evaluation Schedule and Budget

Evaluation Element	Estimated Budget and Completion					
	2009	2010	2011	2012	2013	Total
Process Evaluation	$61,000a	$63,000b	$38,000c	$99,000d	-	$261,000

a. The data collection portion of the 2009 Process evaluation is estimated at $17,000.
b. The data collection portion of the 2010 Process evaluation is estimated at $17,000.
c. The data collection portion of the 2011 Process evaluation is estimated at $10,000.
d. The data collection portion of the 2012 Process Evaluation is estimated at $51,000.

VIII. NYSERDA Evaluation Process

This evaluation plan is an early, but important step in NYSERDA's evaluation planning and implementation process. It is NYSERDA's understanding that DPS Staff wish to be involved as a reviewer/participant in the following parts of the evaluation process: detailed evaluation plans, project kick-off meetings, workplans (including sampling, statistics and modeling issues), data collection instruments, interim results reports (as applicable), presentation of evaluation results, and draft evaluation reports. NYSERDA will conduct evaluation planning and implementation in an open and transparent manner, and will invite DPS Staff participation in the designated aspects of the process and any others upon DPS' request.[25] Should DPS Staff choose to modify the level or manner of their involvement, NYSERDA should be notified about the change(s). DPS Staff should also choose when and how to involve their evaluation advisor consultant team in NYSERDA's evaluation processes, should directly provide any materials and information necessary for their advisor consultant team to fulfill this role, and should notify NYSERDA about the type and level of advisor consultant involvement.

An important goal of NYSERDA's evaluation effort is to provide early feedback to program staff to help inform and improve program implementation. NYSERDA accomplishes this goal in several ways:

1. Ongoing communications between the NYSERDA evaluation staff and evaluation contractors to identify issues that need to be brought to the attention of NYSERDA program staff, DPS Staff, and other involved parties.

2. Interim results reports may be generated, sometimes at the request of NYSERDA program staff and sometimes by initiative of NYSERDA's evaluation team and contractors, where early results are required or deemed useful prior to completion of the full evaluation effort.

3. Presentations of draft evaluation results held with NYSERDA evaluation contractors, evaluation team, program staff, and DPS Staff before evaluation reports are written provide feedback on the programs as soon as possible, and provide evaluation contractors with additional perspective and context that will be useful in reporting final recommendations.

Upon completion of final evaluation reports, the NYSERDA evaluation team will also provide support and assistance to program staff with regard to implementation of recommendations and program improvements.

IX. Reporting

Detailed reports presenting results from evaluation studies conducted by NYSERDA's evaluation contractors will be provided to DPS and the EAG upon completion. Depending on the level of review desired by DPS and the EAG, NYSERDA could provide draft reports as needed. NYSERDA also expects to involve DPS and the EAG in the evaluation process leading up to the delivery of these detailed

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[25] In order to maintain transparency, and allow for confirmation checking and follow-up analysis, evaluation data will be maintained by NYSERDA and made available to DPS on an as-needed basis. NYSERDA will continue to maintain its secure "data warehouse" which includes data files, code books, and analysis files which can be made available in electronic form to DPS upon request. In order to provide a comprehensive record of each study conducted, the data warehouse also holds copies of final evaluation reports and appendices, including blank survey instruments, although these documents will be made available to DPS and publicly upon completion of each evaluation project.

reports, including review of this evaluation plan. Final reports will align with requirements set forth in the DPS evaluation guidelines, and will include: methodology, key results, recommendations, summary and conclusions, and appendices with detailed documentation.

Upon completion of each major evaluation study effort, findings, results and recommendations will be communicated by NYSERDA's evaluation contractors and evaluation staff to NYSERDA program staff. Actionable recommendations and information on program progress toward goals will be provided as input to the program design and improvement process. NYSERDA's evaluation staff will follow up regularly with program staff on recommendations arising from the evaluation and the status of their consideration or adoption of these recommendations.

NYSERDA's evaluation staff will prepare quarterly and annual reports to the Public Service Commission, DPS and the EAG summarizing the results on all programs and from all evaluation studies occurring in the most recent quarter or year. The latest evaluated program savings, realization rates, and net-to-gross ratios will be used in compiling data for these overarching reports. Quarterly reports will be provided to the Commission within 60 days of the end of each calendar quarter. The annual report will substitute for the fourth quarterly report, summarizing program and portfolio progress throughout the calendar year. The annual report will be submitted to the Commission within 90 days of the end of the calendar year.

X. Total Resource Cost Analysis

Once per year, NYSERDA will update benefit/cost ratios (at a minimum, Total Resource Cost test) for each major program and for the entire portfolio of SBC-funded **New York Energy $mart**^{SM} and EEPS programs. The Total Resource Cost (TRC) test divides the present value of the benefits by the present value of Program and Participant Costs. A benefit-cost ratio greater than 1 indicates benefits exceed NYSERDA and participant costs. The Program Administrator Cost (PAC) test divides the present value of the benefits by the present value of the Program Administrator Costs. A benefit-cost ratio greater than 1 indicates benefits exceed NYSERDA costs. For more detailed definition of benefit/cost terms and a description of NYSERDA's current benefit/cost input sources, including avoided energy, capacity and distribution costs, refer to Appendix A of NYSERDA's September 22, 2008 Energy Efficiency Portfolio Standard Program Administrator Proposal.

The latest evaluated program savings, realization rates, net-to-gross ratios, and measure cost analysis resulting from the evaluation efforts described in this plan will be used in the annual benefit/cost analysis update. NYSERDA will conduct benefit/cost analysis for its programs in a manner consistent with other program administrators, as appropriate. NYSERDA has knowledgeable staff and a tool in place to accomplish benefit/cost analyses for all of its SBC and EEPS programs. NYSERDA is prepared to make adjustments to its current practice should DPS Staff or the EAG decide that alternative methods, tools, or inputs are superior or would foster greater consistency among program administrators.