

NYSERDA NEW CONSTRUCTION PROGRAM

FINAL Evaluation, Measurement, and Verification Plan

August 18, 2009

1. 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 \$martSM** Programs (2008-2011) for the New Construction 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 New Construction Program (NCP) 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.

This evaluation plan was designed to constitute a comprehensive approach to assessing the entire NCP that is supported by SBC and EEPS funding. NYSERDA will not differentiate between funding sources when conducting this evaluation effort.

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

The overarching goals of NYSERDA's **New York Energy \$martSM** 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 NCP evaluation are to:

- (1) Establish rigorous and defensible estimates of the savings that can be attributed to the efficiency associated with the NCP
- (2) Develop a comprehensive understanding of current and emerging markets, especially among larger commercial building projects such as retail facilities (*e.g.*, supermarkets)
- (3) Provide baseline and background information on new and current construction projects as required by NYSERDA to define and deliver programs to target markets

- (4) Track changes in construction markets over time with a specific focus on market indicators that are likely to be impacted by program offerings, focusing especially on the expanded use of whole building design
- (5) Assess the effectiveness of the enhanced program outreach, marketing and education efforts, especially as related to the goals to increase levels of technical assistance, attract a broader range of building projects, and increase the overall use of Whole Building Design concepts
- (6) Examine program processes, focusing particularly on program efforts to increase technical assistance capacity and capability
- (7) Assess efforts to attract larger, more energy-intensive projects into the program and assess the impact of technical assistance and incentive levels on participation and non participation.
- (8) Document program progress and make recommendations for program improvements, focusing specifically on satisfaction of participants and non participants along a number of dimensions including incentive levels and technical assistance

The New Construction Program budget (3rd Quarter 2008 through 2011) consists of approximately \$63 million in EEPS funds and \$86 million in SBC funding, providing a total budget of \$149 million. The proposed evaluation budget for the NCP is nearly \$3.2 million, and is less than 5% of program funding.¹ However, 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. The primary driving factors supporting evaluation funding of less than 5% for this program are: the overall population of new commercial construction in the State is a relatively small market, and the most complex projects, which provide the large majority of the total expected savings for the program and require the most complex evaluation methods, will be a small percentage of the total participating projects. Evaluation budgets by element and calendar year are presented in Table 1.

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.

Table 1: New Construction Program Evaluation Schedule and Budget

Evaluation Element	Estimated Budget and Completion						
	2009	2010	2011	2012	2013	Total	% of Total Evaluation Budget
Market Characterization & Assessment	-	\$188,000	-		-	\$188,000a	6%
Impact Assessment	\$200,000	\$1,165,000	-	\$730,000	\$720,000	\$2,815,000b	88%
Process Evaluation	\$90,000	\$110,000	-		-	\$200,000c	6%
Total	\$290,000	\$1,275,000	-	\$730,000	\$720,000	\$3,203,000	100%
<p>a. Primary data collection costs represent approximately 35% of the total proposed evaluation budgets.</p> <p>b. Primary data collection costs represent approximately 70% of the total proposed evaluation budgets.</p> <p>c. Primary data collection costs represent approximately 20% of the total proposed evaluation budgets.</p> <p>d. The evaluation plan for the 60-day filing assumed a statewide baseline study would be funded. This updated impact evaluation plan has changed the proposed method to accommodate the fact that a statewide baseline study will not be available for the 2009 evaluation of this program. This modification has added significantly to the budget needed for the proposed impact evaluation plan.</p>							

3. Program Description and Goals

The New Construction Program provides non-residential customers with technical assistance services and capital-cost incentives for implementing energy efficiency improvements in new construction or in substantially renovated buildings. The technical assistance provides cost-shared analysis to customers and their design teams (Architecture and Engineering firms) to identify energy efficiency opportunities for their projects. An additional level of technical assistance provides specialized green building assistance to interested customers including computer modeling, materials analysis and assistance to comply with Leadership in Energy and Environmental Design (LEED®), the rating system developed by the U.S. Green Building Council. The incentives are based on a tiered approach, providing increasing incentives to customers for projects achieving higher levels of energy performance. The program is designed to encourage the incorporation of energy efficiency, renewable energy, and green building features in the design, construction, and operation of commercial, industrial, and institutional buildings. The program addresses a multi faceted and technically sophisticated market segment including both building owners and design firms.

With EEPS Fast Track funding, the NCP will aim to:

- 1) increase NYSERDA’s capacity to use whole building design analysis to maximize energy efficiency of all systems within buildings;
- 2) increase the total number of technical assistance providers available;

- 3) offer additional energy performance incentives through a tiered approach, with higher incentives for projects that achieve energy performance improvements more than 30% above current NYS Energy Conservation and Construction Code requirements; and
- 4) target larger, more complex high energy consuming projects (*e.g.*, supermarkets, data centers, laboratories, *etc.*) to yield a higher level of energy savings per project, increasing the focus on industry leaders among various market segments to better promote the program and create examples for other businesses in these market segments.

NYSERDA will also issue a new request for proposals (RFP) to increase the list of technical assistance providers and further expand program capabilities. New technical assistance providers will be required to demonstrate expertise in computer simulation modeling and green building services. To meet the increased need for services in the Consolidated Edison and National Grid service territories, NYSERDA will contract with technical assistance firms capable of meeting the needs of projects in these specific geographic areas.

Anticipated MWh savings for the NCP are shown in Table 2.²

Table 2. Projected MWh Savings for New Construction Program (2008-2014)

	2008 (1/4 Year)	2009	2010	2011	2012	2013	2014	2015	Total
EEPS	0	14,642	29,633	53,717	72,311	67,749	35,037	5,810	278,900
SBC	2,640	21,120	31,680	60,720	68,640	58,080	21,120	0	264,000
TOTAL	2,640	35,762	61,313	114,437	140,951	125,829	56,157	5,810	542,900

Source: NYSERDA, *System Benefits Charge Supplemental Revision for New York Energy \$martSM Programs (2008-2011)* As Amended, August 22, 2008 and revised March 12, 2009, Page 7, Table 2-3.

4. Logic Model/Theory

In Figure 1 is the most recent logic model for the New Construction Program. As program evaluation efforts begin, a first step in the process will be to review the latest logic model and make updates to the model as needed (see discussion in Section 5). The NCP logic model was developed during a brief period when the program was known as High Performance New Buildings. This is reflected in the title of the logic model and will change as the model is revised.

² For information on energy savings and other achievements to date, see NYSERDA, *New York Energy \$martSM Program Quarterly Evaluation and Status Report*, August 2008.

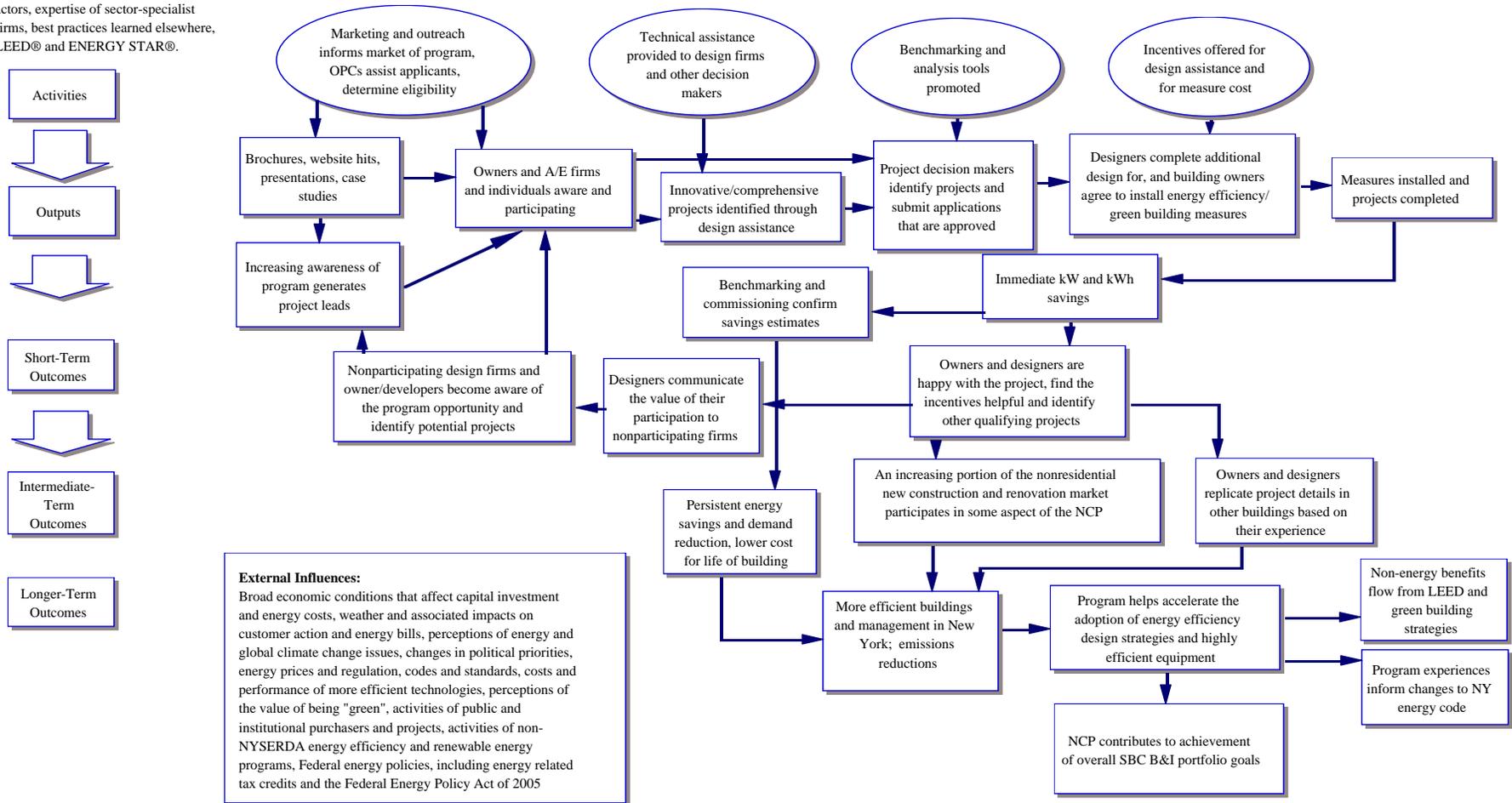
Logic modeling activities will occur early in the evaluation process after completion and approval of the Detailed Evaluation Plan. NYSERDA's evaluation contractors convene logic model "workshops" with program staff to discuss program inputs, activities, outputs, outcomes, external influences and other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

Figure 1. New Construction Program / High Performance New Buildings 2007 Logic Model

Inputs:

SBC funds, Con-Ed System-wide Funding, staff resources and experience implementing earlier SBC programs, credibility and existing relationships, awareness of NYSERDA among market actors, expertise of sector-specialist firms, best practices learned elsewhere, LEED® and ENERGY STAR®.

New Construction Program/High Performance New Buildings
Logic Model
March 2007



5. Market Characterization & Assessment Plan

This section presents the Market Characterization and Assessment (MCA) evaluation plan for the New Construction Program.

Research Objectives

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 NCP operates. The plan was designed to validate program assumptions regarding market characteristics, provide additional details regarding market structure and opportunities, and ensure consistency with prior program evaluation activities conducted by NYSERDA. The continuity in approach will enable the MCA Team to build upon prior research findings and ensure that current and subsequent evaluation results can be used to assess progress towards meeting the PSC'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

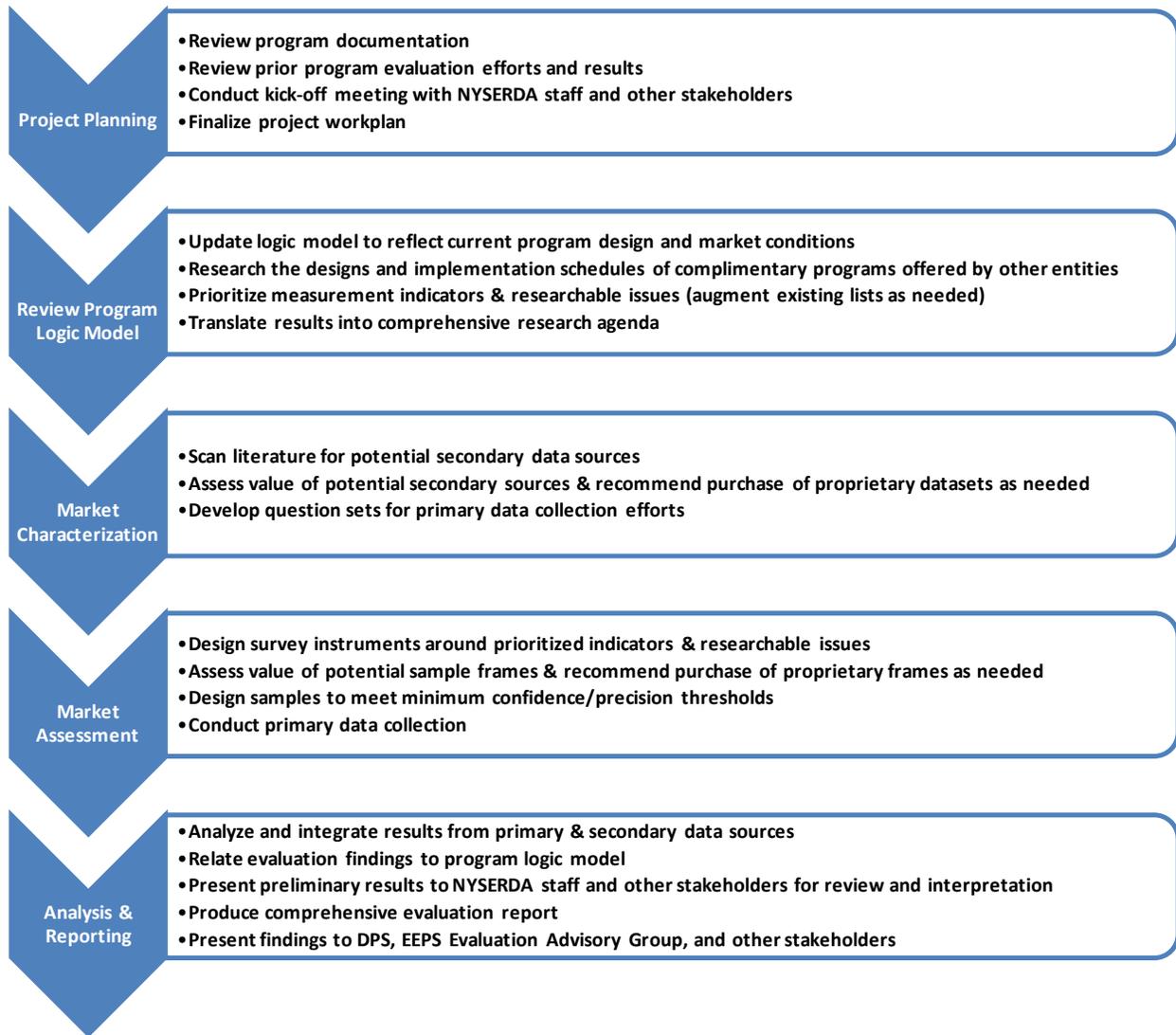
The proposed MCA evaluation plan for the NCP consists of multiple activities (blue arrows) and associated research tasks (bulleted lists), as shown in Figure 2. The approach will make use of a variety of primary and secondary data sources to generate information on a number of topics relevant to the NCP including: program accomplishments and market share in terms of both non-residential new construction activity and interaction with key market actor groups (*e.g.*, design teams³, technical assistance providers, industry leaders, etc.); changes in building owner and design team awareness and understanding of efficiency practices promoted by the program; and participant motivations and decision-making criteria for incorporating energy efficiency improvements and green building design into their new construction projects. The approach is driven primarily by elements and theories presented in the NCP *Logic Model Report*⁴, and key research findings generated by the evaluation will be related to the outputs and outcomes anticipated by the program logic model. 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.

³ Design teams include architecture and engineering (A&E) firms as well as other specialty contractors involved in the non-residential new construction process (*e.g.*, lighting designers, HVAC contractors, etc.)

⁴ NYSERDA, *New Construction Program – Program Logic Model Report*, March, 2007. See Section III of this document for additional details regarding the NCP Logic Model.

Each activity and the associated research tasks are discussed in more detail in the remainder of this section.

Figure 2. Synopsis of MCA evaluation activities and research tasks



Project Planning

This task encompasses a variety of project planning activities including review of available program documentation and prior program evaluation results, meetings and discussions with NYSERDA evaluation staff and other evaluation contractors, a project kick-off meeting with NCP staff and other project stakeholders, and the development of the final project work plan. An important component of this initial phase of the project is providing NCP 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.).

Review Program Logic Model

The NCP *Program Logic Model Report* was designed to help guide NYSERDA's program-specific evaluation activities; thus, an initial activity undertaken by the MCA Team will be to conduct a comprehensive review of the *Program Logic Model Report* to ensure the document accurately reflects the current program design and state of the market. A central element of the review will be researching 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. The results of this review, including the MCA Team's suggested prioritization of measurement indicators and researchable issues, will be presented to NYSERDA staff in memorandum format and suggested updates to the document, if any, will be discussed with NYSERDA staff and other project stakeholders to reach consensus on the proposed revisions.

Before proceeding, it should be noted that this initial phase of the evaluation will provide an opportunity for the MCA Team to generate feedback regarding proposed program design and implementation strategies. The Team will use the logic model review to suggest opportunities for program improvement, if any are observed, in the hopes of streamlining program delivery processes.

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 NCP tracking database, previous program evaluation reports prepared for NYSERDA and for similar programs operating in other jurisdictions, McGraw-Hill Construction Dodge databases, U.S. DOE's Commercial Buildings Energy Consumption Survey (CBECS) data, U.S. Census County Business Patterns Reports, membership lists and other publicly-available data from relevant professional organizations (*e.g.*, the American Institute of Architects (AIA), the U.S. Green Building Council (USGBC), etc.), 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 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:

- Non-residential new construction activity (*e.g.*, number of projects, building area, and value) segmented by market sector and geography
- Baseline building practices and energy intensity of non-residential new construction⁵
- Existing technical service delivery channels, both design teams and technical assistance providers, segmented by market sector and geography
- Identification of industry leaders within targeted market segments to assist NCP outreach and promotional efforts⁶

⁵ For this task to be accomplished, access to utility data, formatted to maintain existing confidentiality agreements, will be essential. Should utility data be unavailable, the MCA Team will use CBECS data to characterize energy intensity by market sector; however, the results will be limited in that the CBECS data is not specific to New York State.

- Success in penetrating the green building/sustainable design market in terms of participating projects and specialized design teams/technical assistance providers
- NCP accomplishments and market share in terms of both non-residential new construction activity and interaction with key market actor groups
- Other metrics as identified

A baseline study on code compliance is planned under NYSERDA's American Recovery and Reinvestment Act (ARRA)-funded Energy Codes Program.⁷ Depending on the timing of this baseline study, the MCA research will leverage this study and will not include a separate analysis of code compliance in new construction.

Market Assessment

Market Assessment results will be generated through primary data collection efforts with end-use customers and design teams participating in the NCP as well as with comparison non-participant groups eligible to participate in the program (See next subsection for specific details regarding the proposed data collection efforts). The data collection instruments will be structured around the prioritized measurement indicators and researchable issues identified during the logic model review.⁸ Care will be taken to ensure continuity of longitudinal indicator measurements where appropriate so that temporal trends in the measurements can be assessed. Market assessment results will be segmented on an upstate-downstate regional basis to identify spatial variations in responses and associated market conditions.

Example indicators to be measured during the market assessment work include:

- Market awareness of NYSERDA program offerings and broader energy efficiency opportunities
- Market perceptions regarding value of services promoted by the program (*e.g.*, whole building design/computer simulation modeling, green building services, benchmarking of proposed project performance, etc.)
- Customer decision-making processes including organizational structure and financial and other non-energy considerations
- Market demand for energy efficiency measures/design approaches and green building/sustainable design services and percent of new construction projects in which these measures are incorporated
- Design team/technical service provider expertise with energy efficiency measures/design approaches and green building/sustainable design

⁶ This issue will be explored in several ways including identification of relative market capitalizations of different organizations as well as through questions with survey respondents regarding their perceptions of leading organizations within their respective markets.

⁷ For more information, see: <http://www.nysesda.org/Economicrecovery/sep.asp>

⁸ Other NYSERDA 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.

- Availability of service providers trained in energy efficiency measures/design approaches and green building/sustainable design
- Other indicators as identified

Analysis and Reporting

Data analysis and reporting will be conducted by the MCA 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 NCP 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, NCP staff, DPS 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 project stakeholders during scheduled meetings.

Populations/Samples

As discussed previously, the MCA evaluation of the NCP will involve primary data collection with end-use customers and design teams participating in the program as well as with comparison non-participant groups eligible to participate in the program.⁹ The NCP tracking database will be the sample frame for program participants. Participants eligible to be included in the sample frame will be those end-use customers and design teams associated with projects that were completed subsequent to December 15, 2007.¹⁰ The participant sample frame will be stratified based on NCP incentive amount to ensure that projects with larger incentives are sampled at a higher rate.^{11,12} The final stratification plan will be

⁹ 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 (e.g., ESCOs) 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.

¹⁰ Projects that were completed prior to December 15, 2007 were sampled during previous MCA studies.

¹¹ The project will be the unit of analysis (i.e., a sample of projects will be drawn and the end-use customers and design teams associated with the projects in the sample will be the survey respondents). The project architect will be the primary respondent in terms of the design team population; however, if an architect is not listed in the program database or in instances where an architect is involved with more than one sampled project, the listed engineer or specialty contractor will be contacted.

¹² Larger incentives typically correspond to larger, more complex projects, which will be increasingly targeted by the NCP. Prior research has shown that average savings tends to increase as building size increases and that large projects tend to be high profile, easy to target, and may emphasize environmental and/or public recognition.

designed to meet the 90/10 absolute confidence/precision criteria for all participants on an upstate-downstate regional basis.¹³

The McGraw-Hill Construction Dodge Players Database will provide the sample frame for non-participants.¹⁴ This database is developed using information from the F.W. Dodge New Construction Reporting system and is designed to furnish information on the market actors associated with individual new construction projects, including owners, architects, engineers, and other market actors. The sample frame will be restricted to include only those non-residential new construction projects eligible to participate in the NCP¹⁵ and will be reviewed to exclude actors that have participated in the NCP.¹⁶ Non-participants eligible to be included in the sample frame will be those end-use customers and design teams associated with projects that were constructed in New York subsequent to December 15, 2007. The non-participant sample frame will be stratified based on total construction value to ensure that larger projects are sampled at a higher rate.¹⁷ The final stratification plan will be designed to meet the 90/10 absolute confidence/precision criteria for all participants on an upstate-downstate regional basis.¹⁸

Current estimated sample sizes, expected sampling precision, and anticipated survey fielding dates for the 2010 MCA evaluation are summarized in Table 3.¹⁹ These estimates will be finalized prior to undertaking the planned evaluation and once the MCA Team more thoroughly analyzes program participation data.

¹³ Should NYSERDA be directed that 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.

¹⁴ The MCA Team will coordinate with the Impact Team to request a list of all new connects and consumption data within the relevant time period from the utilities for their C&I tariffs. This list would also need to be screened to ascertain building types and determine when the building was constructed. If these data are made available, they will be evaluated for use as a non-participant building owner sample frame and possibly a non-participant design team sample frame (assuming a process can be established to identify the design teams associated with the listed new construction projects).

¹⁵ Dodge New Construction Reports include a number of project types that would not be eligible for NCP incentives including airports (non-building), bridges, communication systems, dams and reservoirs, gas systems, miscellaneous non-building construction, power/heat/cooling plans, river/harbor/flood control, sewage and waste disposal systems, streets and highways, and water supply systems. In addition, projects located in Nassau County and Suffolk County (*i.e.*, Long Island) and other projects that do not pay SBC funds will be excluded from the sample frame.

¹⁶ In addition, screening questions will be included in the survey instruments to identify current and former program participants and exclude them from the sample.

¹⁷ The project will be the unit of analysis (*i.e.*, a sample of projects will be drawn and the end-use customers and design teams associated with the projects in the sample will be the survey respondents). The project architect will be the primary respondent in terms of the design team population; however, if an architect is not listed in the program database or in instances where an architect is involved with more than one sampled project, the listed engineer or specialty contractor will be contacted.

¹⁸ Should NYSERDA be directed that 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.

¹⁹ Similar estimates were used to develop budget estimates for the proposed 2012 MCA evaluation. Final metrics, including corresponding budget estimates, will be developed prior to launching the 2012 evaluation.

Table 3. NCP MCA 2010 Evaluation Specifics

Target Group	Estimated Population Size	Estimated Sample Size	Expected Sampling Precision ¹	Survey Administration By	Expected Start of Fielding
Participating End-use Customers	TBD	140a	90/7	Survey Contractor	Summer 2010
Each Region (Upstate/Downstate)	TBD	70	90/10	Survey Contractor	Summer 2010
Participating Design Teams	TBD	140a	90/7	Survey Contractor	Summer 2010
Each Region (Upstate/Downstate)	TBD	70	90/10	Survey Contractor	Summer 2010
Non-participating End-use Customers ²	TBD	140a	90/7	Survey Contractor	Summer 2010
Each Region (Upstate/Downstate)	TBD	70	90/10	Survey Contractor	Summer 2010
Non-participating Design Teams	TBD	140a	90/7	Survey Contractor	Summer 2010
Each Region (Upstate/Downstate)	TBD	70	90/10	Survey Contractor	Summer 2010

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

2. The impact team is also targeting non-participants for surveying in the summer of 2009. The teams will coordinate to avoid survey fatigue and leverage the other's efforts, as appropriate.

a. Should NYSERDA be directed that 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 organizations participating in the different programs. If so, the team will design an 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 design a contractor survey covering those programs that are substantially overlapping.

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 telephone²⁰ and will consist of the following steps undertaken by NYSERDA's Survey Contractor: 1) format the final survey instruments and program them into a CATI system, 2) pretest the final instruments with subsets of the market actor

²⁰ Surveys will be designed to be completed in approximately 15 – 20 minutes.

group samples and consult with the MCA Team as needed to resolve any issues that are identified²¹, 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.

The MCA Team will coordinate with NYSERDA’s other evaluation contractors to the extent possible to fully leverage other planned data collection efforts. Doing so will achieve economies of scale in terms of minimizing data collection costs, ensure consistency of approach and question wording to facilitate comparison of results across evaluation efforts, and minimize the burden placed on different respondent groups. In addition, the MCA Team will work closely with the impact evaluation contractor team to ensure that final MCA results are considered during the baseline estimation and attribution analyses conducted by that team (see discussion in Section 6). The NCP is designed to have a strong market transformational element, and the theory-driven results generated by the MCA evaluations will ensure the program is credited for structural and functional changes in the market that result from program interventions, changes that market actors contacted during attribution analyses may not be fully cognizant of.

The proposed MCA evaluation schedule and budget for the NCP are shown in Table 4. These initial budget estimates will be finalized prior to undertaking the planned evaluation after sample sizes are determined through analysis of program data.

Table 4. New Construction Program MCA Evaluation Schedule and Budget

Evaluation Element	Estimated Budget and Completion					
	2009	2010	2011	2012	2013	Total
Market Characterization & Assessment	--	\$188,000a	--		--	\$188,000

a. Primary data collection costs represent approximately 35% of the total proposed evaluation budgets.

6. Impact Evaluation Plan

In 2009-2010 an impact evaluation will be conducted for NCP projects completed in 2007 and 2008. This work will be referred to as the 2009 evaluation and will include only SBC-funded projects. The first impact evaluation of the jointly-funded SBC and EEPS program will be conducted in 2012, allowing time for project completions from 2009 through 2011.

Research Objectives

The purpose of impact evaluation is to establish rigorous and defensible estimates of the savings 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 estimate in order 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

²¹ Pretest interviews will be included as completed interviews unless major revisions to the instruments are made.

possibility of bias in the result, 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 energy, demand, and MMBtu savings, which will entail verifying the installation and the estimation of savings for a representative sample of program participants in comparison to project specific code baseline usage levels. The program is designed to increase building efficiency above code through technical assistance and incentives. NYS has a statewide energy code providing a consistent platform for determining project specific gross savings.²² The gross savings realization rate is then applied to the program population or NYSERDA-reported gross savings to derive the final savings estimates (evaluation-based estimates, or *ex post* savings).

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 in the form of a net-to-gross (NTG) ratio becomes the adjustment factor to derive net impacts. For the NCP, project specific participant net effects (free-ridership and participant inside spillover) will be derived as the difference between the project's as built and operating usage and the project specific counter-factual (the building as it would have been built without program intervention). The net participant realization rate for participating sites from the sample will be applied to the program population to provide participant savings. Participant outside spillover and non-participant spillover will be estimated based upon survey/interview data from participating and non-participating building owners and design firms (including architects, engineers and design-build firms).

Precision and Bias

Sample sizes will be designed to target 90/10 precision for the statewide program based upon the preliminary *Evaluation Plan Guidance for Program Administrators*.²³ 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.

²² New York does not currently have local codes that vary from the statewide Energy Conservation Construction Code (ECCC). New York City has discussed taking steps in this direction. The impact evaluation team will monitor New York code activities and adjust the baseline as appropriate if local codes deviate from the statewide ECCC.

²³ The sample size depends on the type of statistical analysis being conducted and the type and 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.

Activities

Gross Savings Impact Evaluation

Background

In general, prior evaluations have found that the SBC-funded NCP has provided high quality engineering support to participating firms. At the same time, the increased evaluation funding and call for higher rigor can significantly add to the overall reliability in the evaluation of savings estimates by supporting a substantial expansion in the evaluation methods. More sophisticated methods with greater measurement support can significantly reduce any risks of potential bias that can be unobserved within more simplistic methods.

NYSERDA's New Construction *ex ante* savings estimates generally are based on DOE-2 modeling of code-defined baseline and program-supported design conditions. NYSERDA attempts to control bias through a program design, which: (a) calls for an independent NYSERDA-contracted engineering Technical Assistance (TA) contractor to perform the modeling and savings estimation; (b) requires each TA firm's work to be overseen by a NYSERDA-contracted outreach project consultant (OPC); (c) funds OPC verification of as-built equipment installation; and (d) funds post-installation commissioning to ensure proper system operation. Post-installation verification by the OPC validates measure implementation. Pre-qualified incentives are available for certain measures. The NCP Terms & Conditions reserve the right to site access for evaluation purposes for 24 months after completion.

The NCP funds TA studies directly through the program. The use of the term TA in this plan refers to NCP-funded TA studies, not Flex Tech-funded TA studies. There is no overlap between the two programs in this regard.

Baseline Issues

Due to the inherent uncertainty in determining project baseline conditions, New Construction *ex ante* savings estimates have greater engineering uncertainty and potential for bias than retrofit savings estimates even when the program funds independent analysis using advanced techniques. There is a lack of data on the baseline conditions for any given project, and neither billing nor metering data exists to confirm baseline assumptions.

Ex post savings evaluation based only on review of initial analysis methodology or re-verification of installed equipment limits the potential to discover discrepancies between design and as-built schedules and conditions or to adjust deemed savings associated with pre-qualified measures. It also fails to address the site-specific variations in baseline that are common in new construction. Some projects may have entered the program with planned baselines well above code, while others may not have met code prior to entering the program.

Many new construction programs use the simplifying assumption of Energy Code as the baseline. Nevertheless, for both actual practice and NTG, obtaining a true baseline study of commercial new construction would offer much greater reliability for the ultimate savings estimates. NYSERDA has proposed several statewide market and baseline studies to the DPS for funding by all EEPS program administrators. A well-designed and comprehensive baseline study of new construction in the C/I sector may simplify the estimation of gross and net impacts for this program and is being considered for funding. However, such a study would provide information for a 2009 or 2010 baseline and would not apply to the 2007 and 2008 projects to be evaluated in 2009. Consequently, the Impact Evaluation Team

has developed an alternative strategy to be tested for 2009, detailed below under the heading ‘2009 Baseline Estimation.’ For the 2012 evaluation, the results of the statewide baseline study are assumed to be available and impacts could be estimated using either the site-specific approach or the statewide baseline, depending on the outcome of the 2009 evaluation and the 2012 assessment of 2009-2011 participants.

General Approach to Modeling and Estimation of Impacts

The Impact Evaluation Team will use a combination of modeling, metering and utility data analysis in the *ex post* analysis to determine the gross savings realization rates for the sampled projects. The two general strategies to be used for estimating savings are discussed below. The evaluation team will select which of the two approaches will be used for a particular participant based on the nature of the measures in a project (*e.g.* whether energy use is directly measurable or not, the degree to which measures interact, the magnitude of savings, and cost).

The first type of evaluation is based on updating the *ex ante* savings analysis using a calibrated simulation model as described in International Performance Measurement and Verification Protocol [IPMVP] Option D. This approach is likely to be selected for projects where the predominant savings comes from upgrades to equipment for which energy use cannot be measured directly, such as high efficiency windows, a cool roof, or above-code insulation and where a building model was constructed in the TA phase of the program intervention. The approach may also be used for projects with multiple highly interactive measures associated with disparate equipment, such as a project that includes both advanced air-side ventilation controls and advanced water-side chiller controls. This approach is only applicable for buildings that have at least 12 months of billing data for use in model calibration. The calibrated modeling will be completed as follows:

- 1) Review the existing model. Determine availability of the model in electronic format. Confirm that all needed model input data is available for reconstruction of models where necessary. Select modeling software.
- 2) Develop an M&V plan based on review of the design model, measure and project documentation, identifying the key parameters that affect the savings for each measure. M&V Plans will include documentation of any additional on-site sub-metering required to calibrate the model to actual usage. The plan will identify all project specific variables required for calibration. Typical data collection will include the following items:
 - a. Utility billing history for energy and demand usage
 - b. NOAA weather data for the M&V period
 - c. On site sub-metering of major mechanical systems
 - d. Light logging for lighting systems
 - e. Direct Digital Control System (DDC) trend logs for major equipment
 - f. Equipment set-points
 - g. Operating schedules

- 3) Calibrate the *ex ante* building model to the utility consumption history using the actual building operating parameters and sub-meter data. Where deviations from the modeled case are minimal and minor (such as where the only change is in operating hours), the Impact Evaluation Team may calculate adjustments using a spreadsheet analysis. This approach is consistent with IPMVP Option A. For all other cases, the modeling will be performed using one of the following methods:
 - a. Where feasible, the Impact Evaluation Team will modify the *ex ante* DOE-2 model inputs and re-run that model;
 - b. If it is not feasible to obtain access to the original model, then a new 8,760 (hour) building simulation model (DOE-2 or equivalent) will be created for verification purposes.
- 4) Once the *ex ante* model has been calibrated to actual building performance, the baseline model will then be recalibrated to reflect the baseline for the constructed building and actual operating conditions.
- 5) Finally a model will be constructed to reflect the project specific baseline which will include deviations from code that would have been expected to occur in the project absent the program as determined from participant interviews (building owners and design firms) and market research.
- 6) As built conditions will be field verified and will provide the basis for the baseline and efficient case models.

The second type of evaluation, based on IPMVP Option B, focuses on verifying performance of the individual measures that were installed. Examples of candidates for such analysis include projects that predominantly focus on lighting and pumps, both of which can be isolated for metering, and multi-measure projects designed to improve the efficiency of a specific end use, such as a combination of chilled and condenser water reset, a VFD-controlled chiller, and a VFD-controlled tower. In this second example, the chiller plant and overall project performance can be isolated. To conduct this type of evaluation, the evaluation engineer will use the following process:

- 1) Develop a measure-based evaluation plan,
- 2) Perform on-site data collection and short-term metering of the installed equipment and systems including equipment power, flow, or other relevant characteristics over a period of time.
 - a. Where feasible, the engineers will verify the Building Automation System (BAS) data and obtain trend logs from the BAS to either supplement or supplant equipment specific metering to reduce the costs of metering and, where available, to obtain seasonal data.
- 3) Model measure-level energy use using spreadsheets or simulation modeling to determine annual operating energy use, baseline energy use (code) and project specific baseline energy use.

This approach requires consideration of interactive effects between measures. For example, measures that are not readily metered, such as building envelope upgrades, will impact the metered energy consumption of the air conditioning and heating systems and must be accounted for in the baseline comparison. This strategy is the most exact approach because modeled savings are calibrated against measured performance at the measure level. Again, as built conditions will be field verified and used in the modeling of the efficiency case and the baseline will be adjusted accordingly. (For instance, if a system type is changed, then the baseline system would need to be the comparable baseline equipment in accordance with ASHRAE 90.1).

NYSERDA previously used such an approach for the Large Savers Evaluation of 2006-07 projects. Typical new construction participants incorporate multiple measures into their designs to reach the program's 10% minimum efficiency improvement requirement for an incentive. For this measure-based level of analysis the engineer will instrument and perform *ex post* analysis for the measures contributing most of the savings. Prior experience indicates that such a Pareto-based approach typically allows estimation of realization rates for over 90% of gross savings while keeping evaluation costs within a reasonable range.

The analysis results for both approaches will include deriving gross and net realization rates for annual kWh savings and peak period electric demand reductions for all projects. The evaluation will then use these, along with appropriate sample weighting, to derive estimates for gross and net energy and demand savings. Where feasible and applicable, the evaluation will also estimate annual natural gas savings.

2009 Baseline Estimation

In the absence of a baseline study, the Impact Evaluation Team will use the following approach to determine gross and net savings for the sampled projects. All models will include three simulations which will be developed consistent with the requirements of ASHRAE Standard 90.1 Chapter 12 (even when a full building model is not undertaken), as described below:

- 1) The as-built conditions, reflecting the calibrated model of the actual building energy performance. Model calibration will be based on either utility data or measure-specific metered data.
- 2) The code compliant building, based on the NYS 2002 Energy Code or the applicable code at the time the project was initiated.
- 3) The site-specific baseline building,

The comparison of the as-built model with the code baseline model will provide the gross savings realization rate for the project. The use of the site-specific baseline building will be to support the calculation of the net realization rate. This approach effectively captures the deviation of project specific baselines from code

The foundation for each site-specific baseline will be constructed from interviews with the site owner and design firms, combined with any other available evidence, such as other recent non-participating projects completed by the same customer, building and/or engineer.²⁴ The interviews to determine the initial model inputs for the project specific baseline building will enable the Impact Evaluation Team to include inside spillover and free-ridership at the measure level, as discussed in more detail in the section on attribution below. These site-specific inputs will then be adjusted based upon a triangulation process with broader baseline market data. This triangulation process will include a teleconference between the Team NCP evaluation manager, the site-specific lead engineer, the Team's Engineering Director and NYSERDA's NCP evaluation manager. DPS staff will be invited to participate, as they desire, in these teleconferences.

The broader baseline market data for this process in 2009-2010 will be collected from two sources. Several retrospective questions for 2007-2008, relating to critical baseline issues for the evaluation sample sites, will be included in the Team's surveys with non-participating building owners, non-participating design firms. (Further description of the samples for these surveys is provided below.) The

²⁴ All data collection for this activity will occur through interviews with project personnel for sampled projects, and from information these individuals can provide, such as as-built blueprints, COMcheck runs, and other NY Energy Code compliance documents. No additional data collection for other sites, participating or non-participating is planned.

Impact Evaluation Team will also work with the Process Evaluation Team to develop a few retrospective questions to be included in that Team's interviews with local code officials in 2009-2010 for the express purpose of providing additional market baseline information from a balancing perspective.

Following the completion of the 2009 evaluation, the results from this approach will be assessed and the Impact Evaluation Team will outline the advantages and disadvantages of this approach in comparison to estimating savings using a statewide baseline. This discussion will include recommendations for the approach to be applied for the 2012-2013 evaluation.

Attribution

Background

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).²⁵ 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.

In addition, non-participants can also be influenced by the program. The simplest example for the NCP program would be where former participating design firms promote energy efficiency or green building practices to their customers due to what they learned when they participated with the program. Non-participating design firms could research efficiency or green building practices and promote them as they hear their competitors are doing in order to maintain competitiveness. Both of these sources of non-participant spillover as well as impacts on non-participating building owners will be explored and measured as part of the NCP attribution evaluation effort.

Participant Net Effects

Estimating participant net effects will be incorporated into the process of determining the gross savings as described above. Constructing the site-specific baselines allows the opportunity to establish what was planned prior to participation in the program. Through the modeling of the three scenarios (as-built, code compliant baseline and site-specific baseline), the Impact Evaluation Team will be able to estimate net savings that incorporate free-ridership and inside spillover. The interviews with the players associated with these projects will also provide the opportunity to estimate outside spillover.

The Impact Evaluation Team will explore participant free-ridership and spillover for the NCP with building owners and design firms (architectural, engineering and design-build firms) through an enhanced self-report survey process. For the sampled projects, interviews will be conducted with the participating

²⁵ Methods will also be needed to ensure there is no double-counting of savings between one program's spillover estimates and another program's gross or spillover estimates.

building owners, separate financial decision-makers and the design firms, providing more than one source of information for each sampled project.

Interviews with the various players will be designed to investigate the design and decision process, including how and when changes were made and how participating design firms, program staff and the OPC were involved in these changes. The self-report enhancements include comparing the responses from these multiple perspectives and incorporating this information into the site-specific baseline.

For the projects selected in the gross savings sample, the Impact Evaluation Team will conduct in-depth interviews to establish the site-specific parameters and also to investigate outside spillover. These interviews will be with the following market players:

- The project design firm team members (architects, engineers and/or design-build team members) such as the project manager, project architect, mechanical and/or electrical engineers and lighting designers.
- The customer representative(s) who had decision making authority during project design and construction including facilities and operations personnel.

A self-report interview process will be used to gain additional input from a broad range of the players involved in the decision-making process who could not be included in the more in-depth surveys. Other decision-makers such as chief financial officers or vendors may also be interviewed for the largest projects, if they are found to be highly influential in the decisions to invest in energy efficiency and green building measures.

The discussion of sample sizes is included below in the section on population/samples. The reliability for attribution, however, 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. Use of 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 from multiple perspectives can increase the construct validity of the estimate.

Non-Participant Spillover

In addition to the combination of gross and net surveys as described above, telephone surveys of non-participating design firms (architects, engineers and design-build firms) and non-participating building owners will be conducted to estimate non-participant spillover through enhanced self-reports. Depending on the survey lengths, the team may add questions to investigate the baseline construction practices of the non-participants. The Team will also endeavor to coordinate non-participant interviews with the MCA team. Furthermore, the above mentioned code compliance study that is planned as part of NYSERDA's ARRA-funded Energy Codes Program will also inform this analysis as applicable depending on the timing of the ARRA-funded study.

Non-participants' design firms will be divided into two groups: design firms that never participated in NCP and design firms who initially participated in the program but have not had any activity in NCP in the past four years or more (after 2004). Once the sample frame of non-participant firms has been established (discussed below under "Sample Issues"), the list will be compared to the NCP-participating design firms to identify overlap and attempt to ensure that the interviewed firms either did not participate in the program or have not participated in the last four years. A screening question will also be included in the survey to verify that the survey respondents meet the criteria for non-participating firms.

Integration of Market Effects

The 2009 evaluation of the New Construction Program will also include a pilot effort to investigate integrating market effects and NTG factors. Theoretically, the comprehensive spillover measurements with participants and non-participants, customers and mid-stream market actors should capture all the impacts that would be generated by the program in the market. However, market transformation is based on complex interactions and it is entirely possible that the overall program effects go beyond what can be easily measured in these specific categories. For example, high free-ridership rates could actually be caused over time from the programs' market transformational nature. This evaluation component will include evaluation research using secondary data and additional survey questions. Further detail of the specific research questions and the selected methodologies for this study are still to be developed.

Populations/Samples

Sampling will be necessary to estimate both gross and net impacts.

Gross Impact Sampling

For the verification of gross savings, the planned impact evaluation will include significant site survey work on a representative sample of participants. Efficient sample sizes will be chosen using stratified ratio estimation (SRE) to meet a 90/10 confidence/precision level for the statewide program. Given the level of detailed on-site field work and engineering modeling required for this evaluation, estimating gross and net savings to the 90/10 confidence/precision standard at the upstate/downstate or utility level will be prohibitively expensive.²⁶

An initial review of Nexant's 2006 M&V report on the NCP indicates that stratified ratio estimation will be likely to improve precision and minimize sample sizes. The evaluation results also indicate that there is a high degree of variation in the realization rate for the pre-qualified measures, particularly in comparison to the custom measures.²⁷ The Impact Evaluation Team is aware that NYSERDA has completed a review of the pre-qualified measures and corrected the program database, suggesting there will be less variability for the 2007 and 2008 program years. For the purposes of developing an initial estimate of the sample size, an overall error ratio of 0.5 was assumed. Taking into account the finite population correction factor, a sample size of about 45 participating projects will be needed to provide the desired precision of 90/10 for the whole program statewide. Projects will be stratified by size (typically the magnitude of the energy savings) and possibly by region or other variables, as indicated. The sample will be randomly selected within each stratum.

Attribution Sampling

The evaluation of net impacts is focused not only on the building owner and actual building under construction, but also on a wider range of market actors, including design firms. Previous NCP

²⁶ For reference, during the SBCIII funding period, 16% of the completed projects and 34% of the expected energy savings are in the downstate area, while 84% of the completed projects and over half of the expected savings are upstate.

²⁷ The error ratios for the pre-qualified and custom components are estimated to be approximately 1.0 and 0.3, respectively. Estimating the error ratio requires a high level of detail, and some of the critical inputs were not included in last M&V report completed by Nexant, Inc. in 2006. Consequently, some assumptions were made in the calculation of the error ratios.

attribution evaluations have included surveys for participating and non-participating building owners and participating and non-participating architects and engineering firms (*i.e.*, A&E firms).

For efficiency, and to reduce evaluation costs, the gross and net surveys will be integrated for building owners. In addition, the Impact Evaluation Team will consider whether the design firms associated with the selected projects will constitute a sufficient sample. When both the owners and design firms for the same projects are surveyed, it allows the Impact Evaluation Team to gain valuable insights into how the same project is viewed from multiple perspectives. Particularly when the Impact Evaluation Team has been on site and has first-hand knowledge of the actual installations, this approach provides useful validation of the owner and design firm self-reports.

The issue becomes how to project the survey results for the design firms to the wider market. While the stratification for gross impacts is on project size (typically energy savings), this approach does not guarantee that the largest design firms are associated with the largest NCP projects, and a separate, stratified random sample of the design market may be more appropriate to achieve our research objectives.

Two separate stratified random samples of non-participating design firms and non-participating building owners will be drawn for the non-participant telephone survey. Stratification variables may include magnitude of the construction activity represented by the firm and the region where the firm operates. The sample size of 75 is designed to meet the 90/10 confidence/precision standard for the statewide program, with a few extra surveys included to cover the possibility of inconsistent responses or other issues. In addition, the Impact Evaluation Team will review NYSERDA's program databases to identify formerly-participating design firms. If the total number of these formerly-participating design firms is 30 or less, a census attempt will be made. Otherwise, a stratified random sample will be selected as described above for the other non-participating contractors.

Sampling Issues

There are a number of issues that may complicate the sampling both for net and gross impacts, as listed below.

- Utility usage data will be needed for participants to calibrate whole building models or as a reality check for savings calculated from measured data. This may require randomly selecting an initial set of projects that is substantially larger than our target sample size to allow for the possibility that some projects will either not have sufficient billing history or not be able to be matched to utility records for other reasons.
- Identifying non-participants is not a trivial task, and will certainly be necessary for net impacts. One option is to use the Dodge database or a similar vehicle. The Dodge database includes all projects that received permits, so it will be necessary to winnow it further to identify completed new construction projects. Another option is to request a list of all new connects and consumption data within the relevant time period from the utilities for their C&I tariffs. This list would also need to be screened to ascertain building types and determine when the building was constructed. However, the Dodge database will still be necessary to identify the non-participating design firms.²⁸

²⁸ The commercial new construction participant and non-participant populations are scheduled for surveys in 2009 and 2012 by the Impact Evaluation Team, in 2010 and 2012 by the MCA Team and in 2009 and 2010 for the participant populations by the Process Evaluation Team. These evaluation contractors will coordinate on sampling

These issues will need to be resolved to ensure that the sampling can proceed within the required time frame. The sampling plan will be further developed and will address these issues.

Data Collection

To be able to conduct the sampling and proceed with the evaluation, the Impact Evaluation Team will need the following information from the NYSERDA New Construction Program staff at a minimum:

- Project level information, including address, contact information for the site owner and design team members, the type of project (design/bid/build design/build, custom, prescriptive), type of business, key project dates – enrollment, construction completion.
- Measure level information (in easily readable electronic format), such as a description of the measure, quantity installed, the energy savings (electric, gas and other fuels), demand savings, measure life, incremental costs.
- Building simulation data, including all data that NYSERDA has for each of the selected projects, data input and output files, contact information for the firm that conducted the modeling and an electronic copy of the model as available.
- Customer firmographics, including the size of the firm, the number of employees, the fuels used for major end uses, types of major electric and gas end uses.

In addition, critical information will need to be collected from third party sources, as described below.

- Utility consumption data (both electricity and natural gas) for participants and the non-participant samples, 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

Evaluators will collect primary data as described in the Activities above.

and/or surveys to ensure appropriate samples for each evaluation and to minimize survey fatigue. A preliminary review of the Dodge Players database reveals roughly 8,000 potential non-participant respondents.

Table 5. New Construction Program Impact Evaluation Survey Specifics for 2009 Evaluation

Target Group	Estimated Population Size	Estimated Sample Size	Expected Precision	Survey Administration By	Estimated Date of Fielding
Participating Firms w/Completion - On-site Survey	~100/year ¹	45	90/10	Impact Evaluation Team	Ongoing
Participating Design Firms - Telephone Survey	~85a	40	90/10	Impact Evaluation Team	Fall 2009
Non-Participating Building Owners - Telephone Survey ²	Unknown	75	90/10	Survey Contractor	Fall 2009 or winter 2010
Non-Participating Design Firms - Telephone Survey	Unknown	75	90/10	Survey Contractor	Fall 2009 or winter 2010
Formerly-Participating Design Firms - Telephone Survey	Unknown	30 (census, if possible)	NA	Survey Contractor	Fall 2009 or winter 2010
<ol style="list-style-type: none"> 1. A review of the NCP database indicates that the NCP program has had about 100 project completions each year. 2. The MCA team is also targeting non-participants for surveying in 2010. The teams will coordinate to avoid survey fatigue and leverage the other's efforts, as appropriate. <ol style="list-style-type: none"> a. From an analysis the NCP database, it appears that about 85 design firms have been active in recent years. 					

Key impact budget assumptions associated with the unit cost-related efforts and the telephone survey/interviews, are enumerated in Table 6. These constitute the major costs for data collection and are approximately 70% of the total costs for the proposed impact evaluation. Per project costs include development of site specific M&V plans, on site metering and verification, modeling using an 8,760 simulation model or spreadsheets, results analysis and project reporting. The Impact Evaluation Team's experience in performing metering and analysis for NYSERDA's recent Large Savers Evaluation indicates that the planned levels of investigation will cost between \$10,000-20,000 for less complex projects and \$20,000-30,000 for comprehensive whole building efficiency projects.

Table 6: Impact Budget Basis

Budget Element	Cost
On-site visits and initial analysis of collected data against project files and models.	\$19,600 Average per completed site
Expert phone interviews	\$420 Average per completed interview
Labor hours per sampled site to calibrate as built and operating model. Create and test the code baseline and site-specific baseline models to derive project-specific gross and net savings estimates.	18 hours per site
Design baseline questions for non-participants and local code official interviews, baseline analysis, and assumed 30 sample sites have baseline adjustment teleconferences (3 hours max. to prep, arrange and conduct)	\$18,000
Developing pilot market effects measurement integrated with NTG exam, collecting additionally required information and analysis.	300 labor hours, totaling \$45,000

The costs in Table 6 exclude fixed costs such as set-up (establishing site procedures and training staff), tracking, instrument development, further sample/population analyses, management, and reporting.

These categories constitute the remaining 14% of the total cost for this program’s impact evaluation. The budgeted cost per site is high relative to other program evaluations, largely due to the fact that the New Construction Program is the only Energy Efficiency Services program for which large projects will not have been subject to pre-retrofit metering, post-retrofit metering, or pre- or post-retrofit bill reconciliation prior to evaluation.

The Impact Evaluation Team will make completed project reports available to program staff on a periodic basis prior to the release of the 2009 and 2012 impact evaluation reports. An interim presentation of preliminary findings will be provided to NYSERDA program and evaluation staff, and DPS staff as evaluation findings can serve the continuous program improvement process.

The Impact Evaluation Team plans to repeat the 2009 evaluation in 2012-2013, with the same sample sizes and surveys of participating and non-participating building owners and design firms as shown in Table 5. Unit costs for the 2012 evaluation include escalation to best approximate the costs to be incurred at that time. They also include a discount in level of effort required per site, in anticipation that the proposed new construction baseline study results will inform the 2012 study and reduce related costs.

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. If an additional evaluation is required, the 2012 costs are expected to be representative.

Table 7 outlines the Impact budget by year for the New Construction program. The NPC impact evaluation is projected to require 2% of the total program budget allocated under SBCIII (including Fast Track funding), a reasonable investment in the evaluation of this complex program with difficult baseline measurement issues. The Impact Evaluation team will provide periodic progress reports, including delivery of project specific reviews, prior to completion of the impact evaluation, and will review and comment on the baseline study in 2010.

Table 7. New Construction Impact Evaluation Schedule and Budget

Evaluation Element	Estimated Budget and Completion					
	2009	2010	2011	2012	2013	Total
Impact Assessment	\$200,000	\$1,165,000a	-	\$730,000	\$720,000b	\$2,815,000c
a The 2009 evaluation is expected to begin mid-2009 with completion in 2010. b The 2012 evaluation is expected to be completed in 2013. c The evaluation plan for the 60-day filing assumed a statewide baseline study. This updated impact evaluation plan has changed the proposed method to accommodate the fact that an applicable statewide baseline study is not available for the 2009 evaluation. This modification has significantly added to the budget needed for the proposed impact evaluation plan.						

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 program manager.

7. Process Evaluation Plan

The process evaluation for the NCP will be a formative evaluation. As the existing NCP ramps up in 2009 and 2010 to meet additional EEPS Fast Track goals, a substantial effort will be made to assess progress toward accomplishing the expanded implementation capacity put forward in the EEPS program plan. The process evaluation will be conducted over a two-year period, to ensure that the expanding activities are observed and documented.

The evaluation will rely on interviews with implementation team members, and with design and owner/developer representative teams for both participating and partial-participating projects. The approach used here will specifically enable the process evaluation team to assess the effectiveness of the program in encouraging the whole building approach. In particular, by interviewing project teams in each of the three tracts: pre-qualified, custom analysis and whole building, the process evaluation will be able to assess how the different track options affect project team decisions.

Later in 2012 and 2014, if program funding continues beyond 2011, additional process evaluation activities could be conducted to assess on-going progress with the program, identify further opportunities for program improvement, and assess market progress.

Research Objectives

The research objectives for the NCP process evaluation are noted below. These objectives reflect issues that are specific to the expanded program for the EEPS order as well as issues identified from previous evaluations of the SBC funded program.

1. Assess the effectiveness of enhanced program outreach activities to attain program goals
 - a. Use of Outreach Project Consultants (OPC)
 - b. Contacts with 'industry leaders'
 - c. Leverage with other organizations
 - d. Value of incentives to design teams and developers/owners
 - e. Coordination with local and state code officials
2. Assess the effectiveness of the program at increasing technical assistance capability and capacity
 - a. Ability to provide interactive whole building design services
 - b. Ability to provide green building services
 - c. Ability to provide commissioning and benchmarking activities
 - d. Increased capacity to serve Con-Edison and National Grid customers
 - e. Relationship of program to local and state code decisions

3. Assess efforts to successfully attract larger, more complex, high energy use projects to yield higher level of energy savings per project
 - a. Awareness of different tracts and availability of support to enhance project efficiency
 - b. Ability to change project designs as a result of program awareness and participation in program activities
 - c. Decisions made about projects as a result of program involvement
4. Document history and progress of the program toward accomplishing its goals and objectives
 - a. Assess satisfaction with the program among participating and partial participating team members
 - b. Assess barriers to participation in program components, including: green building, commissioning, benchmarking, whole building design

Activities

The process evaluation will use interviews with program implementation staff as well as design teams and owners/developers for projects at different stages of the program process. These interviews will seek to capture the entire program experience from the viewpoint of participants and partial participants. Participants are defined as those who are actively completing projects while partial participants will be those that have dropped out or cancelled projects. While program staff believes most of the partial participants have cancelled their projects and dropped out for non-programmatic reasons, this will be assessed in the in order to explore if any additional program features could be used to decrease the current project cancellation/dropout rate. Project cancellation/drop-outs may need ongoing attention as the financial climate begins to improve as well.

Due to the whole building focus of the NCP, for each participant and partial participant project sampled for the evaluation, the process evaluation team will seek to interview a representative of the design team, a representative for the owner/developer, and if possible, one other team member such as the contractor, another design team member or another member of the owner/developer team. This approach provides a comprehensive view of the project process and can more effectively illuminate barriers and successes of the whole building approach.

Other market actors and local and state building/energy code officials also play a role in how program effects occur. The program specifically targets working with market actors such as the Green Building Council to leverage the program services with the objectives of these other market actors. Assessing how this is occurring and the role of the NCP will be important for improving the program. If the program is influencing the code process, the program will need to reflect these changes. Assessing the relationship between code officials and the program will further aid the program in improving outreach and effectiveness.

The Program's approach for all projects is to find the optimum efficiency solutions for the project team and facilitate increased efficiency for all projects; the three tracts facilitate this process. A decision-tree helps project teams make the best choice for their situation. The effectiveness of this analysis process for projects of different sizes will be important to understand by sampling projects of different sizes to learn how they used the decision tool and how they chose the program track.

The process team will develop interview guides for each subgroup. The interview guides will be designed to permit triangulation on the issues of concern by using similar questions across each interview to permit comparison and contrast of points of view. Questions specific to each subgroup's experience will also be included.

Populations/Samples

The ten population groups for the NCP are noted below in Table 8. NYSERDA program staff, the OPCs and the technical assistance (TA) providers constitute the program implementation team. The assumption of 100 projects per year, results in 200 projects for the two-year period of the evaluation. Project contacts include the design team of architects and engineers and the owner/developer team. The process team will conduct in-depth interviews with NCP project team members. The resource requirements for the planned approach of in-depth interviews with multiple project participants are high and thus the evaluation is being conducted over a two-year period to achieve a 90/10 absolute precision for all participants and their design teams. However, the confidence level will necessarily be reduced to 80/10 for partial participants, as more interviews are unlikely to lead to more knowledge.

The NCP tracks projects based on status in the program process. These data will be used to select projects for interviews. Prior to selecting the sample the process team will analyze the disposition of projects in the program by status: number cancelled, number completed, number active in the TA stage, commissioning, green services, etc. Additionally, the process evaluation team will stratify the projects by upstate and downstate, by size of anticipated savings, by building type/complexity and by program tract: pre-qualified, custom analysis and whole building. Though the sample will be stratified across these characteristics, the sample will be designed to draw conclusions for the program as a whole, not by strata. Projects will be selected to represent the disposition of all projects in May 2009 and then again in May 2010. The estimated total interviews to be completed are shown in Table 8.

Interviews with other market actors such as United State Green Building Council and New York High Performance Schools with whom NYSERDA hopes to leverage projects and interviews with code officials will be conducted in 2009 and 2010.

Data Collection

As displayed in Table 8 the data collection will begin in June 2009 with interviews of the program implementation team: NYSERDA program staff, the OPCs and TA providers. An analysis of the project files to identify the sample for interviews for each year will begin in June and be completed by August.²⁹ Data collection instruments for the implementation team will be developed in May 2009 and revised in May 2010. Instruments for interviews with project teams will be developed in July and August 2009 and revised in July and August 2010. Data collection should be completed by November of each year with analysis and report writing completed in December. An interim report will be produced in December 2009 and a final report in December 2010.

The process evaluation team anticipates conducting hour-long interviews with program staff, OPCs and TAs, 30-45 minute interviews with other market actors and 30-60 minute interviews with participant and partial participant teams.

²⁹ Other than NYSERDA staff, program contractors and other market actors, total sample sizes in the table are for the entire two-year project period, with 50% of the interviews completed each year for each sampled group.

Table 8. NCP Process Evaluation Data Collection Specifics

Target Group	Estimated Population Size	Estimated Sample Size	Expected Sampling Precision	Administration By	Expected Start of Fielding
NYSERDA Program staff	12	6	NA	Process Team	June 2009 & June 2010
Outreach Project Consultants	2	2	NA	Process Team	June 2009 & June 2010
Technical Assistance Providers	14	12	90/10a	Process Team	June 2009 & June 2010
Local and State Code Officials	>100	20	NA	Process Team	June 2009 & June 2010
Other Market Actors	~5	5	NA	Process Team	Sept 2009 & Sept 2010
Participant Architects and Engineers Teams	~200	68	90/10b	Process Team	Sept 2009 & Sept 2010
Participant Owners/Developers	~200	68	90/10b	Process Team	Sept 2009 & Sept 2010
Other Participant Project Team Members	TBD	30	NA	Process Team	Sept 2009 & Sept 2010
Partial-participant Architects and Engineers	<100	34	80/10b	Process Team	Sept 2009 & Sept 2010
Partial-participant Owners/Developers	<100	34	80/10b	Process Team	Sept 2009 & Sept 2010

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

b Assumes proportional sampling, 2-tailed test, absolute precision

Special Issues

One of the primary reasons for investigating the experience of the partial participants is to explore whether they pursued projects independent of NYSERDA and whether portions of these projects may have been completed with other EEPs program administrators.

Schedule and Budget

Table 9 displays the schedule and budget allocation by year.

Table 9. NCP Evaluation Schedule and Budget

Evaluation Element	Estimated Budget and Completion					
	2009	2010	2011	2012	2013	Total
Process Evaluation ¹	\$90,000	\$110,000	--	--	--	\$200,000

1. The 2009 process evaluation costs include \$22,000 for interviews, this cost increases to \$23,000 in 2010.

8. 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, 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.³⁰ 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.

9. 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 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

³⁰ 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 evaluation reports, survey instruments, data files, code books, and analysis files. Electronic files can be made available to DPS upon request.

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.

10. 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 \$martSM** 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, and net-to-gross ratios 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.