

NYSERDA Home Performance with ENERGY STAR® Program

FINAL Evaluation, Measurement and Verification Plan

July 28, 2009

I. Introduction

The detailed evaluation plan presented in this document builds upon prior evaluation activities conducted for the Home Performance with ENERGY STAR (HPwES) Program. In developing this evaluation plan, 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 HPwES Program works to meet its current SBC program 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 Home Performance with ENERGY STAR Program supported by SBC funding, including both the market-rate and low-income program components.

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

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

- (1) Establish rigorous and defensible estimates of the energy savings that can be attributed to the HPwES Program;
- (2) Develop a comprehensive understanding of current and emerging markets related to existing residential homes (*e.g.*, market structure and market actors);
- (3) Provide baseline and background information required by NYSERDA to define and deliver existing residential homes efforts to target markets;
- (4) Track changes in markets over time with a specific focus on market indicators that are likely to be impacted by the HPwES Program;

(5) Assess program activities and tactics and document progress toward achieving goals and objectives, including an assessment of barriers to participation and opportunities to reduce barriers facing contractors and households;

(6) Assess response to processes to increase program outreach, throughput and participation;

(7) Explore contractor and homeowner value, benefits and concerns associated with completing projects and living in homes treated through the HPwES Program.

The HPwES Program budget (4th Quarter 2008 through 2011) consists of approximately \$49.9 million in SBC funding. The proposed evaluation budget is \$1.071 million which equates to nearly 2% of program funding.¹ Annual budgets for each evaluation component are shown in Table 1.

Table 1. HPwES Evaluation Schedule and Budget

Evaluation Element	Estimated Budget and Completion						% of Total Evaluation Budget
	2009	2010	2011	2012	2013	Total	
Market Characterization & Assessment	-	\$267,500a,b	-	-	-	\$267,500	25%
Impact Evaluation	\$299,000c		\$312,000 c		-	\$611,000	57%
Process Evaluation	-	\$193,000d	-	-	-	\$193,000	18%
Total	\$299,000	\$460,500	\$312,000	\$0	-	\$1,071,500	100%

a. Primary data collection costs represent approximately 50% of the total proposed Market Characterization & Assessment evaluation budget.

b. The primary data collection portion of this evaluation is scheduled to begin in the latter months of 2010 with completion in winter 2011 (*i.e.*, the budget shown in 2010 will carry-over into 2011).

c. Data collection costs account for 27% of the estimated Impact Evaluation budget in 2009 and 26% in 2011.

d. Data collection costs are \$10,000 for interviews, \$90,000 for surveys, plus \$2,500 for honorarium to respondents.

III. Home Performance with ENERGY STAR Program Description and Goals

The Home Performance with ENERGY STAR Program encourages the implementation of comprehensive energy efficiency-related improvements and technologies by qualified contractors in existing one-to-four family residential homes.

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.

HPwES seeks to create a “one-stop shopping” experience for consumers looking to make energy efficiency improvements to their homes. This is accomplished by requiring the participating contractor who provides a comprehensive home assessment to also have the capability to prepare a scope of work and install the recommended energy efficiency measures. The program also fosters consumer protection by offering training, a robust quality assurance/quality control (QA/QC) process, a one-year warranty and by requiring certification and accreditation of participating contractors. Energy efficiency improvements covered by HPwES include building shell measures, such as air sealing and insulation; electric measures, like ENERGY STAR refrigerators; heating measures, such as boilers and furnaces; cooling measures, such as ENERGY STAR room or central air conditioners, and certain renewable energy technologies. Eligible homeowners can elect to receive financing from the **New York Energy \$martSM** Loan Fund or the New York ENERGY STAR financing option.

HPwES also contains a component for low- to moderate- income households. The “Assisted” components of the HPwES Program are available to residents with up to 80% of Area Median Income, or 80% of State Median Income, whichever is higher for the county (as compared to the 60% of State Median Income criterion used for participation in the federally-funded Weatherization Assistance Program). This component offers subsidies (up to 50% with a limit) for making improvements to income-qualified households. Rental properties with one-to-four units are also eligible for subsidies at varying levels depending upon the number of income-qualified households residing within the building.

Table 2 displays program goals from the SBC III Operating Plan.² These goals apply to the five year funding period from July 1, 2006 to June 30, 2011.

Table 2. Home Performance with ENERGY STAR Program Goals

Activity	Five-Year Goal
Existing homes served	16,125
Existing low-income homes served	10,500
Electricity Savings (GWh) ¹	26.1
Fuel savings (MMBtu) ¹	1,199,000

IV. Logic Model/Theory

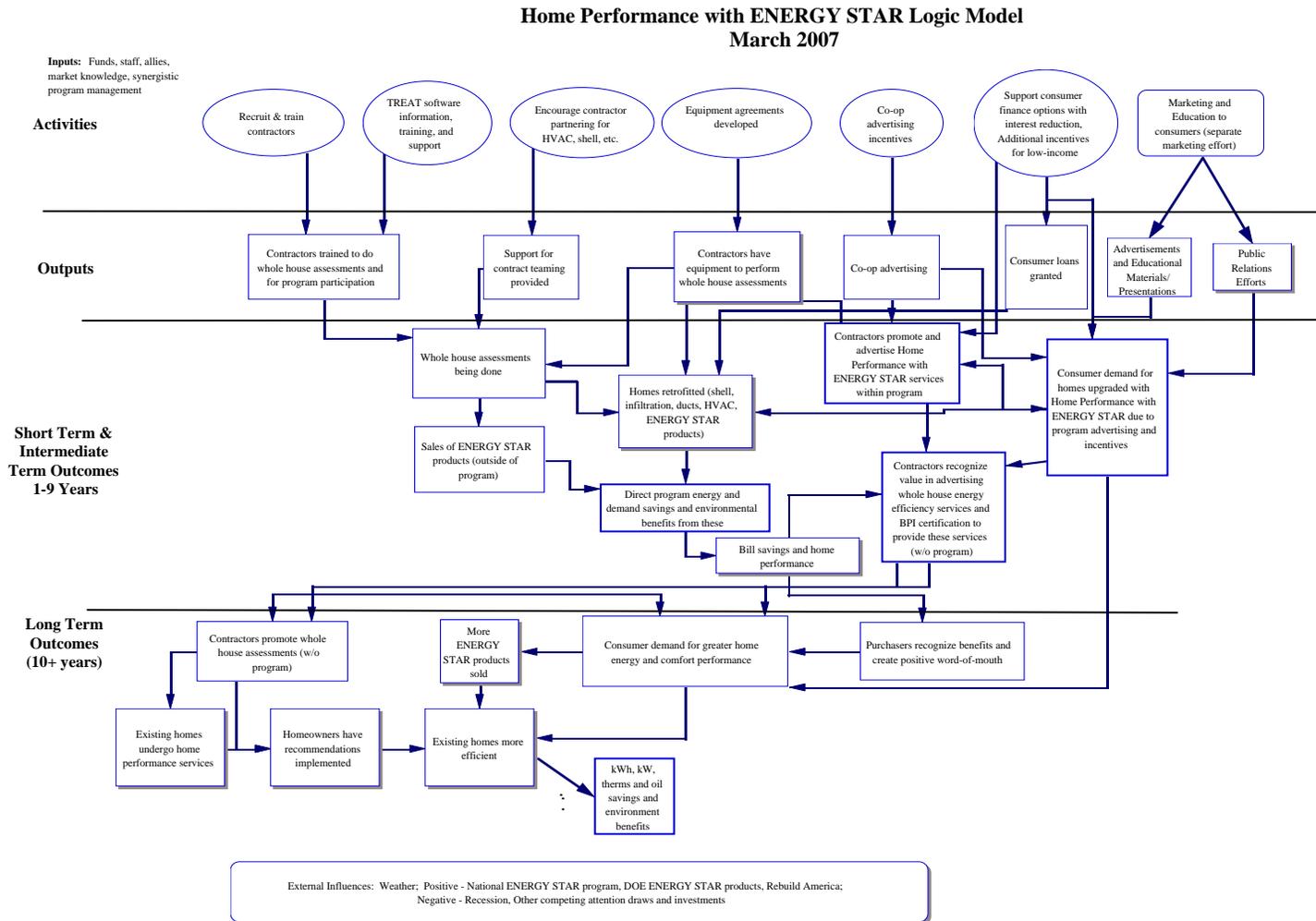
Figure 1 presents the most recent logic model for this program. As program evaluation efforts defined in this plan begin, a first step in the process will be to review the logic model and make updates as necessary.

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

² System Benefits Charge, Proposed Plan for New York Energy \$martSM Programs (2006-2011), As amended March 2, 2006.

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. Home Performance with ENERGY STAR Logic Model



V. Market Characterization & Assessment Plan

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

Research Objectives

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

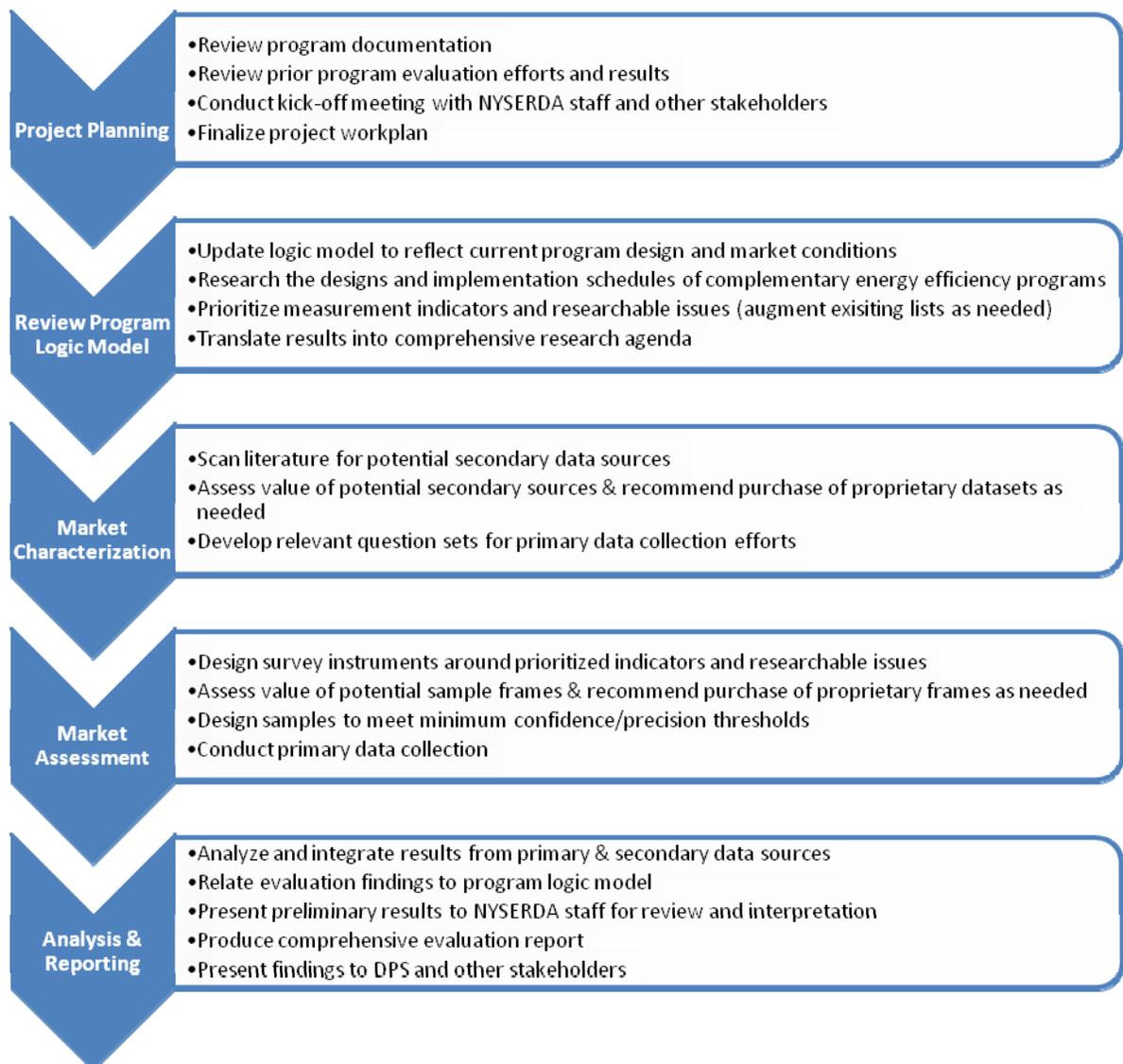
The proposed MCA evaluation plan was structured to accommodate these overarching research goals with a specific focus placed on the market and context within which the HPwES Program operates. The plan was designed to test program assumptions regarding market characteristics, provide additional details 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 HPwES Program 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 HPwES Program including: program accomplishments and market share in terms of participation rates within key market actor groups; changes in customer and contractor awareness and understanding of measures and practices promoted by the program; and customer and contractor motivations and decision-making criteria related to energy efficiency improvements and practices. This current research approach is driven primarily by elements and theories presented in the HPwES *Program Logic Model Report*³, and key research findings generated by the evaluation will be related to the outputs and outcomes anticipated by the program logic model, including any revisions made to the logic model as part of this evaluation (see subsequent discussion). Each activity and the associated research tasks are discussed in more detail in the remainder of this section.

³ New York Energy \$martSM Single Family Home Performance Program Logic Report, March 2007. See Section IV of this document for additional details regarding the HPwES Program Logic Model.

Figure 2. Synopsis of MCA evaluation activities and 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 HPwES Program 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 HPwES Program staff an opportunity to discuss research items of interest to ensure development of a research agenda geared toward overcoming any existing gaps in staff’s knowledge of current market conditions and opportunities. The collaboration with NYSERDA program and evaluation staff and other project stakeholders will continue throughout the evaluation as iterative processes are used to review and finalize interim and final project deliverables (e.g., survey instruments, summary memos and reports, etc.).

Review Program Logic Model

The HPwES *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. An important 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.

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: any available HPwES Program tracking databases; previous evaluation reports prepared for NYSERDA and for similar programs operating in other jurisdictions; US Census data; Dunn and Bradstreet Contractor lists; McGraw-Hill Construction Dodge Players Database, Building Stock Database, and New, Addition, and Alteration Database; 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. Previous evaluation work has found that great potential for residential home renovation growth exists in the downstate New York region; however, program participation in that area has been minimal. Data compiled for the market characterization activities will assist in further investigating this finding.

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

- Eligible residential building stock, including an estimate of the proportion undergoing relevant renovations in the time frame being analyzed
- Eligible contractor market, by specialty area including carpenters, plumbing, HVAC, plastering, dry wall and those that construct single family homes
- Participating contractors/market actors (including the most active market actors) and their roles in market decision-making (*e.g.*, for energy efficiency, design practices)
- Current market practices, behaviors, and perceptions of market barriers and opportunities
- HPwES program accomplishments and market penetration including geographic distribution of participating contractors, projects, and associated program reported savings
- Impact of the most active participating contractors, including the number and value of renovation projects completed by these contractors compared to the total market and the influence these contractors may have on increasing program awareness and changes in non-participating contractor practices
- Other metrics as identified

Market Assessment

Market Assessment results will be generated through primary data collection efforts with HPwES Program participating and former participating contractors, participating and partially-participating homeowners, and 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.⁴ 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. Previous evaluation work has found that great potential for residential home renovation growth exists in the downstate New York region; however, program participation in that area has been minimal. Market assessment activities will assist in further investigating this finding.

Example indicators to be measured during the market assessment work include⁵:

- Contractor and homeowner awareness of the HPwES Program and energy efficiency measures and practices promoted by the program
- Participating contractor satisfaction with the program and perceived value (*e.g.*, increased profitability, increased consumer demand) from participation
- Availability of contractors and energy efficiency equipment
- Project profitability and cost allocations among different measures (*e.g.*, dollars expended for heating and cooling equipment compared to windows or insulation)
- Changes in energy efficiency practices and program influence among contractors and homeowners
- Contractor promotion, training/education, quality assurance, advertising and outreach
- 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 HPwES Program as well as the success of program intervention strategies. All data sources used in the analysis and reporting phase of the project will be clearly cited to ensure a transparent record of activities undertaken. In addition, evaluation findings will be related back to the outputs and outcomes anticipated by the program logic model to help NYSERDA staff and other project stakeholders better assess program accomplishments to date.

⁴ Other evaluation contractors will be able to suggest additions to the instruments to collect data relevant to separate studies and the MCA Team will endeavor to accommodate such requests balancing the additional survey components against the need to minimize impacts on survey respondents.

⁵ The MCA team will coordinate with the other evaluation specialty contractors (*e.g.*, Process) should data collection efforts on specific indicators overlap (*e.g.*, satisfaction).

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

Populations/Samples

As discussed previously, the MCA evaluation of the HPwES Program will involve primary data collection with HPwES Program participating and former participating contractors, participating and partially-participating homeowners, and comparison non-participant groups eligible to participate in the program. The MCA Team will work closely with NYSERDA's survey data collection contractor and review applicable program databases, to identify potential sample frames and to develop sampling procedures to effectively represent the participant and non-participant populations. The final sample sizes for all market actor groups will be designed to meet 90/10 absolute confidence/precision criteria on an upstate-downstate regional basis.⁶

Current estimates regarding sample sizes, expected sampling precision, and anticipated survey fielding dates for the 2010 MCA evaluation are summarized in Table 3.⁷ These estimates will be finalized prior to undertaking the planned evaluation and once the MCA Team more thoroughly analyzes program participation data.

⁶Should 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.

Table 3. HPwES Program 2010 MCA Evaluation Specifics

Target Group	Estimated Population Size	Estimated Sample Size	Expected Sampling Precision ¹	Survey Administration By	Expected Start of Fielding
Participating Contractors	132	70	90/10	Survey Contractor	July 2010
Former Participating Contractors	~25	Census	90/10	Survey Contractor	July 2010
Nonparticipating Contractors	5,552	140a	90/7	Survey Contractor	July 2010
Participating Homeowners (market rate projects)	2,589	140a	90/7	Survey Contractor	September 2010
Participating Homeowners (assisted HPwES projects)	1,217	140a	90/7	Survey Contractor	September 2010
Partially-Participating Homeowners (market rate projects) ²	TBD	70	90/10	Survey Contractor	September 2010
Partially-Participating Homeowners (assisted HPwES projects) ²	TBD	70	90/10	Survey Contractor	September 2010
Nonparticipating Homeowners ³	TBD	140a	90/7	Survey Contractor	September 2010

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

² Program databases do not track partial participants or partial participation in the market-rate or assisted components separately. Population sizes will be determined by NYSERDA, possibly through the random digit dial survey conducted through the **New York Energy \$martSM** Products Program Evaluation.

³ The nonparticipating homeowner sample will be identified through a random digit dial survey conducted through the **New York Energy \$martSM** Products Program Evaluation. The survey is described in more detail within that Program's evaluation plan.

a. Assumes 70 completed surveys in each of the upstate and downstate regions (to achieve 90/10 confidence/precision levels on a regional basis). 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.

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 telephone⁸ 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 group samples and consult with the MCA Team as needed to resolve any issues that are identified⁹, 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 cleaning, and 5) deliver to the MCA Team final data files in SPSS and SAS formats including all

⁸ Surveys will be designed to take approximately 20 – 30 minutes to complete.

⁹ Pretest interviews will be included as completed interviews unless major revisions to the instruments are made.

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.

Schedule and Budget

The proposed MCA evaluation schedule and budget for the HPwES Program are shown in Table 4. These initial budget estimates will be finalized after sample sizes are determined through analysis of program data. If the program continues beyond 2011, a MCA evaluation could be conducted in 2012 to allow for continuous monitoring of the residential existing homes market, provide insights on future program design and inform how future programs may be shaped. This study would be funded out of future evaluation budgets, however.

Table 4. HPwES Program MCA Evaluation Schedule and Budget

Evaluation Element	Estimated Budget and Completion					
	2009	2010	2011	2012	2013	Total
Market Characterization & Assessment	-	\$267,500a,b	-	-	-	\$267,500
a Primary data collection costs represent approximately 50% of the total proposed MCA evaluation budget. b The primary data collection portion of this evaluation is scheduled to begin in the latter months of 2010 with completion in winter 2011 (<i>i.e.</i> , the budget shown in 2010 will carry-over into 2011).						

VI. Impact Evaluation Plan

The HPwES Program has installed measures in over 21,000 homes through September of 2008; nearly 8,000 of these projects were completed in 2007 and 2008. Impact evaluation for program years 2007 and 2008 is planned for 2009, which will include billing analysis for projects installed during 2007 and the early part of 2008. The next impact evaluation will be conducted in 2011, allowing time for one year of post-retrofit consumption data to accumulate for projects completed during 2009.

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. This process involves determining the realization rate for gross savings and the free rider and spillover factors for net impacts. In both of these aspects of the impact evaluation, the evaluators need to determine how to achieve the desired precision, minimize the possibility of bias in the result and assess the validity of the results. A secondary object is to investigate non-energy impacts (NEIs) for this program. Each of these key aspects of impact evaluation is discussed briefly below. Another objective, which will be further fleshed out for the 2011 impact evaluation study, is to coordinate with other evaluation efforts to assess the impact of separate Workforce Development program activities on energy savings within the Home Performance with ENERGY STAR Program.

Determine Realization Rates for Gross Savings

A critical component of the impact evaluation is to develop rigorous estimates of the realization rates for gross electricity, demand and other fuel savings. There are numerous approaches to achieve this goal, including billing analysis and verifying the installation and the estimation of savings for a representative sample of program participants. An optimal strategy is proposed herein based upon level of effort required, availability of data and cost. However, a secondary strategy, and the data required should that alternative approach need to be employed, is also detailed below.

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 assessment of net effects will cover numerous potential sources of spillover, including both participant and non-participant spillover. Consequently, the research into net savings will need to incorporate all of the parties who may be contributing to net effects, including participating homeowners, participating contractors, non-participating contractors and formerly-participating contractors.

Precision and Bias

Sample sizes will be designed to target 90/10 precision for natural gas and electric savings on a statewide basis. A billing analysis of all participants with sufficient billing data also allows for the estimation of savings at the utility level with no sampling, thus eliminating concerns about sampling precision. The Impact Evaluation Team will also field a telephone survey and conduct a billing analysis on this smaller sample of survey respondents to address the potential bias created by external events that affect energy consumption but are not in any way related to program activity. If billing data are not made available to NYSERDA for this study, the feasibility of estimating savings at the utility level through a model that incorporates only the telephone survey of respondents will need to be further considered.

Methods will be selected to minimize self-selection, non-response and other sources of bias, to the extent possible. For example, bias mitigation through telephone surveys is mentioned above and covered in greater detail under the billing analysis section below. Another example is that the non-response rate for telephone surveys can be reduced by ensuring that several attempts are made to contact each potential respondent at different times of the day.

Activities

Gross Impacts

One of the most reliable impact evaluation methods for energy efficiency programs targeting existing buildings is using pre- and post-energy use data to statistically analyze average energy savings, referred to as billing analysis. Billing analysis is feasible when savings are measurable in comparison to total household consumption (often recommended to be 8 to 10% of pre-installation consumption), when the population is fairly homogenous and when the program tracking system provides sufficiently detailed information to support the analysis.¹⁰ This approach is least costly approach to obtain reliable savings estimates at a high rigor level for this program.

¹⁰ It is possible to quantify lesser savings when the sample is highly homogenous or the sample size is quite large.

In addition to the improved rigor, billing analysis is generally less costly than other approaches due to the fact that the billing data is already collected by the utilities. Consequently, most of the population can be included in the model with little additional cost required for data collection. A related advantage of using billing analysis on all participants is that reliable estimates at the utility level are quite likely. Few other rigorous impact methods can allow utility level estimates with only a small incremental cost. Another advantage of billing analysis is that savings are based on actual behavioral patterns and snap back, *i.e.*, trading some part of the energy savings for increased comfort, is incorporated into the savings estimates.

The HPwES Program is a good candidate for a billing analysis due to the detailed information regarding energy end uses and savings estimates collected for each home and maintained in the program tracking system. Program savings are claimed only for projects that are reported as completed by the HPwES contractor, and the program tracking system includes a detailed description of each measure and the completion date.¹¹ In addition, annual savings are in the range of 850 to 950 kWh per household, or about 15% of the average annual household electricity use of 6,200 kWh.¹² In New York, homes are predominantly heated by natural gas, comprising 47% of fuel usage by the residential sector.¹³ For natural-gas heated homes, insulation, weatherization and heating equipment measures would be significant enough in this cold-weather state to obtain reliable savings estimates from billing analysis.¹⁴ Fuel savings average 55 MMBtu in treated homes, which is over half of the typical residential use in 2006 (77 MMBtu per year).¹⁵ This preliminary review suggests that the household savings levels should be large enough to estimate through billing analysis.

A challenge in conducting a residential billing analysis is that residential use tends to vary tremendously from one home to the next depending on the number of occupants in the home, the types of energy end uses, life style and numerous other non-program related factors. The Impact Evaluation Team will use a regression technique based on the Analysis of Covariance (ANCOVA) to estimate program savings by allowing each participant to act as his or her own control and accounting for the energy characteristics of the home within the statistical analysis. The ANCOVA method addresses the energy-related characteristics of the home that do not change over time, such as the size of the home, the lifestyle of the occupants, and the presence of major electric or gas appliances and heating equipment.

The Impact Evaluation Team will carefully review the data and assess the results to ensure that the savings estimates are statistically sound. Testing for violations of statistical assumptions will be conducted and any violations will be mitigated to the extent possible. The information-theoretic approach to model selection will be employed to ensure that the selection of the final model is based on objective statistical standards.¹⁶

¹¹ Savings from homes that selected other contractors to perform the work or installed additional measures at different times would be included in the spillover estimates.

¹² Average annual savings per participant are from Conservation Services Group's Quarterly Report of NYSERDA's Home Performance Programs, October, 2008. Annual residential electric use is from *Patterns and Trends*, New York State Energy Profiles: 1992-2006, published January 2008 by NYSERDA, pages 7 and 29.

¹³ *Patterns and Trends*, New York State Energy Profiles: 1992-2006, published January 2008 by NYSERDA.

¹⁴ It will not be possible to conduct a billing analysis for the heating-related measures for homes with an oil or propane primary heating system due to the complexity of obtaining and interpreting the billing and delivery/storage records. Given the similarity in the analysis of heating-related loads, the realization rates for the heat-related measures from the natural gas analysis will be applied to the savings estimates for oil and propane heated homes. This strategy is based on the assumption that the accuracy (level of bias) of the algorithms used by the program for estimating oil and propane savings is the same as those applied by the program for natural gas heated homes.

¹⁵ *Patterns and Trends*, New York State Energy Profiles: 1992-2006, published January 2008 by NYSERDA, page 31.

¹⁶ In billing analysis, the analyst makes many decisions regarding the statistical characteristics of the model and the specific parameters to be included. Thus, there are typically a number of possible models that could be used to

While the ANCOVA method controls for the characteristics of the home that are stable over time, it is possible that the estimation of program impacts can be affected by other factors that do change over time. These types of changes can be conceptualized in two broad categories:

- changes in the overall economy that affect the residential market in a global way, such as volatile gasoline prices, unemployment rates, or an increase in home heating costs.
- individual changes that affect specific homes, such as acquiring new household members, taking a longer vacation, or having a change in one's work schedule

These issues need to be considered and addressed separately.

Economic impacts can introduce either an upward or downward bias to the results. For example, a billing analysis may indicate that participants on average are saving 100 kWh per year, but it may be that on average residential electric consumption increased by 100 kWh per year during the same period, suggesting that the actual program impacts are 200 kWh per year. Given that the national economy appears to be moving into a period of contraction, one would expect that energy consumption may be reduced across the board, making it likely that program savings may be under- or over-estimated, depending upon the timing of the pre- and post-installation periods.

There are two common approaches to counteract these factors in within the statistical analysis: 1) include a non-participant comparison group in the analysis, and 2) incorporate trends lines into the analysis. Unfortunately, the first strategy can introduce net effects into what should be an estimate of gross savings. To that end, a billing analysis that includes both participants and a non-participant comparison group will be likely produce savings estimates that are somewhere in between net and gross effects and, thus, difficult to interpret with any degree of accuracy.

Incorporating trend lines is a cleaner approach and will be the preferred strategy applied in this evaluation. The Impact Evaluation Team will rely on third party economic data, often available through public sources, to develop these trend lines. It is also possible to construct trend lines from non-participant consumption data. This approach will be pursued if it is possible to obtain billing data for a substantial subset of residential non-participants.

Determining in-home changes that may affect energy use can substantially improve the model. This issue will be addressed by fielding a survey of participants to gather data to supplement the billing analysis. This survey will be designed to obtain additional information regarding typical changes occurring with the residence during the pre- and post-installation period (such as replacing a refrigerator, and changes in schedules and occupancy). In addition, this survey also provides the opportunity to investigate the more personal impacts of the national and regional economic trends, such as changes in employment status. Since this type of information may be sensitive to some participants, the Impact Evaluation Team will consider how to incorporate this line of questioning into the survey and how the question can be worded to minimize negative responses.

This survey will provide valuable insights for interpreting the billing analysis. Given the wide variability in residential energy use, a large sample size will be necessary. The billing analysis will be conducted

estimate savings. The information-theoretic approach provides an objective framework for selecting the best model among a series of competing candidate models. Please refer to *Model Selection and Multimodel Inference* by Kenneth Burnham and David Anderson, Springer-Verlag, NY, 2002.

with this subset of participants who receive the phone survey and with all participants with complete billing data, and the results will be compared for reliability.

Previous experience in this type of evaluation suggests that the approach of collecting additional information on patterns in individual homes does not always result in a better specified model.¹⁷ Conducting a phone survey necessarily restricts the sample size, and in some cases the sheer volume of including all participants with complete billing records provides more reliable results. This situation is more likely to occur when the program savings are small in comparison to total energy consumption.

The Impact Evaluation Team has concluded that adding information from a telephone survey to the billing model has a better chance of success with HPwES's high estimated savings per home. Given the relatively large savings in comparison to total energy use (15%), it seems reasonable to expect that a model with fewer observations may still produce robust results. Even if the smaller sample size does not improve the model, the phone survey will still provide critical information about the external influences on energy use for this variable market segment. In order to conduct this analysis, NYSERDA will require utility account numbers, electric and natural gas consumption records (kWh, kW, therms and interval/advanced meter data) for participants and non-participants (if possible), to be provided electronically in a readily accessible format. NYSERDA currently obtains account information and permission from the participant to obtain energy use data from the utility. Non-participant billing data may be more difficult to obtain, and the Impact Evaluation Team will work the NYSERDA and the utilities to pursue this approach. The Impact Evaluation Team recognizes the importance of protecting confidentiality of the consumer's data.

Demand Savings

Demand (kW) savings will be estimated by applying a kWh/KW factor to the energy savings. For example, the most recent kWh/kW ratios per measure in the Deemed Savings Database (DSD) could be used to derive the program's kW estimates. This approach is commonly used in the residential sector. Improved rigor for demand savings generally entails substantial increases in budget, and therefore is not planned as part of this evaluation effort.

Non-Energy Impacts

The Impact Evaluation Team will also investigate NEIs for this program, such as improved comfort, enhanced health and safety or reduced operation and maintenance costs. The first step will be to construct a list of the potential NEIs and then to select from this list a limited number of possibilities that may be measurable. The next step will be to construct questions to be included in the participant telephone survey to ascertain whether the participants perceive benefits related to the selected NEIs. The results of this analysis will be incorporated into the final report. The assessment of NEIs will build upon prior work conducted for NYSERDA on the HPwES Program.

¹⁷ Xenergy (now KEMA) conducted an impact analysis of the Low Income Energy Efficiency program in California for program year 2000 which included a large-scale billing analysis and a telephone survey of 1,000 participants. Xenergy ultimately concluded that the results from large scale billing analysis were more reliable than the smaller scale analysis that included only the telephone survey respondents. The scale of the savings were in the range of 5% of total energy use, and the extremely large sample size allowed for the estimation of these small effects. This study is available on the CALMAC website.

Alternatives to the Billing Analysis Approach

If the consumption data are not forthcoming, the Impact Evaluation Team would aim to complete an adequate number of site visits with on-site measurements to meet 90/10 confidence and precision for the statewide program. This approach would require direct measurements on a sample of homes in order to employ IPMVP Option A and then back-casting baseline conditions. This approach is less rigorous than the proposed billing analysis but considerably more affordable and easier on participants than a pre/post metering approach. Another consequence of needing an alternative approach to the billing analysis would be the inability to develop rigorous savings estimates at the utility level without a substantial increase in the budget.

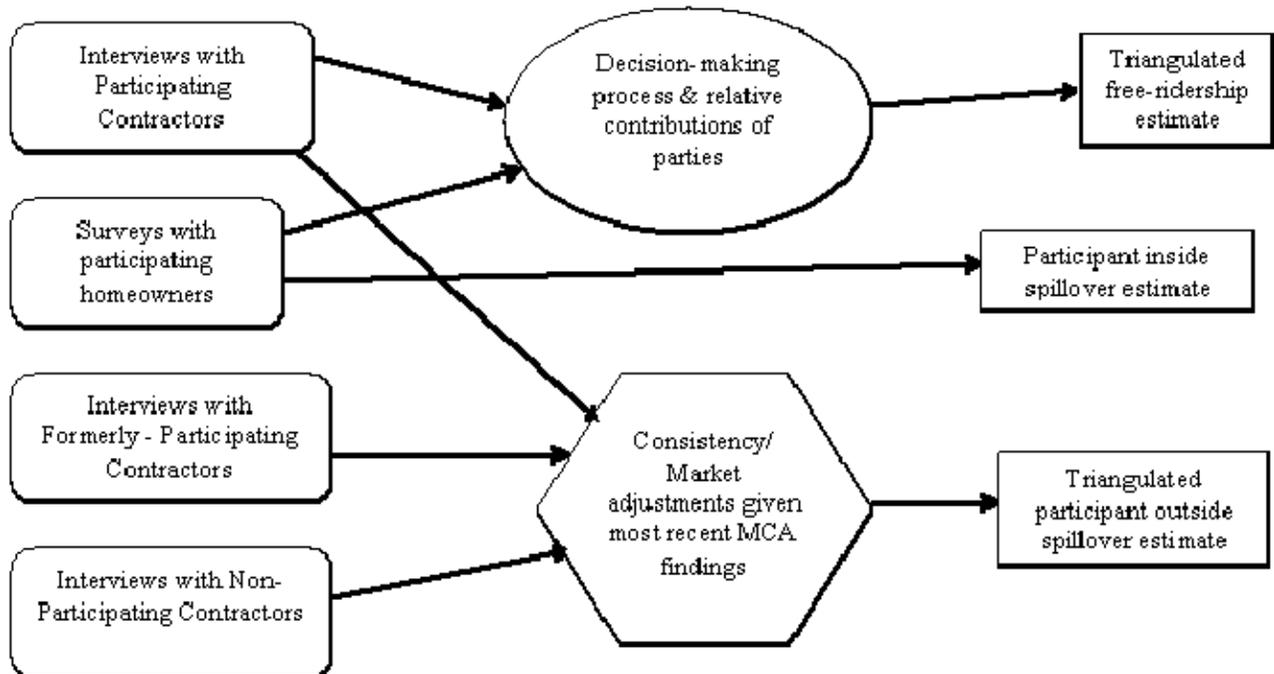
Attribution

The Impact Evaluation Team will explore participant and non-participant spillover and participant free-ridership by using an enhanced self-report survey process with multiple decision-makers. For the sampled projects, interviews will be conducted with the participating homeowners and HPwES contractors providing more than one source of information for each sampled project. Interviews with the various players will be designed to investigate the decision-making process, including the level of involvement of the participating homeowners, HPwES contractors and NYSERDA program staff. Because participating homeowners may not be aware of the influence of the program on the availability of energy-efficiency services, the evaluation effort will involve review of, and potential adjustments to, their responses about free-ridership based on participating contractors' judgments regarding the program's influence on their offering of such services.

The Impact Evaluation Team considered other strategies for estimating attribution, including complex statistical methods such as nested logit and structural equation modeling, as well as the possibility of pursuing some variation of cross-state comparisons. The complex statistical methods require the collection of data from a significant sample of non-participating homeowners that obtained a similarly comprehensive home assessment (CHA) and efficiency measures. The statistical models measure the characteristics and attitudes common to the participating and non-participating homeowners with both CHAs and efficiency measures in order to correct for the self-selection bias within participation. Reliable identification of homes with CHAs is not possible. Contractors will generally say they offer a comprehensive assessment without understanding the requirements within the program-defined CHA. This same difficulty also applies to obtaining valid data for a cross-state comparison from interviews with contractors in the comparison areas without a similar program.

The self-report approach proposed for this evaluation includes enhancements from comparing the responses from multiple perspectives and incorporating this information into the estimation of net effects. These inquiries will also add depth to the measurement of free-ridership by comparing the information provided by multiple decision-makers to support an analysis of construct validity and produce greater reliability in the estimates. Figure 3 outlines the various sources of information that will be used within the enhanced self-report approach for this evaluation.

Figure 3. Enhanced Self-Report Process for the HPwES Program FR & SO Estimates



Among participating homeowners and contractors, the Impact Evaluation Team will examine inside spillover (participating homeowners who install additional measures beyond those included in program records), and outside spillover (participating contractors who install measures at non-participating homes because of the influence of the program).

A recent HPwES evaluation showed a modest spillover effect (2% of program savings) from partial participant spillover (homeowners who received a comprehensive home assessment (CHA) and installed at least some of the recommended measures, but not through the program).¹⁸ This previous report indicates that this segment of program participants is difficult to identify due to the lack of program tracking data, suggesting that a critical component for improving the estimated savings relies on enhanced program tracking of partial participants. If NYSERDA decides to pursue collecting additional information on partial participants as part of its program-level tracking, the Impact Evaluation Team may be able to develop more rigorous methods of estimating savings through conducting a billing analysis for these participants. However, there are still substantial uncertainties relating to the details and timing of the installations which may affect the reliability of the billing analysis. Since the savings associated with this segment of program participants are quite modest and the billing analysis is not certain to produce reliable results, the additional costs of the evaluation may not be warranted and the costs are not included in this budget.

¹⁸ "New York Home Performance With ENERGY STAR® Program Market Characterization, Market Assessment and Causality Evaluation," prepared for NYSERDA by Quantec and Summit Blue Consulting, May, 2006. Savings estimates were based on average savings per measure group for full program participants, and then applied to partial participants based on telephone survey responses.

The Impact Evaluation Team will further investigate non-participant spillover among contractors (measures installed by non-participating contractors because of the influence of the program). Non-participant spillover among homeowners (measures installed by non-participating homeowners because of the influence of the program) will not be considered since the incidence is likely to be low, making it difficult to attain the desired precision levels. This latter spillover could also overlap with the contractor spillover and would be difficult to separate the two in order not to double-count program spillover.

In addition, recent impact evaluation activities for HPwES suggest that there may be significant spillover from formerly participating contractors. After initial participation in the program, these contractors continue to install products and employ methods promoted through the HPwES, but without direct program support. This avenue will be more thoroughly explored in the 2009 evaluation.

These methods will be used to derive a draft triangulated net-to-gross ratio (NTGR) which will provide a high level of construct validity for the net savings estimates. These draft NTGR results will be reviewed and discussed, along with the Impact Evaluation Team's recommended triangulation method, with DPS staff and the NYSERDA evaluation project manager. Based upon comments received in this review, the Impact Evaluation Team will finalize the free-ridership and participant spillover estimates. The enhanced self-report components and overall process for the development of these estimates is illustrated in Figure 3.

Populations/Samples

Sampling will likely be a component in the estimation of both gross and net impacts, as discussed in more detail below. For this program, sample sizes are designed to obtain the 90/10 confidence/precision targets at the program level. Historically, the vast majority of the program activity has occurred in the upstate region. From the beginning of 2007 through June, 2009, 98% of the projects and 96% of the savings occur in the upstate region. Consequently, the additional costs associated with sampling on an upstate/downstate basis do not seem to be warranted. It may be possible to obtain separate upstate/downstate estimates for gross savings through the billing analysis if there are a sufficient number of homes in each region to obtain reliable estimates.

Gross Impact Sampling

For the verification of gross savings, the preferred impact evaluation approach is a billing analysis. In this case, all participants with sufficient billing history will be included in the analysis and no sampling will be necessary. Thus, there will be no sampling error, and it will also be possible to conduct the analysis at the utility level.¹⁹

The Impact Evaluation Team also intends to field a telephone survey to expand the data inputs into the billing analysis. This survey will be leveraged to support the net-to-gross and NEI components of the study. There is no clear consensus on how to determine sample sizes to reach a specific precision/confidence level for the type of complex, multivariate analysis planned for this program. Based on previous experience with other residential program evaluations and given the expected savings in comparison to pre-installation energy use (15%), the Impact Evaluation Team estimates that 600 completed surveys are likely to comprise a sufficient sample size to estimate household savings at the

¹⁹ The ability to estimate gross savings by utility will depend on the number of homes served in each utility's territory. In some cases, there may be too few homes in the model to be able to obtain reliable savings estimates.

target precision of 90/10 or better at the program level.²⁰ A stratified random sample for the telephone survey will be selected based on annual household energy use and region, for the purposes of ensuring that the sample represents the total program population in terms of these key parameters. The utility billing records will be needed prior to the sampling to ensure that sufficient billing history is available for all participants selected for the telephone survey.

The models will be run including all participants with sufficient billing records and also with the restricted sample from the telephone surveys. The results from both analyses will be presented and compared, with a discussion of the reliability, precision and potential bias (if any). If the precision target cannot be met with the restricted sample, the results from the more comprehensive model can be used as the source of final program savings.

Should utility billing data not be made available to NYSERDA and site visits be required, the Impact Evaluation Team will attempt to complete a sufficient number of site visits with direct measurement to estimate savings with the 90/10 confidence and precision standard statewide as well as on an upstate versus downstate regional basis. However, it should be noted that this approach is suboptimal and may have negative impacts on program participation. Additionally, using this evaluation approach would require funding from elsewhere within NYSERDA's evaluation budget to support the substantial costs of on-site surveys with the sample size required to attain 90/10 confidence and precision. If this evaluation approach is required due to the inability to obtain a comprehensive set of billing data, then site visit data will be collected and analyzed by the Impact Evaluation Team following established evaluation protocols. The budget estimate below does not reflect this scenario.

Attribution Sampling

Surveys will be fielded for participating homeowners, participating contractors, non-participating contractors and formerly-participating contractors. For participating homeowners, the attribution questions will be incorporated into the gross impacts telephone survey of participating homeowners and renters. Given that the sample size of 600 was established to provide a sufficient sample for a multivariate billing regression model, it is more than adequate to estimate the attribution parameters of interest (such as the likelihood of free-ridership and spillover) at the 90% confidence and 10% precision standard statewide, for the program. This sample size may also produce reliable utility level results that meet the 90/10 confidence/precision standard (depending upon the sampling requirements for the billing analysis versus the attribution study).

The samples sizes for the participating and nonparticipating contractors and formerly participating contractors are based on estimating a proportion and achieving the 90% confidence and 10% precision level at the program level. The finite population correction factor was applied where appropriate. The sample sizes for each survey group are provided in **Error! Reference source not found.** below. The surveys are likely to be fielded by NYSERDA's survey contractor.

Sampling Issues

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

²⁰ The power analysis was conducted with conservative assumptions, and indicated that 540 participants would be required. Given previous experience with low-income residential billing analysis, the Impact Evaluation Team further increased the sample size to 600.

- Utility usage data will be needed for all participants. This approach will require close cooperation with the utilities to obtain billing history for all participants. Even if all of the participants are correctly identified by NYSERDA and matched by the utilities, it is likely that only half of the participants will have the full two years' worth of billing records required for the analysis (12 months pre and post installation). In addition, utilities archive billing data at regular intervals and the NYSERDA data request will need to be made before data from the pre-installation period would be archived.
- Since non-participant billing data is needed for the purpose of incorporating economic trends into the billing analysis, it will be necessary to establish a method to obtain this data from the utilities. One strategy is to request the utilities to calculate average residential energy use and billed amounts for every billing cycle during the specified analysis period. A second approach is to request a large sample of residential billing records from the utilities to be able to calculate the needed trend lines. A third option is to draw on "future" participants during the period of time prior to their participation in the program.

These issues will need to be resolved to ensure that the sampling can proceed within the required time frame. The sampling plan will be developed as part of the detailed evaluation work plans, 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 HPwES staff at a minimum:

- Project level information, including address, contact information for the site owner and contractor
- Measure level information, such as a description of the measure, quantity installed, the energy savings (electric, gas and other fuels), demand savings, measure life, installation costs
- House level information, including the size of the house, the number of occupants, the fuels used for space and water heater, other 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, 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
- Utility consumption data (electricity and natural gas) for some subset of residential customers (same fields as listed above) for use in developing trend lines
- Weather data, which may be available from the utilities or from the national weather service (National Oceanic and Atmospheric Administration, NOAA)
- Economic trends, such as gasoline prices and unemployment rates, often available from public sources such as the Department of Energy and Bureau of Labor Statistics

Table 5 below displays detailed information on the planned surveys, the population, as well as the sample size and sampling precision.

Table 5. Home Performance with ENERGY STAR Impact Evaluation Survey Specifics

Target Group	Estimated Population Size	Estimated Sample Size	Expected Sampling Precision	Survey Administration By	Expected Start of Fielding
Participating Homeowners Telephone Survey	~6,000	600	90/10	Survey Contractor	September 2009
Participating Contractors Telephone Survey	132	50	90/10	Survey Contractor	Fall 2009
Non-Participating Contractors Telephone Survey	Large	70	90/10	Survey Contractor	Fall 2009
Formerly-Participating Contractors Telephone Survey	51	25 (census)	90/10	Survey Contractor	Fall 2009

Schedule and Budget

Table 6 below displays the estimated budget for Impact evaluation by year.

Table 6. Home Performance with ENERGY STAR Impact Evaluation Schedule and Budget

Evaluation Element	Estimated Budget and Completion					
	2009	2010	2011	2012	2013	Total
Impact Evaluation	\$299,000a		\$312,000a		-	\$611,000

a. Data collection costs account for 27% of the estimated Impact budget in 2009 and 26% in 2011.

VII. Process Evaluation Plan

The purpose of the process evaluation of the HPwES Program will be to, assess program operations identify potential issues, and to develop recommendations to improve program operation and performance. In addition, the evaluation will document program progress and explore the value, benefits and concerns of constructing projects and living in Home Performance with ENERGY STAR homes for contractors and households. If the program continues beyond 2011, follow-up work may be conducted in 2011 or 2012, however this work would be funded out of future evaluation budgets.

Research Objectives

The research objectives for the process evaluation of the HPwES Program are noted below. In order for the process evaluation to provide the greatest value, other relevant or necessary objectives may be added, or objectives listed below may change somewhat, as the timing of this research draws closer. Among these objectives may be an assessment of effects of the 2008-2009 economic recession on business conditions.

1. Assess and improve program performance, including:
 - a. Assess program processes with program staffs and explore opportunities to improve the efficiency and effectiveness of program opportunities to increase program outreach and throughput
 - b. Assess response to program processes from contractors to explore opportunities to improve the processes efficiency to increase program outreach and throughput, including an investigation of contractor response to BPI training and certification
 - c. Assess the response of household decision makers to the program processes and operations, and to explore opportunities to improve efficiency and effectiveness of the process and the access to program services to increase program participation

2. Explore the value, benefits and concerns associated with completing projects and living in homes treated through the HPwES Program, such as:
 - a. Contractors' perceptions of the value, benefits or concerns around completing projects using HPwES Program requirements
 - b. Household decision makers' perceptions of the value, benefits and concerns of living in homes treated through the HPwES Program.
 - c. To explore and identify ways to reduce free ridership and maximize spillover of program benefits.

3. Document activities and progress and assess efforts toward achieving the goals and objectives of the program, including:
 - a. Document the history and progress of the program through review of program materials and data, and through interviews with NYSERDA and program implementation staffs
 - b. Review program tactics and explore the response of contractors and households to program tactics
 - c. Assess barriers to participation and opportunities to reduce barriers facing contractors and households
 - d. Assess contractor and customer awareness, understanding and perception of the options for energy efficiency upgrades to homes, including new programs offered by utilities and how they relate to NYSERDA's HPwES Program.

Activities

The process evaluation team will interview NYSERDA and program implementation staff to obtain views on program progress, process, and tactics and on the value, benefits and concerns for the program. These interviews will form the basis for development of questions to ask contractors and household decision makers about program processes and tactics. The Process Evaluation Team will then coordinate with the Impact Evaluation Team to incorporate the free-rider questions into the process evaluation surveys. This will provide an opportunity to ask household decision makers about their decision making process at a time closer to their decision than the impact evaluation typically can achieve.

The Process Evaluation Team will also develop some screening questions on the value, benefits and concerns contractors and households have experienced with HPwES homes. As all questions in the surveys will necessarily be closed-ended, these questions will form the basis of selecting a subsample

from those able to provide additional information. In-depth interviews will then be conducted with this subsample of contractors and household decisions makers to obtain in-depth information on perceptions of the value, benefits and concerns (for contractors) of constructing projects and (for household decision makers) of choosing this approach and living in a HPwES home. The survey respondents who have comments on the values and benefits of the program and are willing to participate in a second interview is likely to be small. By using the survey to identify those with either positive or negative experiences of the program, it is assumed that bias in responses to the in-depth interviews can be minimized.

To obtain data as close as possible to the program participation experience, the data collection efforts will be conducted in fall 2010 for those who have participated in the program between August 2009 and August 2010. The final report will be completed in February 2011.

Populations/Samples

Table 7 displays the samples assumed for the direct work the process evaluation team will implement. The samples will be drawn from the program database for participants and partial participants between August 2009 and August 2010.

Data Collection

The Process Evaluation Team will conduct interviews with NYSERDA and with program implementation and quality assurance contract staff involved with the HPwES Program. The Process Evaluation Team will implement a survey of participating market rate and assisted project household decision makers and partial participating households. The survey of households will include free-rider questions that will help the impact evaluation team assess free-ridership among these 2009 – 2010 participants. Subsamples of participating and partial participating household decision makers will be selected from the surveys for in-depth interviews to better understand the value and benefits of the program for participants.

In addition, the samples selected for the market assessment surveys in 2010 will be used for selection of subsamples to be interviewed for the process evaluation (out of a population of 132 participating contractors, 140 nonparticipating contractors and 51 formerly participating contractors). Subsamples from each of these samples will be selected from the surveys for in-depth interviews to better understand the value and benefits of the program for households and contractors. As these subsamples will depend greatly on the willingness of contractors and household decision makers to engage in an additional survey with the evaluators, the Process Evaluation Team intends to offer a small \$25 honorarium to interview respondents.

Table 7. HPwES Process Evaluation Survey Specifics August 2009 – August 2010 Participants

Target Group	Estimated Population Size	Estimated Sample Size	Expected Sampling Precision	Survey Administration By	Expected Start of Fielding
NYSERDA and contracted implementation staffs	6	6	NA	Process Team	May 2010
Participating Market Rate Household Decision Makers	2,589	400	95/5a	Survey Team	Oct 2010
Participating Assisted Projects Household Decision Makers	1,217	400	95/5a	Survey Team	Oct 2010
Partial Participating Households	TBD	70	90/10a	Survey Team	Oct 2010
Participating Contractors ¹	132	25	NA	Process Team	Nov 2010
Formerly-Participating Contractors ¹	~25	<10	NA	Process Team	Nov 2010
Participating Market Rate Household Decision Makers ²	400	30	NA	Process Team	Dec 2010
Participating Assisted Projects Household Decision Makers ²	400	30	NA	Process Team	Dec 2010
Partial Participating Households ²	70	10	NA	Process Team	Dec 2010

¹ Populations are the sample of anticipated completes from the market surveys (Table 3)

² Populations are the sample of anticipated completes from the surveys

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

Special Issues

The impact, process and market evaluation teams will need to closely coordinate survey development. The process team will use the free-rider questions from the impact team for the participant surveys. The survey contractor will help integrate the questions to ensure the data collection process is comparable to that expected for the impact evaluation. The Process Evaluation Team will draft process questions for inclusion in the market survey of contractors. The survey contractor will help integrate the questions to ensure the data collection process is effective.

Schedule and Budget

Table 8 displays the schedule and budget allocation by year and evaluation element.

Table 8. HPwES Process Evaluation Schedule and Budget

Evaluation Element	Estimated Budget and Completion					
	2009	2010	2011	2012	2013	Total
Process Evaluation		\$193,000a,b	-	-	-	\$193,000

a. Data collection costs are \$10,000 for interviews, \$90,000 for surveys, plus \$2,500 for honorarium to respondents.

b. If the program continues beyond 2011, follow-up work may be conducted in 2011 or 2012. However, this would be funded out of future evaluation budgets.

VIII. NYSERDA Evaluation Process

This evaluation plan is an early, but important step in NYSERDA’s evaluation planning and implementation process. It is NYSERDA’s understanding that DPS Staff wish to be involved as a reviewer/participant in the following parts of the evaluation process: detailed evaluation plans, project kick-off meetings, workplans (including sampling, statistics and modeling issues), data collection

instruments, interim results reports (as applicable), presentation of evaluation results, and draft evaluation reports. NYSERDA will conduct evaluation planning and implementation in an open and transparent manner, and will invite DPS Staff participation in the designated aspects of the process and any others upon DPS' request.²¹ Should DPS Staff choose to modify the level or manner of their involvement, NYSERDA should be notified about the change(s). DPS Staff should also choose when and how to involve their evaluation advisor consultant team in NYSERDA's evaluation processes, should directly provide any materials and information necessary for their advisor consultant team to fulfill this role, and should notify NYSERDA about the type and level of advisor consultant involvement.

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

1. Ongoing communications between the NYSERDA evaluation staff and evaluation contractors to identify issues that need to be brought to the attention of NYSERDA program staff, DPS Staff, and other involved parties.
2. Interim results reports may be generated, sometimes at the request of NYSERDA program staff and sometimes by initiative of NYSERDA's evaluation team and contractors, where early results are required or deemed useful prior to completion of the full evaluation effort.
3. Presentations of draft evaluation results held with NYSERDA evaluation contractors, evaluation team, program staff, and DPS Staff before evaluation reports are written provide feedback on the programs as soon as possible, and provide evaluation contractors with additional perspective and context that will be useful in reporting final recommendations.

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

IX. Reporting

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 and results will be communicated by NYSERDA's evaluation contractors and evaluation staff to NYSERDA program staff. Actionable recommendations and information on program progress toward goals will be provided as input to the program design and improvement process. NYSERDA's evaluation staff will follow up regularly with

²¹ In order to maintain transparency, and allow for confirmation checking and follow-up analysis, evaluation data will be maintained by NYSERDA and made available to DPS on an as-needed basis. NYSERDA will continue to maintain its secure "data warehouse" which includes data files, code books, and analysis files which can be made available in electronic form to DPS upon request. In order to provide a comprehensive record of each study conducted, the data warehouse also holds copies of final evaluation reports and appendices, including blank survey instruments, although these documents will be made available to DPS and publicly upon completion of each evaluation project.

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.

VIII. 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. If available, NYSERDA will also present benefit/cost scenarios that include non-energy impacts.

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.