

# NYSERDA NEW YORK ENERGY STAR<sup>®</sup> HOMES PROGRAM

## Evaluation, Measurement, and Verification Plan

July 29, 2009

### 1. Introduction

The detailed evaluation plan presented in this document builds upon prior evaluation activities conducted for the New York ENERGY STAR Homes (NYESH) 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 NYESH 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 NYESH Program supported by SBC funding, including both the market-rate and low-income program components.

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

The overarching goals of NYSERDA's New York Energy \$mart<sup>SM</sup> 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 NYESH Program evaluation are to:

- (1) Establish rigorous and defensible estimates of the savings that can be attributed to the efficiency associated with the ENERGY STAR Homes Program. The primary focus of the impact evaluation will be on verifying the inputs used for modeling savings and comparing the as-built homes to an appropriate baseline.
- (2) Develop a comprehensive understanding of current and emerging markets, including growth trends in eligible residential construction activity, market decision making and an assessment of code compliance among participating builders and other market actors.
- (3) Assess NYESH Program accomplishments and market penetration including geographic distribution of participating builders, projects, and associated program reported energy savings. This includes assessing the awareness of NYESH Program, efficiency, and green building features, and familiarity

with and use of certified Home Energy Rating System (HERS) Raters.

- (4) , Assess and identify any program process concerns and develop recommendations to improve program processes and performance.
- (5) Explore the value, benefits, and concerns of building and living in ENERGY STAR homes for builders and home owners.

The New York Energy Star Homes Program budget (Third Quarter 2008 through 2011) is comprised of approximately \$22.2 million in SBC funds. The proposed evaluation budget is nearly \$1.2 million, or approximately 5% of program funding.<sup>1</sup> NYSERDA believes this level of funding for evaluation is justifiable and adequate to achieve a high level of confidence and precision related to program impacts as well as address key process and market evaluation issues. Annual budgets for each evaluation component are shown in Table 1.

**Table 1. NYESH Program Evaluation Schedule and Budget**

Evaluation Element	Estimated Budget and Completion					
	2009	2010	2011	2012	Total	% of Total Evaluation Budget
Market Characterization & Assessment		\$210,000a			\$210,000	18%
Impact Evaluation	\$413,500b			\$412,500b	\$826,000	72%
Process Evaluation			\$115,500c		\$115,500	10%
<b>Total</b>	\$413,500	\$210,000	\$115,500	\$412,500	\$1,151,500	100%
a Primary data collection costs represent approximately 38% of the total proposed evaluation budgets. b Primary data collection costs represent approximately 15% of the total proposed evaluation budgets. c Primary data collection costs represent approximately 23% of the total proposed evaluation budgets.						

### 3. Program Goals

The goal of the New York ENERGY STAR Homes Program is to implement and promote an enhanced version of the U.S. Environmental Protection Agency’s (EPA) ENERGY STAR Program in New York State. The program provides technical assistance and targeted financial incentives to residential builders

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<sup>1</sup> 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.

and income eligible homeowners<sup>2</sup> to encourage the adoption of energy efficient design features and the selection and installation of more energy efficient equipment. The program targets owners and builders of one to four unit homes, along with Home Energy Rater System (HERS) raters and provides technical assistance and financial incentives to encourage adoption of energy efficient design features and the selection and installation of more energy-efficient equipment in new construction and substantial renovation projects. ENERGY STAR rated buildings use approximately 30% less energy than homes built to current energy code. As part of the EPA’s ENERGY STAR requirements, each home must include a qualified ventilation system; have electrical savings measures (either ENERGY STAR lighting or appliances) that produce annual electricity savings of 600 kilowatt-hours, compared to standard efficiency measures. Performance must be verified by a certified HERS rater who acts as the independent third party, ensuring that these homes meet program criteria.

Table 2 below displays program goals from the SBC III Operating Plan and achievements to date.<sup>3</sup> These goals apply to the five year funding period from July 1, 2006 to June 30, 2011.

**Table 2. ENERGY STAR New Homes Program Goals**

Activity	Five-Year Goal	Achieved (as of March 31, 2009)
New Homes built through NYESH	10,750	6,350
New low-income homes built through NYESH	4,000	16
Electricity Savings (GWh) <sup>1</sup>	8.9	13.8a
Fuel savings (MMBtu) <sup>1</sup>	518,500	339,052

1 GWh and MMBtu savings goals include targets for projects for low-income homeowners  
a Of this total, 0.5 GWh have been saved in the Con Edison service territory.

#### 4. Logic Model/Theory

Figure 1 shows 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 discussions in a brief program theory/logic report, which includes a logic model diagram for the program.

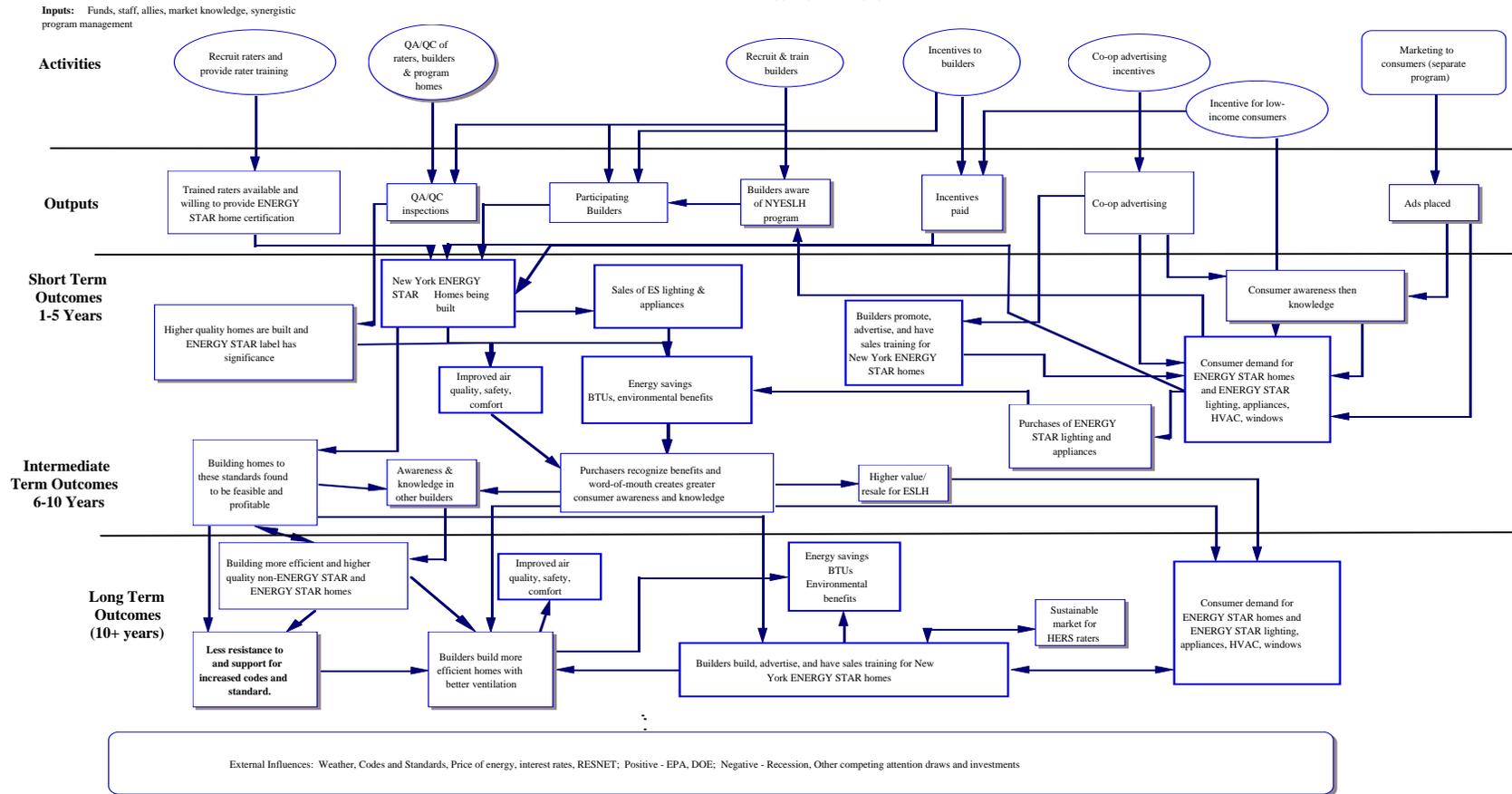
<sup>2</sup> Homeowners are eligible for incentives only if they participate in NYSERDA’s Assisted Energy Star Homes Program. To be eligible for this program participants’ household income is 80% or less than the state median income. For more information on the Assisted Energy Star Homes Program see *System Benefits Charge, Proposed Plan for New York Energy \$mart<sup>SM</sup> Programs (2006-2011)*, as amended March 2, 2006.

<sup>3</sup> *System Benefits Charge, Proposed Plan for New York Energy \$mart<sup>SM</sup> Programs (2006-2011)*, as amended March 2, 2006.

NYSERDA will invite DPS Staff to participate in logic model workshops and review draft program theory/logic reports.

**Figure 1. New York ENERGY STAR Labeled Homes Logic Model**

## New York ENERGY STAR Labeled Homes Logic Model March 2007



## 5. Market Characterization & Assessment Plan

This section presents the Market Characterization and Assessment (MCA) evaluation plan for the New York ENERGY STAR Homes (NYESH) 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.<sup>4</sup>

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 NYESH Program 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*

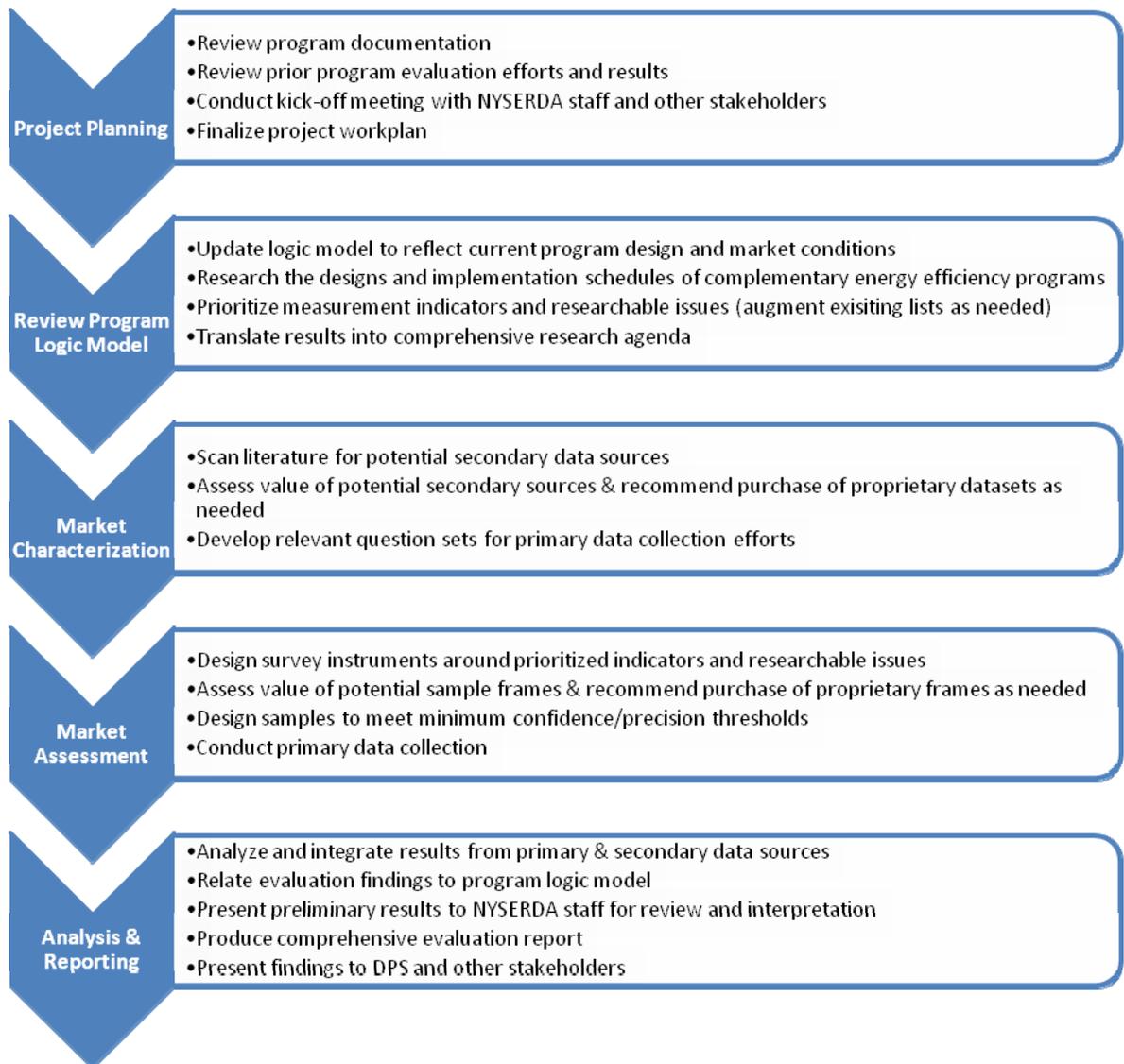
The proposed MCA evaluation plan for the NYESH Program consists of multiple activities (blue arrows) and associated research tasks (bulleted lists), as shown in Figure . The approach will make use of a variety of primary and secondary data sources to generate information on a number of topics relevant to the NYESH Program including: program accomplishments and market share in terms of participation rates within key market actor groups; changes in customer and builder awareness and understanding of measures and practices promoted by the program; and customer and builder 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 *NYESH Program Logic Model Report*<sup>5</sup>, 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.

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<sup>4</sup> Evaluation activities for this program may be adjusted pending further guidance related to possible statewide residential new construction baseline evaluation activities.

<sup>5</sup> **New York Energy \$mart**<sup>SM</sup> Single Family Home Performance Program Logic Report, March 2007. See Section III of this document for additional details regarding the NYESH 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 NYESH 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 NYESH 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 NYESH *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 NYESH Program tracking databases; previous evaluation reports prepared for NYSERDA and for similar programs operating in other jurisdictions; US Census data; 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 new construction 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 investigating this finding further.

Example market characterization metrics to be developed pending data availability include, but may not be limited to:

- Growth trends in the eligible residential construction activity
- Participating builders/market actors (including the most active market actors) and their roles in market decision-making (*e.g.*, for energy efficiency, design/construction practices)
- Current market practices, behaviors, and perceptions of market barriers and opportunities, including an assessment of code compliance among builders
- NYESH Program accomplishments and market penetration including geographic distribution of participating builders, projects, and associated program reported energy savings
- Impact of the most active participating builders, including the number of and value of homes built by these builders compared to the total market and the influence these builders may have on increasing program awareness and changes in non-participating builder practices
- Other metrics as identified

## Market Assessment

Market Assessment results will be generated through primary data collection efforts with NYESH Program participating and former participating builders, participating homeowners, and comparison non-

participant groups eligible to participate in the program (See the 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.<sup>6</sup> 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 new construction growth exists in the downstate New York region; however, program participation in that area has been minimal. Market assessment activities will assist in investigating this finding further.

Example indicators to be measured during the market assessment work include<sup>7</sup>:

- Builder and homeowner awareness of the NYESH Program, efficiency and green building features, and familiarity with and use of certified Home Energy Rating System (HERS) raters
- Participating builder satisfaction with the program and perceived value (*e.g.*, increased profitability, increased consumer demand) from participation
- Availability of ENERGY STAR rated homes, builders, and efficiency equipment
- Builder perception of the profitability of building ENERGY STAR homes
- Changes in energy efficiency practices and program influence on those changes among builders and homeowners
- 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 NYESH Program as well as the success of program intervention strategies. All data sources used in the analysis and reporting phase of the project will be clearly cited to ensure a transparent record of activities undertaken. In addition, evaluation findings will be related back to the outputs and outcomes anticipated by the program logic model to help NYSERDA staff and other project stakeholders better assess program accomplishments to date.

Before preparing the final evaluation report, the MCA Team will present preliminary results to NYSERDA evaluation staff, NYESH Program staff, and other project stakeholders to review key findings, clarify discussion points as necessary, and ensure proper 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

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<sup>6</sup> 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.

<sup>7</sup> The MCA team will coordinate with the other evaluation specialty contractors (*e.g.*, Process) should measurements on specific indicators overlap.

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 NYESH Program will involve primary data collection with NYESH Program participating and former participating builders, participating homeowners, and comparison eligible non-participant groups. The MCA Team will work closely with NYSERDA’s survey data collection contractor 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.<sup>8</sup>

Current estimates regarding sample sizes, expected sampling precision, and anticipated survey fielding dates for the 2010 MCA evaluation are summarized in Table 3. These estimates will be finalized prior to undertaking the planned evaluation and once the MCA Team more thoroughly analyzes program participation data.

**Table 3. NYESH Program 2010 MCA Evaluation Specifics**

Target Group	Estimated Population Size	Estimated Sample Size	Expected Sampling Precision <sup>1</sup>	Survey Administration By	Expected Start of Fielding
Participating Homeowners	4,377	140a	90/7	Survey Contractor	October 2010
Nonparticipating Homeowners <sup>2</sup>	Large	140a	90/7	Survey Contractor	October 2010
Participating Builders	290	140a	90/7	Survey Contractor	January 2011
Nonparticipating Builders	4,493	140a	90/7	Survey Contractor	January 2011
Former Participating Builders	441	140a	90/10	Survey Contractor	January 2011

<sup>1</sup> Assumes proportional sampling, two-tailed test, finite population correction.  
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.  
<sup>2</sup> The nonparticipating homeowner sample will be identified through a random digit dial survey conducted through the **New York Energy \$mart<sup>SM</sup>** Products Program Evaluation. The survey is described in more detail within that Program’s evaluation plan.

<sup>8</sup> 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 telephone<sup>9</sup> and will consist of the following steps undertaken by the 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 identified<sup>10</sup>, 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.

The proposed MCA evaluation schedule and budget for the NYESH 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 follow up MCA evaluation could be conducted in 2012 to allow for continuous monitoring of the residential new construction market, provide insights on future program design and inform how future programs may be shaped. This follow up study could be funded out of the future evaluation budget.

**Table 4. NYESH MCA Schedule and Budget**

Evaluation Element	Estimated Budget and Completion					
	2009	2010	2011	2012	2013	Total
Market Characterization & Assessment	-	\$210,000a	-	-	-	\$210,000

a Primary data collection costs represent approximately 38% of the total proposed evaluation budget.

## Impact Evaluation Plan

The NYESH Program has constructed over 13,000 new ENERGY STAR Homes since inception through December 2008. Impact evaluation for homes constructed during 2007 and 2008 is proposed for 2009. The plan includes detailed modeling for each sample home and calibrated to billing records. The last impact evaluation will be conducted in 2012, allowing time for two years of post-retrofit consumption data to accumulate for projects completed during 2009 and 2010.

<sup>9</sup> Surveys will be designed to take approximately 20 – 30 minutes to complete.

<sup>10</sup> Pretest interviews will be included as completed interviews unless major revisions to the instruments are made.

## ***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. Each of these key aspects of impact evaluation is discussed briefly below.

### **Determine Realization Rates for Gross Savings**

A critical component of the impact evaluation is to develop rigorous estimates of the realization rates for gross electricity, demand and fuel savings. For this residential new construction effort, the primary focus will be on verifying the inputs used for modeling savings and comparing the as-built homes to an appropriate baseline.

### **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 builders, non-participating builders and formerly-participating builders.

### ***Precision and Bias***

Sample sizes will be designed to target 90/10 precision for natural gas and electric savings on a statewide basis. Given the high variability in energy use from house-to-house in the residential sector, sample sizes tend to be large and constructing a sample to obtain results at the 90/10 level for each utility territory will be likely to be cost-prohibitive. Since only 3% of the energy savings claimed for SBC3 to date are in the downstate region, developing separate estimators by upstate/downstate region is not warranted. This issue will be revisited prior to the 2012 evaluation to determine whether a modification in approach would be indicated by the distribution of projects completed in 2010 and 2011.

Methods will be selected to minimize self-selection, non-response and other sources of bias, to the extent possible. For example, bias can be controlled by using the telephone surveys to gather information on non-program changes that affect energy consumption, such as a change in occupancy that can then be properly addressed in the analysis. 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 - 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, or what would have been built or purchased, for any given home.

The NYESH Program uses the simplifying assumption that the New York State building code is the baseline. Nevertheless, for both actual practice and net-to-gross/attribution (NTG), performing a true baseline study of residential 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 residential sector may simplify the estimation of gross and net impacts for this program and provide more accurate and more precise savings estimates.. However, even if such a study were currently being planned, it would provide information for a 2009 or 2010 baseline, and would not apply to the 2007 and 2008 projects being evaluated in 2009.

There are a number of possible approaches to the developing an interim baseline that are likely to be an improvement over the New York State building code. The 'Baseline Estimation for the 2009 Impact Evaluation' describes the Impact Evaluation Team's proposal for an interim strategy that minimizes costs while still allowing for the estimation of a defensible baseline. For the 2012 evaluation, the results of the statewide baseline study are assumed to be available and impacts could be estimated from the statewide baseline.

### M&V Activities

M&V activities will involve the analysis of the detailed project files already available through the program to determine the estimated energy use for the home as built. This modeling will then be calibrated to actual billing records to ensure incorporation of the unique aspects of the home and its occupants to accurately estimate the energy use. Then models will be rerun substituting values for key measures (HVAC, shell, etc.) to be consistent with the baseline; the difference will be the gross savings from the program. This approach will be applied to space heating, space cooling and water heating.

This file review will be supplemented by a telephone survey of participating homeowners to obtain additional information about the current occupancy of the home and major appliances or energy-intensive equipment that may not be included in the program-level data, such as a pool or driveway heaters. If necessary, the Impact Evaluation Team will request that homeowners sign a waiver to allow the gas and electric utilities to release the billing data for the home. The Impact Evaluation Team will maintain the confidentiality of all billing and other home-specific data.

The software used to perform the modeling will be the same software used by the program implementation contractor to perform the home energy ratings. Designed by Architectural Energy Corporation, Inc. (AEC), REM/Rate™ is a Windows-based residential energy analysis, code compliance and energy rating software developed specifically for the needs of Home Energy Rating System (HERS) providers and the administrators of the U.S. EPA's ENERGY STAR® Home labeling guidelines and the subsequent state and utility programs that adopt the EPA's ENERGY STAR® guidelines. REM/Rate calculates estimated consumption and costs for various end-uses (*i.e.* heating, cooling, hot water, lighting, and appliances) for new and existing homes. In addition, the home energy rating is calculated based on guidelines developed by the National Association of State Energy Offices (NASEO/RESNET). Members of the program evaluation team are licensed users of REM/Rate software and have extensive experience with its use as a tool for estimating energy savings.<sup>11</sup>

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<sup>11</sup> The modeling software also generates a prediction for demand (kW) savings from the as-built home being modeled. This output will be compared to estimates based upon NYSERDA residential load shapes to estimate demand after deriving the evaluation's *ex post* energy savings to determine the most reliable *ex post* demand savings estimate.

The output from the models will be compared to the billing history for each home to calibrate the savings to actual use. This process will be based on comparing the total household gas energy use from the model to the actual energy consumption for each home. This type of model calibration to billing data for the heating-related measures for homes with an oil or propane primary heating system is not reasonable 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.

Due to the limitations of the modeling software, savings for the electric appliances and lighting will not be calculated directly from these tools. For appliances such as refrigerators, dishwashers and clothes washers, additional information regarding occupant use will be collected through the telephone surveys (such as number of dishwasher cycles and loads of laundry per week), and the savings will then be calculated based on this site-specific information. For lighting, the location of the efficient fixtures will be determined from program records (if possible) and lighting savings will be estimated based on the location of the fixtures and external studies of average lighting use in the specified locations. Otherwise, a simplified on-site survey may be conducted to obtain site-specific information regarding the location of the efficient fixtures and hours of use for all of the homes in the sample. Another possibility would be to rely on the results of the planned residential CFL study.

In addition, a detailed on-site verification will be conducted for 20% of the homes selected for the project review to verify the inputs into the energy modeling.<sup>12</sup> It will not be possible to inspect some energy characteristics of the homes, such as wall insulation and the U-value of the windows, however blower door tests will be conducted and infrared scans can be used to identify any gaps in the insulation. The on-site inspection will also include verification of the heating and cooling equipment, testing windows for low-E coating, and collecting other inputs needed for modeling with the REM/Rate™ software. If this process indicates substantial discrepancies between the actual and recorded conditions, the Impact Evaluation Team will consider whether additional on-site inspections are required.

#### Baseline Estimation for the 2009 Impact Evaluation

The Impact Evaluation Team has identified several possible options for estimating the baseline to be used in the 2009 evaluation. The challenge is to collect unbiased and complete data to estimate baselines for all targeted measures. The method proposed below incorporates a combination of methods that offer the highest reliability at the lowest cost.

The baseline for the 2009 evaluation will be based on a re-analysis of data collected through another study conducted recently in New York<sup>13</sup> and supplemental primary data collection. The following steps will be undertaken to provide the data to support the baseline. The information sources to be drawn upon are also referenced below.

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<sup>12</sup> For the purposes of developing an initial budget, the Impact Evaluation Team assumed that on-site inspections will be conducted for 40 of the 140 selected sites. These inspections are expected to include blower door tests and infrared imaging as well as all other information used to complete a Home Energy Rating (HERS Index)..

<sup>13</sup> "Reference Design Guide For Highly Energy Efficient Residential Construction," NYSERDA Report 07-13, prepared by the Vermont Energy Investment Corporation and Conservation Services Group, July, 2007.

- The first step is to conduct an assessment and select primary parameters for baseline development. The Impact Evaluation Team will review the range of measures installed through the program and the method(s) used to estimate savings. The primary baseline parameters may include (but are not limited to) average insulation levels, air infiltration, duct leakage, annual fuel use efficiency (AFUE) for heating equipment, type of heating equipment, type of water heater equipment, water heater efficiencies, the incidence of CFL fixtures, air-conditioner SEER, and dishwasher energy factor. A recent study conducted for the NYESH program for purposes of improving program performance included the collection of some baseline data from homes in New York and from builders.<sup>14</sup> The Impact Evaluation Team will review the sampling methods and re-analyze the primary data collected for this study to assess its ability to support estimation of the specified baseline parameters (as identified in the step above) in a reliable manner. An assessment will be made for each parameter to determine whether the available data are reliable and can be used to develop the primary baseline factors. This analysis will also identify a list of primary baseline factors requiring that additional information be collected.
- The builder surveys currently planned for the NTG evaluation could be expanded to inquire about standard practice for the primary baseline factors identified above where more information was needed. The impact team will compare data collected by the MCA team on code compliance against builder responses.

It is also possible that this primary method may not be tractable or as reliable as hoped (depending upon the ability to use the prior New York new home study and the level of information needing to be collected from builders). An alternative would be to construct a sample of non-participants homes as a matched sample to participants, stratified by characteristics such as home size, upstate/downstate, etc. Site visits would be conducted with these new homes to determine baseline conditions. This approach would require developing the sample frame for non-participants, obtaining permission to inspect their homes and review their billing data, and then performing the inspections and analyzing the results. Incentives would need to be offered to non-participants to gain cooperation. This is a high cost alternative and would likely double the costs for the 2007-2008 impact evaluation.

#### Alternatives to the Calibrated Modeling Approach

If energy use data cannot be obtained, the Impact Evaluation Team plans to design an evaluation based on conducting site visits and on-site measurements for the full sample of project review homes. This alternative approach would involve on-site measurements and incentives to the evaluation participants, substantially increasing the cost of the evaluation. This approach may also require reallocation of the evaluation budget and changes to plans for the market and process evaluation components.

#### ***Attribution***

The approach to attribution for this program relies on enhanced self reports, in which the survey process compares the results from various decision makers to support an analysis of construct validity. This strategy addresses many of the issues raised by evaluations based solely on self-reports from one type of participant, *e.g.*, homebuyers.

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

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<sup>14</sup> *Ibid.*

collection of data from a significant sample of non-participating home buyers that purchased a similarly efficient home. The statistical models measure the characteristics and attitudes common to the participating and non-participating efficient home buyer in order to correct for the self-selection bias within participation. It would be very difficult to identify new homes as efficient as program homes to be used in these analyses. Even if enough of these types of new homes could be identified, the costs of finding them and collecting the necessary data could nearly double the required budget for evaluating this program. To construct a valid cross-state comparison, it is necessary to find an appropriate state (or states) to match to New York, to identify the relevant types of data for the analysis, and to determine whether this data is actually available for the selected state(s). Typically, data is available only for specific technologies (if it is available at all), whereas the NYESH program is targeted toward improving the overall efficiency of the home. Attempting to identify and measure the efficiency level for new homes in a comparison area without an ENERGY STAR home program (*i.e.*, not relying on HERs rated new homes) would be equally difficult to the challenge above of identifying and measuring non-participant efficient homes. Given that this program reflects a small part of NYSERDA's portfolio (less than 5% of the residential savings), the Impact Evaluation Team concluded that enhanced self-reports are the most reasonable and least costly alternative.

The Impact Evaluation Team will explore participant spillover and free-ridership by using an enhanced self-report survey process with multiple decision-makers including builders and homebuyers. Because participating homebuyers may not be aware of the influence of the program on the availability of ENERGY STAR homes, the evaluation effort will use the builders' self-reports as the foundation for the free-ridership estimate and then involve review of, and potential adjustments to, their responses about free-ridership based on the relationship between responses on new home search criteria for the participating homeowners and that participating builders' judgments regarding the program's influence on their production of these homes and homes with these characteristics.<sup>15</sup> 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.

Among participating homebuyers and builders, the Impact Evaluation Team will examine inside spillover (participating homebuyers who install additional measures beyond those included in their ENERGY STAR home) and outside spillover (participating builders who install measures at non-participating homes because of the influence of the program).<sup>16</sup>

The Impact Evaluation Team will further investigate non-participant spillover among formerly-participating builders and never-participating builders (measures installed by non-participating builders because of the influence of the program).<sup>17</sup> Non-participant spillover among homeowners (measures installed by non-participating homeowners because of the influence of the program) will not be

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<sup>15</sup> The awareness of the Energy Star Homes label among home buyers in New York State is quite high. The 2004 MCA evaluation of this program found that 52% of homeowners who either purchased a new home or underwent a home renovation outside of the program were aware of New York Energy Star New Homes. (Energy Star® Labeled Homes and Home Performance with Energy Star® Phase 1 Market Characterization, Assessment, and Causality (MCAC) Evaluation, July, 2004, page 4-2)

<sup>16</sup> The most recent prior MCA study will also be reviewed to assess consistency between that study's participating and non-participating home buyers and their decision-making as compared to the self-reported responses gathered as part of this impact evaluation.

<sup>17</sup> The 2006 evaluation of this program found significant outside spillover (by participating builders' influence on non-participating homes they build), and non-participant spillover by both former participating builders and non-participating builders.

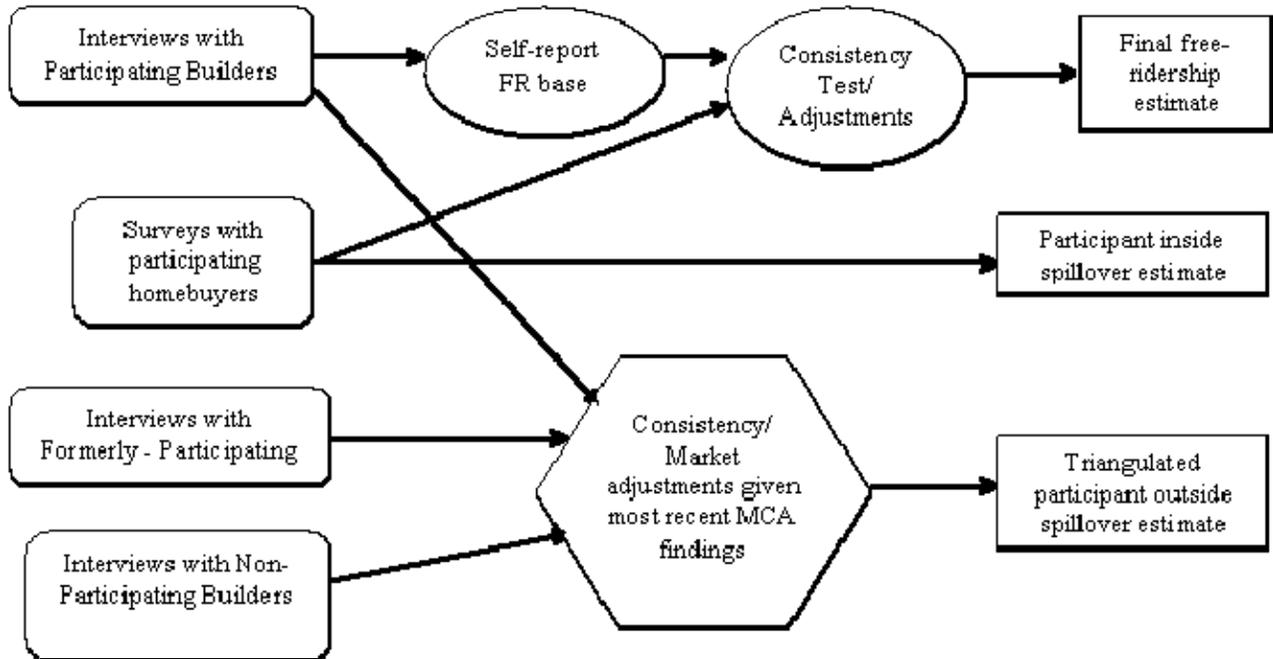
considered since the incidence is likely to be low, making it difficult to attain the desired precision levels. This latter spillover could also overlap with the builder spillover and it would be difficult to separate the two in order to avoid double-counting program spillover.

These attribution-related activities are summarized in the list below and presented in Figure 3.

- Participant spillover (including inside and outside spillover)
  - Interviews with participating homebuyers and contractors
- Free-riders
  - Interviews with participating builders and homebuyers (new home search criteria versus ENERGY STAR Homes marketing and builder marketing)
- Non-participant spillover
  - Interviews with builders who never participated in the program
  - Interviews with previously-participating builders

Responses by homeowners and contractors relating to the same homes will be compared to assess the validity of the self reports and the relative contributions of the parties to the efficiency of the home. The 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.

**Figure 3. Enhanced Self-Report Process for the ENERGY STAR Homes Program FR & SO Estimates**



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 complicated in that it asks about conjecture of a theoretical alternative. Therefore, 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 in multiple ways can also increase the construct validity of the estimate.

Populations/Samples

Sampling will be a component in the estimation of both gross and net impacts, as discussed in more detail below.

Gross Impact Sampling

Efficient sample sizes will be chosen using stratified ratio estimation (SRE) to meet a 90/10 confidence/precision level for the statewide program for electric and natural gas savings. Given the level of detailed modeling required for this evaluation, estimating gross and net savings to the 90/10 confidence/precision standard at the utility level will be prohibitively expensive.

Previous evaluation results and experience indicate that there is a high degree of variation in residential energy consumption. Given that the savings for many of the electric measures are claimed on a deemed savings basis, the Impact Evaluation Team expects to find substantial differences between *ex-ante* and evaluated savings at the household level. For the purposes of developing an initial estimate of the sample size, an overall error ratio of 0.8 was assumed. A sample size of about 140 participating projects will be needed to provide the desired precision of 90/10 for the whole program statewide using the SRE sampling method.

Projects will be stratified by size (typically the magnitude of the energy savings) other variables, as indicated. To allow for estimation of both gas and electric savings from the sample, homes with only gas or only electric savings may be excluded from the population, based on the assumption that these homes are not materially different from homes having both electric and gas savings, with the exception of the heating fuel or presence of major electrical end uses. Since only 3% of the SBC3 energy savings to date occurred in the downstate region and the overall savings for this program are a small part of NYSERDA's portfolio, the Impact Evaluation Team does not intend to estimate savings separately for the upstate and downstate regions.

The sample will be randomly selected within each stratum. Once the sample has been chosen, it will be checked to ensure that it represents a reasonable range of types of builders (owner-builders, small- and large-scale builders), as indicated by the level of participation in the program. Obtaining utility billing records for all participating homes prior to the sampling will allow the Impact Evaluation Team to ensure that sufficient billing history is available for all selected participants to calibrate the modeling.

#### Attribution Sampling

Surveys will be fielded for participating homebuyers, participating builders, formerly-participating builders and non-participating builders. Sample sizes will be calculated to meet 90% confidence and 10% precision statewide as well as on an upstate/downstate regional basis. The surveys will be fielded by NYSERDA's survey contractor.

#### **Sampling Issues**

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

- Constructing the sample frame of non-participating new homes is not a trivial task and will be necessary for the attribution analysis if not for estimating gross savings. There are two approaches that may be appropriate for NYSERDA's NYESH program: 1) requesting the utilities to provide a complete list of residential new connects and screening these utility accounts to identify new homes, or 2) working from permit data as provided by a commercial source (such as Dodge data), which will also need to be screened for new homes. The first option is likely to be more efficient and comprehensive, but will require cooperation from the utilities.
- Utility usage data will be needed for all participants and possibly non-participants if no baseline study is available. 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, many participants may not have the full years' worth of billing records required for the billing analysis.
- Homeowner contact information is not available for all participating homes, requiring an additional step of collecting the data from the builder (where possible) or cross-referencing addresses to obtain the homeowner name and contact information.

- Since the builder rather than the homeowner is the program participant, there is no opportunity within the current program set up to request the homeowner's permission to obtain utility billing data. If this interim step is necessary, it will add another administrative task to the budget and require an extension of the timeline to allow for this step.

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 plan 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 NYSERDA's NYESH staff at a minimum:

- Project level information, including address, contact information for the builder and homebuyer (if possible)
- Measure level information, such as a description of the measure, quantity installed, the energy savings (electric, gas and other fuels), demand savings, and measure life
- House level information, including the size of the house, the fuels used for space and water heater, other major electric and gas end uses (if available)

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, weather station (if available)
- Weather data, which may be available from the utilities or from the national weather service (National Oceanic and Atmospheric Administration, NOAA)

**Table 5. ENERGY STAR Homes 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, Paper Review and Calibration to Billing	~2,400/ year	140	90/10	Survey Contractor	Fall/Winter2009
Participating Homeowners - Full On Site Inspection	~2,400/ year	30a	N/A	Impact Evaluation Team	Fall /Winter2009
Participating Homeowners - Partial On Site Inspection (Lighting only)	~2,400/ year	110a	N/A	Impact Evaluation Team	Fall /Winter2009
Participating Builders	~1,100	70	90/10	Survey Contractor	Fall 2009
Formerly-Participating Builders	>120	60	90/10	Survey Contractor	Fall 2009
Non-Participating Builders	Unlimited	100	90/10	Survey Contractor	Fall 2009

a. This sample is inclusive of the 140 participating homeowners receiving a telephone survey or paper review.

**SCHEDULE AND BUDGET**

**Table 6. ENERGY STAR Homes Impact Evaluation Schedule and Budget**

Evaluation Element	Estimated Budget and Completion					
	2009	2010	2011	2012	2013	Total
Impact Evaluation	\$413,500a	-	-	\$412,500a	-	\$826,000

a Primary data collection costs represent approximately 15% of the total proposed evaluation budgets.

**6. Process Evaluation Plan**

The purpose of the process evaluation of the NYESH Program will be to assess program operations, , identify potential issues, and to develop recommendations to improve program operations and performance. In addition, the process evaluation will document program progress and explore the value, benefits, and concerns of building and living in ENERGY STAR homes for builders and home owners. Follow-up work may be conducted again in 2012 depending on the status of the program at that time.

### ***Research Objectives***

The research objectives for the process evaluation of the NYESH 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.

1. To assess program processes and operations to improve program performance including:
  - a) Assessing program processes with program staffs to identify potential opportunities to improve program operation and efficiency and to increase program outreach and throughput
  - b) Assessing builder response to program processes to identify potential opportunities to improve program efficiency and to increase program outreach and throughput
  - c) Assessing satisfaction of builders with the program and identifying potential strategies to increase their satisfaction with the program
  
2. To explore the value, benefits and concerns of building and living in ENERGY STAR Homes including:
  - a) Exploring with builders their perception of the value, benefits and concerns with building ENERGY STAR homes
  - b) To explore with homeowners their perception of the value, benefits and concerns about buying and living in ENERGY STAR homes.
  - c) To explore and identify ways to reduce free ridership and to maximize spillover of program benefits
  
3. To document program activities and progress and assess program tactics in achieving the goals and objectives of the program, including:
  - a) Documenting the history and progress of the program through review of program materials, program data and interviews with NYSERDA and program implementation staffs
  - b) Reviewing program tactics and explore the response of builders and home owners to these program tactics
  - c) Assessing barriers to participation and opportunities to reduce barriers for builders who wish to participate in the program

### ***Activities***

The Process Evaluation Team will interview NYSERDA and Program Implementation Staff to obtain their views on program progress, process, operations as well as program values, benefits and concerns. These interviews will form the basis to develop questions to ask builders and homeowners about program processes and operations. The process evaluation will be focused on program participants between August 2010 and August 2011.

The Process Evaluation Team will incorporate the impact team questions on free-ridership into the process evaluation surveys along with process questions and questions on the value, benefits and concerns home owners have experienced with ENERGY STAR homes. As all questions in the survey will necessarily be closed-ended due to the impact evaluation questions, the surveys will form the basis of selecting subsamples of those willing to provide additional information.

The Process Evaluation Team will also work with the MCA Team to incorporate process questions into the earlier market surveys along with screening questions on the value, benefits and concerns builders have experienced with ENERGY STAR® Homes. These questions will be used to select a sub-sample for in-depth interviews.

In-depth interviews will be conducted with these subsamples of builders and home owners to obtain detailed information on perceptions of the value, benefits and concerns (for builders) of building and (for homeowners) of buying and living in ENERGY STAR Homes.

### Populations/Samples

Table 7 displays the samples assumed for process evaluation surveys. The samples selected for the market evaluation surveys form the estimated population size for the in-depth interviews with program participants and nonparticipants (140 participating builders, 70 formerly participating builders). Nonparticipating builders will not be sampled for the in-depth interviews.

**Table 7. ENERGY STAR® Homes Process Evaluation Survey Specifics**

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	August 2011
Participating Homeowners	~2,400	400	95/5a	Survey Team	Fall 2011
Participating Builders <sup>1</sup>	140	30	NA	Process Team	Winter 2011
Formerly-Participating Builders <sup>1</sup>	70	10	NA	Process Team	Winter 2011
Participating Homeowners <sup>2</sup>	400	40	NA	Process Team	Winter 2011

<sup>1</sup> Populations are the sample of anticipated completes for the market surveys (Table 3)

<sup>2</sup> Populations are the sample of anticipated completes from the process surveys

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

### ***Data Collection***

The Process Evaluation Team will conduct interviews with NYSERDA and with program implementation and quality assurance contract staff, including key staff involved with the ENERGY STAR Homes program. The samples selected for the market evaluation (140 participating builders, 70 formerly participating builders) will be used for the in-depth interviews about the values and benefits of building ENERGY STAR homes. A subsample of the 400 homeowners surveyed by the process team will be asked to participate in in-depth interviews about the values and benefits of ENERGY STAR homes. As these subsamples will depend greatly on the willingness of builders and homeowners to engage in an additional survey with the evaluators, the Process Evaluation Team intends to offer a small \$25 honorarium to interview respondents.

### ***Special Issues***

The process, market and impact 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. NYSERDA's Survey Contractor will integrate the questions to ensure the data collection process is efficient and effective.

### ***Schedule and Budget***

The following displays the schedule and budget allocation by year and evaluation element. If the program continues beyond 2011, and additional evaluation funds are made available, another process evaluation study could be conducted in 2013.

**Table 8. ENERGY STAR® Homes Evaluation Schedule and Budget**

Evaluation Element	Estimated Budget and Completion					
	2009	2010	2011	2012	2013	Total
Process Evaluation			\$115,500a			\$115,500

a. Includes \$45,000 for surveys, \$7,500 for interviews and \$1,250 for the honorarium.

## **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.<sup>18</sup> 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

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<sup>18</sup> 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.

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.

#### 4. 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 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.

#### 5. Total Resource Cost Analysis

Once per year, NYSERDA will update benefit/cost ratios (at a minimum, Total Resource Cost test) for each major program and for the entire portfolio of SBC-funded **New York Energy \$mart<sup>SM</sup>** 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.