Massachusetts Statewide
Electric and Gas Energy Efficiency
2013 – 2014 Evaluation Plan
October 15, 2013

Prepared by the Massachusetts Program Administrators
and
the EEAC Consultants

Table of Contents

Background *1*

A. Introduction **1**

B. EM&V Resolution **1**

C. Evaluation Management Committee **2**

D. Types of Evaluation Functions **2**

E. Regulatory Considerations **3**

F. Scope of Research Areas **3**
A. Residential 4
B. Non-Residential 4
C. Cross-Cutting 4

G. Available Budget **5**

H. Assigned Staff **6**
A. Residential 6
B. Non-Residential 6
C. Cross-Cutting 7

I. Discussion of Planning Principles **7**
A. Residential 9
B. Non-Residential 10
C. Cross-Cutting 10

J. Stages of Evaluation **12**

K. Research Completed Since 2010 ..... **13**
A. Residential 13
B. Non-Residential 14
C. Cross-Cutting 15

L. Research In Progress **16**
A. Residential 16
B. Non-Residential 16
C. Cross-Cutting 16

Near Term Priorities *18*
A. Residential 18
B. Non-Residential 18
C. Cross-Cutting 19

Planned Research *20*
A. Residential 20
B. Non-Residential 22
C. Cross-Cutting 24

Other Research *26*
A. Residential 26
B. Non-Residential 28
C. Cross-Cutting 30

Appendix 1: Gantt Chart *31*

Appendix 2: One Page Summaries *34*

Background

A. Introduction

The Massachusetts Statewide Electric and Gas Energy Efficiency 2013 – 2014 Evaluation Plan (2013/2014 Plan) has been developed collaboratively by the electric and gas Program Administrators (PAs), the EEAC Consultants and the evaluation contractors. Prior to 2013/2014 Plan, evaluation planning in Massachusetts was largely completed in one year cycles with study efforts being a function of past evaluation activities and changes in savings levels or implementation of programs. In an effort to better document the strategic evaluation plan, and have an evaluation plan that is more aligned with the energy efficiency program planning period, the PAs and EEAC Consultants have put together the following document to describe the evaluation planning process and describe studies, both generally planned, and specifically in progress. A strategic evaluation planning process will commence with planning meetings to be held in the second quarter of 2015. The planning meetings will inform 2016 – 2018 Evaluation Plans to be provided in the third quarter of 2015 and which will be included in the next three year Plan. Similar evaluation planning meetings will recur in concert with the next planning cycle.

B. EM&V Resolution

On September 8, 2009, the Massachusetts Energy Efficiency Advisory Council (EEAC or Council) unanimously approved a resolution developed collaboratively by the PAs and the EEAC Consultants, setting forth a new administrative framework for the performance of Evaluation, Measurement and Verification (EM&V) in Massachusetts. Under the resolution, the EEAC assumes an oversight role over the EM&V activities of the PAs to ensure the objectivity and independence of those activities, the perception of such, and to help ensure consistency, timeliness, and credibility. While the PAs and EEAC Consultants (acting on behalf of the EEAC) will continue to work diligently to reach a consensus on evaluation issues, where there are areas of difference that may arise that cannot be resolved through consensus during the on-going interactive process between the EEAC Consultant and the PAs' evaluation staff, authority for decision-making resides with the EEAC or its Designee. This arrangement is subject to a system of appeals in the event of any disputes that cannot be resolved collaboratively.

The resolution also restructured EM&V in Massachusetts so that most studies are to be performed at a statewide rather than at an individual PA level, and that at least one independent evaluation contractor per research area be assigned to conduct the studies under long-term contract with the PAs.

The PAs are the main mechanism for contracting with the independent evaluation contractors. Statewide evaluation studies are coordinated by a PA lead (the "PA Study Manager"), and an EEAC Consultant. This enables PAs and the EEAC to collaboratively provide their expertise in the planning, scoping, management, review of methods and draft protocols, and review, acceptance, and application of results of the individual studies. In many cases the PA Study Manager and the statewide research area manager are the same individual.

The initial resolution specified that the range of statewide evaluation activities be divided into 5-7 statewide research areas, oriented primarily to specific target markets. The PAs and the EEAC consultants subsequently developed a system of six research areas that formed the basis for evaluation activities in the 2010-2012 program period. Five of these areas were oriented to target markets, and the sixth was a cross-cutting research area focused on research issues and activities that either spanned multiple markets or for which it was believed to be particularly important that they be performed consistently across markets.

For the 2013-2015 program period, the PAs and the EEAC consultants have agreed to simplify the existing system of research areas, reducing the total number of areas to three: Residential, Non-Residential, and Cross-Cutting. The Residential (including low-income) area combines three different research areas from the 2010-2012 program period: Residential Products, Residential Retrofit, and Residential New Construction. The Non-Residential area combines two different areas from the 2010-2012 program period: Large C&I/New Construction, and Small C&I. The Cross-Cutting area remains largely the same as in 2010-2012.

C. Evaluation Management Committee

In 2012, the Program Administrators and the EEAC Consultants created an Evaluation Management Committee ("EMC") similar to the C&I and Residential Management Committees. The EMC serves as a steering committee for statewide evaluation issues, providing guidance and direction to each of the evaluation research areas.

D. Types of Evaluation Functions

EM&V refers to the systematic collection and analysis of information to document the impacts of energy efficiency programs and improve the effectiveness of these programs. EM&V includes the following types of studies:

- *Impact Evaluation* refers to the measurement of net or gross savings achieved within overall program populations.
- *Market Evaluation* refers to the measurement of the effects that programs have on the structure and functioning of their target markets.
- *Process Evaluation* refers to the systematic assessment of programs for the purpose of documenting their operations and developing recommendations to improve their effectiveness.
- *Market Characterization or Assessment* refers to the systematic assessment of energy efficiency markets for the purpose of improving the effectiveness of programs targeting those markets.
- *Evaluation of Pilots* refers to EM&V activities intended to assess the effectiveness of pilot programs, determine their potential for full-scale implementation, and develop recommendations for any changes in program approach. Under the new framework, evaluation of pilots will occur under the research area most closely related to the market being targeted.

E. Regulatory Considerations

Several recent regulatory orders were considered during the development of evaluation activities for the 2013- 2015 period.

On August 10, 2012, the Department of Public Utilities (Department) issued D.P.U. 11-120-A Order, addressing two issues related to program net savings: (1) alternate methods to determine program net savings; and (2) the prospective or retrospective application of evaluation study results. In addition, the Department declined to adopt an interim proxy value for carbon dioxide to be used in the cost-effectiveness determination of energy efficiency programs.

With respect to net savings, the Department indicated support for alternative approaches to determining net savings that look at effects that occur over multi-year periods and across programs, which is consistent with the approach recommended in the joint comments of the PAs, DOER, DEP, ENE and NEEP. The Department announced that it would convene a working group to explore if and how an alternate (i.e., market-focused) approach to determine program net savings could be developed and implemented. The PAs suggested that working groups convened by the Department continue efforts after the filing of the 2013 – 2015 Plan, and envisioned adopting any new approaches on a prospective basis.

With respect to EM&V results, the Department found that it is appropriate for PAs, when calculating post-implementation program savings (gross and net), to use: (1) the most recently updated gross savings impact factors; and (2) the net savings impact factors that were used when the programs were designed and developed. The PAs will apply this measurement approach for post-implementation savings calculations resulting from the 2013-2015 Energy Efficiency Plans. Prior to 2013, evaluation results were applied retrospectively to the prior year energy efficiency results on an annual basis during the development of the Energy Efficiency Annual Reports. The frequency and process for application of evaluation results for 2013 and forward are under discussion.

On January 31, 2013, the Department issued D.P.U. 11-120-A Phase II Order, addressing revised Energy Efficiency Guidelines. Under the Guidelines adopted in this order, the DPU required the PAs to submit a performance report at the end of each three-year term ("Three-Year Term Report"). The DPU will review this report to determine whether the PAs accurately and reliably reported program savings, benefits, and costs and implemented its energy efficiency programs in a manner consistent with the Department-approved three-year plan. In addition, the Guidelines require each PA to submit a performance report upon completion of each plan year that documents its performance during the applicable year ("Plan-Year Report").

F. Scope of Research Areas

As mentioned above, for the 2013-2015 program period, the PAs and the EEAC consultants have agreed to simplify the existing system of research areas, reducing the total number of areas to three: Residential (including low income), Non-Residential, and Cross-Cutting. Although the

new simplified structure has improved coordination of research activities, additional strategies to improve coordination within and between research areas also includes research area updates at EMC meetings. The PAs and the EEAC consultants also plan to develop strategies to define and delineate research in the boundaries of the research areas to reduce overlap.

A. Residential

As described above, originally this research area consisted of three separate categories: Residential Retrofit and Low Income, Residential Retail Products, and Residential New Construction. The residential evaluation research area still includes these categories, but as a single overarching research area. As currently defined, the initiatives within this research area include[1]:

- Residential New Construction
- Home Energy Services
- Multi-Family Retrofit
- Residential Lighting
- Consumer Products
- Residential Heating & Water Heating
- Low Income New Construction
- Low Income Single Family Retrofit
- Low Income Multi-Family Retrofit

B. Non-Residential

The Non-Residential (or Commercial & Industrial, C&I) research area combines two separate categories: Non-Residential Large Retrofit and New Construction and Non-Residential Small Retrofit. As defined, the C&I research area includes the PAs' C&I retrofit, direct install, new construction and major renovation initiatives.[2]

C. Cross-Cutting

This research area covers topics that do not fit cleanly into either the Residential or Non-Residential research areas, as well as additional specialized topics in which it is particularly important to ensure consistency across research areas and markets. Topics within this research area include, but are not limited to:

- *Behavioral Programs* – Evaluation of behavior-based energy-efficiency programs in all sectors.

[1] Specific program descriptions are included in the 2013-2015 3-year plan.
[2] Ibid.

- *Codes & Standards* – Overall coordination of efforts to evaluate codes & standards initiatives. Specific projects may occur in all three research areas, but overall coordination of efforts is done in this research area.
- *Community Mobilization Initiatives* – Evaluation of PA efforts related to Community Mobilization work in all three sectors.
- *Education & Training* – Evaluation of PA education and training efforts.
- *Market Effects* – Identifying, standardizing and documenting research methods as well as quantifying market effects attributable to PA programs. While some of the quantification work may occur in other research areas, overall responsibility for coordinating methodology lies with this research area. This is a new area in this three year plan period, and there is significant overlap with traditional net-to-gross as studied in the next topic area.
- *Net-to-Gross* - Identifying, standardizing and documenting research methods as well as quantifying net-to-gross ratios for PA programs. While some of the quantification work may occur in other research areas, overall responsibility for coordinating methodology lies with this research area.
- *Non-Energy Impacts* – Identifying, standardizing and documenting research methods as well as quantifying non-energy impacts attributable to PA programs.
- *Program & Portfolio Marketing* – Documenting the effects of PA statewide marketing efforts, as well as supporting marketing efforts with appropriate, timely evaluations as necessary.

G. Available Budget

The budget available to the research areas is the sum of all PAs evaluation budgets excluding approximately $12 million allocated to internal labor, other costs such as external resources to supplement staff and NEEP studies, and the statewide database. Twenty percent of each sector's available evaluation budget is then allocated to the Cross-Cutting research area. The remaining residential and low-income sector available evaluation budget is allocated to the Residential research area; the remaining commercial & industrial sector available evaluation budget is allocated to Non- Residential research area.

Table 1: Research Area Evaluation Budgets 2013-2015

	Electric			
Research Area	**2013**	**2014**	**2015**	**Total**
Residential	$ 4,517,689	$ 4,774,194	$ 5,084,378	$14,376,260
Non-Residential	$ 5,763,321	$ 5,788,086	$ 5,908,618	$17,460,025
Cross-Cutting	$ 2,570,252	$ 2,640,570	$ 2,748,249	$ 7,959,071
Total	**$ 12,851,262**	**$13,202,850**	**$13,741,245**	**$39,795,357**
	Gas			
Research Area	**2013**	**2014**	**2015**	**Total**
Residential	$ 3,293,398	$ 3,368,041	$ 3,473,407	$10,134,846
Non-Residential	$ 1,373,122	$ 1,443,677	$ 1,489,301	$ 4,306,100
Cross-Cutting	$ 1,166,630	$ 1,202,929	$ 1,240,677	$ 3,610,236
Total	**$ 5,833,150**	**$ 6,014,647**	**$ 6,203,386**	**$18,051,182**
	Total			
Research Area	**2013**	**2014**	**2015**	**Grand Total**
Residential	$ 7,811,087	$ 8,142,234	$ 8,557,785	$24,511,106
Non-Residential	$ 7,136,442	$ 7,231,763	$ 7,397,919	$21,766,125
Cross-Cutting	$ 3,736,882	$ 3,843,499	$ 3,988,926	$11,569,308
Total	**$ 18,684,412**	**$19,217,497**	**$19,944,631**	**$57,846,540**

H. Assigned Staff

There are approximately 25 PA employees assigned to MA evaluations as a portion of their job responsibilities, with 20 PA employees actively engaged in study oversight. In addition, the PAs currently contract with several external evaluation experts to supplement staff.

A. Residential

The work in this research area is led by The Cadmus Group, Inc. The Cadmus team also includes Navigant, NMR Group, Inc., DNV KEMA, Tetra Tech and Dorothy Conant Consulting as subcontractors. This evaluation team was selected through a competitively procured joint RFP process conducted in the spring of 2013. The current Cadmus team has been awarded the contract through June of 2016. Each research area and study has an assigned EEAC Consultant covering it.

A representative from Northeast Utilities is the statewide research area manager, with eight employees from three different PA organizations leading individual study efforts.

B. Non-Residential

The EM&V work in this research area is currently conducted by an EM&V contractor team led by DNV KEMA's Energy and Sustainability group with TetraTech, NMR Group, Inc., ERS, DMI, SBW, Apprise and Itron as subcontractors. This evaluation team was selected through a competitively procured joint RFP process conducted in 2010. The current contract term ends in December 2015 and the PAs anticipate conducting another competitive procurement in the first half of 2015 with award no later than June 2015. The 6-month overlap is an intentional overlap intended to minimize any breaks in work as well as to ensure that the current contractor team is

still under contract during the transition period between contracts. Each research area and study has an assigned EEAC Consultant covering it.

A representative from National Grid is the statewide research area manager, with eight employees from four other PA organizations leading individual study efforts.

C. Cross-Cutting

Currently, two contractor teams perform EM&V work in this area, one led by Tetra Tech, and one led by Opinion Dynamics Corporation.[3] The Tetra Tech team also includes NMR Group, Inc. and DNV KEMA as subcontractors. The Opinion Dynamics Corporation team includes Evergreen Economics and Navigant. Each research area and study has an assigned EEAC Consultant covering it.

A representative from Columbia Gas Company of Massachusetts is the statewide research area manager, with six employees from four other PA organizations leading individual study efforts.

I. Discussion of Planning Principles

Collaboratively, the PAs and EEAC Consultants have developed the following set of four primary evaluation planning principles and three additional considerations, which collectively are utilized to assess potential evaluation activities, identify priorities, and determine the appropriate timing of all evaluation efforts.

There are four primary principals that establish the priority of the evaluation research:

1. **Importance.** Allocate evaluation resources to research questions that have a significant impact on demand-side management (DSM) investments or that directly inform significant policy questions and stakeholder interests. Not all programs and measures contribute equally to the PA's DSM portfolio. Therefore, the PAs and EEAC Consultants will focus available evaluation resources on the programs and measures that generate the greatest savings and require more recent and accurate evaluation findings.

2. **History.** Make the most of existing research before investing in additional research. This includes previous evaluation research conducted in Massachusetts and other relevant research, such as that conducted by the Northeast Energy Efficiency Partnerships or other relevant secondary sources of information. As the PAs have been conducting evaluations for over 20 years, the PAs will leverage, build-on, and complement the wealth of historical information available when prioritizing and planning evaluations. However, the PAs and EEAC consultants recognize that some of this information becomes dated and that updated information might be valuable, even for smaller contributors to portfolio level savings. The PAs and EEAC consultants attempt to assess the likely shelf-life of different types of data, based on an

[3]The current contract term ends in December 2014 and the PAs anticipate conducting another competitive procurement in the first half of 2014 with award no later than June 2014. The 6-month overlap is an intentional overlap intended to minimize any breaks in work as well as to ensure that the current contractor team is still under contract during the transition period between contracts.

assessment of how rapidly the programs, technologies, economy and markets are likely to be changing.

3. **Uncertainty.** Allocate evaluation resources to research questions with the greatest uncertainty. Uncertainty may be due to dependence on dated research, introduction of new measures or evaluation methodologies, or programs operating in quickly evolving markets. To ensure savings estimates and program designs reflect current market conditions, the PAs and EEAC Consultants will assess programs and measures in more dynamic markets with greater frequency. Similarly, evaluation practices also evolve over time and new best practices are established. Consequently, the PAs and EEAC Consultants prioritize evaluations that will apply improved methodologies or that will take advantage of data not previously available.

4. **Timing.** Ensure the timing of the research is appropriate for the research questions being asked. Is the program mature enough to allow the research to produce viable results? Is there a significant program change underway that may affect the results or affect the usefulness of the results? Typically, it is not necessary to evaluate a mature program annually, though it may make sense with a new program. The PAs and EEAC Consultants will evaluate the major elements (impact, process, NTG, other) of each significant PA program as part of a multi-year evaluation cycle.

Once the priority is established, there are three additional principals considered when establishing the evaluation research portfolio. These include:

- *Balance* -- The PAs and EEAC Consultants undertake a mix of studies each year, in terms of the evaluation elements assessed (impact, process, NTG, other) and which programs are evaluated.
- *Depth* -- Greater resources always allow for more in-depth study, and typically more reliable evaluation findings. The PAs and EEAC Consultants consider each evaluation option as an investment and determine the level of study needed to cost-effectively estimate savings.
- *Flexibility* -- Unanticipated but not yet known or identified evaluation may arise over time. To ensure that these issues may be addressed, the PAs will allocate sufficient resources for unidentified ad hoc evaluation efforts. The PAs and EEAC Consultants develop evaluation plans with flexibility to add evaluation activities (such as pilot evaluations or assessments of the effectiveness of mid-year program design changes) without compromising the timing and quality of concurrent evaluation work.

While planning strategies vary depending on the particulars of each specific study, the following outlines the principles that apply to each type of evaluation.

- *Impact Evaluation* – The core principles driving impact evaluation planning are Importance and Timing. When determining which end-use(s) to study, the evaluation team considers both the vintage of the most recent study as well as the percent of savings an end-use represents within a program and portfolio. Variability is also an important principle as the availability of higher quality data

or improved evaluation methodologies offer opportunities to more reliably estimate energy savings. Secondary principles considered in this planning process are Balance and Rigor.

- *Market Effects* – The two core principles for determining if a market effects study is warranted are Timing and Importance. A successful Market Effects study requires both a baseline market measurement prior to program intervention and a follow-up market measurement to assess the program's impact on the market, ideally 2 or 3 years after the program is introduced. Secondary principles that are also considered are Balance and Variability.
- *Process Evaluation* – The core principles driving process evaluation planning are Variability and Timing. When determining the appropriateness of conducting a process evaluation of a specific program or initiative, the evaluation team looks at the maturity of the program as well as whether any changes to program delivery or market conditions have recently occurred. In the event changes have occurred or if a program or initiative is new, a process evaluation is typically warranted. However, prioritizing early feedback on program or market changes must be balanced with appropriate consideration, such as a program or initiative that is still undergoing significant changes and therefore should not be evaluated as the findings may be premature and therefore not likely to be useful. Secondary principles considered in the planning process are Importance, Balance and Rigor.
- *Market Characterization or Assessment* – Similar to process evaluation, Variability and Timing are the core principles considered in planning market assessments. In addition, History plays a key role as the evaluation team must consider the information already available about a given market prior to commencing new research. When considering the relevance of historical data, the evaluation team will also assess the volatility or changes occurring in the market in question. Secondary principles that are also considered are Importance and Balance.
- *Evaluation of Pilots* – The core principles driving the planning of evaluation of pilots are Timing and History. In general, the evaluation team considers if other sources are available that provide credible estimates of savings. In addition, the evaluation team considers the timing of the pilot effort and conduct evaluations of any kind only when the timing is appropriate.

A. Residential

For Residential, the specific strategy for planning impact evaluations is dependent on three things: the size of each program or end use, when each program or end use was last evaluated, and whether or not the program has undergone recent and significant changes. Particularly large programs or end-uses within programs, are evaluated on a more frequent basis to ensure the largest contributors to savings in the statewide portfolio are accurate. In addition, the PAs and EEAC Consultants consider evaluating smaller programs, even if the program represents only a small portion of our portfolio savings. Finally, if a program undergoes significant changes, or is

newly developed, the PAs and EEAC Consultants consider an evaluating to understand how well the program is performing and catch any issues with the delivery early.

B. Non-Residential

In general Non-Residential Studies follow a similar strategy as discussed in the Residential section.

For large C&I electric custom and prescriptive measure evaluation the specific strategy used most often for planning impact evaluations is a rotation strategy where each end-use or measure category is evaluated once during a program cycle. For example, recent custom electric impact evaluations include Comprehensive Design Approach (CDA) and HVAC in 2010-11, Process and Compressed Air in 2011-12, and Refrigeration, Motor and Other in 2012-13. Currently, a custom HVAC study is being planned and it is expected that a new custom electric study will be performed in 2014-15 and will include any or all of CDA, Process and Compressed Air.

C. Cross-Cutting

For each cross cutting topic area, specific planning strategies may vary. A brief overview of the current strategy for each topic area follows.

- *Behavioral Programs* –Currently, an impact evaluation is being performed for each behavioral effort in the state. As programs mature and stabilize, this research area will work towards updating realization rates periodically, in line with the governing principles discussed above. New program delivery models will follow a similar track, with repeated early evaluation until results stabilize and a reliable realization rate can be developed. Additionally, regular process evaluation will be performed to inform program delivery efforts.
- *Codes & Standards* – A formal plan for this topic area cannot be developed until implementation plans are developed. This research area provides overall coordination with implementation to ensure that as implementation plans develop in this area, they are designed in such a way that the necessary data is being collected in order to evaluate the impact of such efforts along with appropriate attribution to the PAs. Overall work performed will include assessment of initial and updated baselines, and documenting the specific efforts of the PAs. The goal of this topic area is to both support the development of PA efforts, as well as to lay the appropriate groundwork for future evaluations. In addition to laying the groundwork for evaluating impacts, this topic area will support the development of the program; for example, by clarifying where the opportunities lie.
- *Community Mobilization Initiatives; Education & Training* – For these two topic areas, process and impact evaluations are performed as appropriate based on the defined goals of each delivery model and the planning principles discussed above. Each new in-the-field effort is reviewed to determine whether a specific evaluation of the effort should occur. Evaluation efforts will focus on new or changing delivery models rather than established models, but all efforts will be periodically reviewed.

- *Market Effects* – Planning strategies for this research topic begins with establishing a common understanding and working definitions of market effects and what conditions lead to them, identifying and prioritizing existing or planned programs that are reasonably expected to induce market effects, develop approaches for assessing market effects, and identify how PAs can improve the market effects evaluation of programs. Once research in this topic area matures, longer term planning will occur.
- *Net-to-Gross (NTG)* – After initial work in the first three year Plan to identify, standardize, and document research methods in this area, evaluation efforts focused on quantifying NTG ratios for PA C&I programs. In the current three year Plan, this topic area will research new top-down methodologies being used in other jurisdictions, assess data availability for using a top-down methodology in MA, and establish a working group to make recommendations regarding using a top-down methodology in MA.[4] This topic area also continues to perform C&I quantification work to provide updated information for the next three year Plan. Once top-down research methodologies are established, a more specific plan will be developed and these types of studies may be added as appropriate.
- *Non-Energy Impacts (NEI)* – Similar to NTG, initial work in this area focused on developing methods for quantifying NEIs attributable to the PA programs. Research in this area continues to quantify appropriate NEIs for the C&I new construction programs. This topic area also examines additional NEIs that may be appropriate to either study for the first time, or further update or refine.
- *Program & Portfolio Marketing* – Currently, this area focuses on determining the effectiveness of each statewide marketing campaign. Each year, a pre- and post-survey is done to measure the impact of the campaign in raising brand and program awareness. Additional work will measure brand effectiveness as well as support marketing efforts with specific smaller scale evaluations as necessary.
- *Additional Work* – Work in this area may cross multiple topics in order to identify overarching market trends and consumer behavior. Some additional cross-cutting work is typically developed on a short turnaround, one-off basis. This work may include literature reviews or surveys of programs in other jurisdictions and other smaller scale work to inform implementation efforts or program strategy.

In addition to the topics and strategies discussed above, another priority of this research area is to retain the flexibility to respond to new efforts in the field to provide appropriate and timely evaluation support.

[4] Top Down Methods may include approaches that employ aggregate consumption and macro-economic data to measure reductions in energy use resulting from energy efficiency.

J. Stages of Evaluation

The stages through which a project moves from an initial idea to being completed are as follows:

Table 2: Stages of Evaluation

Stage	Document Under Review	Description
Stage 1: Conceptual Framework	1 Page Summary	Provides conceptual framework for the project including a very high-level budget and timing, as well as the objective or goal.
Stage 2: Preliminary (High Level) Workplan	2 - 3 Page Summary	Provides strategies to meet objective including more detail on the potential research design, level of effort (number of surveys, site visits) including additional detail on budget/timing.
Stage 3: Detailed Workplan	3 - 25 Work plan	Provides detailed sampling and analysis plans; specific staffing and milestone deliverables.
Stage 4: In Progress	Status Report	Work is conducted consistently with plan – there may be detailed planning occurring simultaneously with execution on early tasks.
Stage 5: Reporting	Draft Report	Period from draft report through final report and any review/communications/meetings in-between, includes paperwork for submittal.
Stage 6: Complete	Final Report	Report is finalized and filed with DPU.

Stages 1, 2 and 3 are all planning stages of evaluation, although not every project will go through all three stages of planning. There are multiple planning stages since there is a need for projects to proceed *incrementally* from concept to preliminary workplan to detailed workplan. By proceeding incrementally, the PAs and EEAC Consultants are not only able to better manage the stakeholder review process but effectively stage studies across the three research areas.

The methods in which stakeholders are engaged can vary based on the stage of evaluation. As discussed in the *Near Term Priorities* section the PAs hosted strategic evaluation planning meetings to encourage participation in the early stage of the evaluation planning process and solicit input from a wide variety of program stakeholders. Additionally, there was active engagement with both program implementers and policymakers to identify additional key research needs and to further refine project recommendations developed at the strategic evaluation planning meetings.

Much of the stakeholder engagement happens through the Residential Management Committee and C&I Management Committee. Since both PAs and EEAC Consultants are members of the

management committees, stakeholder engagement at the committee meetings by the research area leads has been successful. For projects in stage 1, one page summaries were developed and shared with the management committees. Progress on projects in stages 2, 3 and 4 (preliminary and detailed workplans and in progress) is also provided to the management committees and for projects in stage 5, draft reports are shared with the management committees. Input from non-utility stakeholders represented on the Council generally flows through the EEAC consultants. The EMC is exploring various mechanisms for systematizing the coordination with the RMC and CIMC, such as having assigned implementers or working groups including both evaluators and implementers who review individual projects.

K. Research Completed Since 2010

Complete studies are reports that have been completed and filed with the D.P.U. The first round of approximately 45 statewide EM&V studies was completed between 2010 and 2011. The second round of approximately 30 statewide EM&V studies was completed and included in the 2011 Annual Report filed in August 2012. The third round of approximately 25 statewide EM&V studies was completed and included in the 2012 Annual Report filed in August 2013. Approximately 16 statewide EM&V studies were finalized after the completion of the 2011 Annual Report and included in the 2013-2015 Plan filed in November 2012.

As discussed in *Section VII. Discussion of Planning Principles* the PAs and EEAC Consultants have utilized evaluation planning principles to assess potential evaluation activities, identify priorities, and determine the appropriate timing of all evaluation efforts since 2010. Research priorities to date have been driven by the need to support Massachusetts' rapid increase in program activity, which has required a commensurate rapid gearing up of the scale of EM&V activity. The rapid increase in EM&V activity required limited administrative resources be allocated strategically to: (1) impact evaluations intended to ensure that as the savings ramp up the results remain reliable; (2) market assessments intended to help support reaching new markets and penetrating existing ones more effectively; and (3) process evaluations, to help make existing programs more effective.

A. Residential

Since 2010, there are 51 studies that have been completed in the Residential research area including 20 impact studies, 9 market assessment or characterization studies, 18 process evaluation studies and 4 market effects studies

Some of the process and impact evaluation research has been driven by the need to evaluate pilots and initiatives developed by program implementers in an attempt to identify new sources of savings in the residential market. Examples are process evaluations of various Residential New Construction pilots, Deep Energy Retrofit and the HES pre-weatherization and packaged measures pilots. Impact evaluations of new measures included Wi-fi Thermostats, Brushless Fan Motors, Heat Pump Water Heaters, Boiler Reset Controls, ECM Circulator Pumps and Solar Hot Water.

Impact and/or market effects studies were completed on the largest programs in the Residential DSM portfolio including Lighting, High Efficiency Heating and Cooling Equipment, Home Energy Services (HES), Multifamily, and the Low-Income Single-Family program. Also baseline studies have been completed on the Residential New Construction market.

In addition to process evaluations of new pilots and initiatives, many programs were evaluated including the HES, Low Income, Lighting, Multifamily and Products programs.

Market assessments were primarily used in the products program in order to take a snapshot of the opportunities for offered measures. Both the appliance and lighting markets are dynamic and shifting due to federal standards and changing consumer habits, and these studies allow for the gathering of data in order to make assessments of baseline products as well as program supported products.

B. Non-Residential

Research in the Non-Residential research area has been mostly driven by the fact that C&I savings both constitute the bulk of all portfolio savings and at an engineering level can be harder to forecast than for residential, with the result that there was a substantial need for gross impact evaluation work in 2010-2013. While the need for gross impact evaluation hasn't gone away, it can now become more of a maintenance effort, and more resources can be devoted to other kinds of studies that can be used to increase overall program effectiveness. Work in this research area focuses on four main types of evaluations – impact, market effects, process and market assessment or characterization. Since 2010, a total of 32 studies have been completed including 22 impact studies, 5 market assessment or characterization studies, 4 process evaluation studies and 1 market effects study.

When deciding which measures to study for impact evaluation, the PAs and EEAC Consultants considered the vintage of the available savings estimate as well as the percent of overall savings contributed by each measure category. A secondary consideration was the need for statewide versus PA-specific impact evaluation results. On the electric side the PAs and EEAC Consultants began with an impact evaluation of custom HVAC installations in 2010 as this represented a significant portion of non-residential electric savings. In addition, the PAs and EEAC Consultants conducted an evaluation of the impact of the CDA process in 2010 as this was an area that had not yet been studied statewide. Other impact evaluation studies that have been completed since 2010 include custom and prescriptive lighting installations, Combined Heat and Power (CHP), custom process, compressed air, refrigeration and motors and prescriptive Variable Speed Drives. In addition, a code compliance baseline study was completed which lays the groundwork for future studies of the market effects of PA codes and standards program efforts. Impact evaluations of lighting installed through the Small Business Direct Install program have also been completed.

On the gas side, when the PAs and EEAC Consultants began investigating impacts of the programs in 2010, there was little experience with C&I gas impact evaluation in Massachusetts or elsewhere in the country, and therefore the team needed to develop new methods of evaluation. Given that the evaluation team was working in uncharted territory, this required

multiple rounds of impact studies. Therefore, impact evaluations completed since 2010 include several studies of custom and prescriptive gas installations focused on boilers, furnaces, infrared heaters and indirect water heaters.

Process evaluations have covered a range of topics including the CDA program, the upstream lighting program, the large C&I program overall, an assessment of the direct install multi-tier structure and a profile of all C&I customers in the state.

Market Characterizations have been launched on a number of markets including new construction, chain and franchise, HVAC, lighting controls and existing buildings.

Finally, a market effects study of the high-bay lighting market was completed.

C. Cross-Cutting

As the savings goals have ramped up, the program implementers have turned increasingly to integrated programming efforts that are not specific to either customer sector, such as community-based programs and umbrella marketing. The Cross-Sector research area has been the locus for evaluation of these efforts.

By topic, research performed since 2010 in the Special & Cross-Cutting area includes the following:

- *Behavioral Programs* –Each behavioral effort in the state to date has been the subject of an impact evaluation, as well as a process evaluation of each delivery model.
- *Community Mobilization Initiatives* – Two major process evaluations were performed for 2010 and 2011 community based partnership efforts.
- *Education & Training* – Two literature reviews have been performed, one for K-12 programs, and one for post-secondary programs.
- *Market Effects* – No specific research has been done in this area to date.
- *Net-to-Gross (NTG)* – In addition to a traditional bottom-up methodology study for residential and for C&I, this research area has studied Electric C&I NTGR (2010 programs) and Gas C&I NTGR (2010 programs, 2011 programs).
- *Non-Energy Impacts (NEI)* – An initial study was performed to quantify certain residential and low-income NEIs. Further research was performed to update select low-income NEIs, as well as begin to quantify the effect of replace-on-failure versus early replacement for select equipment. NEIs were also quantified for C&I Retrofit programs.
- *Program & Portfolio Marketing* – A pre and post campaign assessment was performed for 2011 and 2012 campaigns. The 2013 pre assessment was recently completed.

- *Additional Work* – The PAs and EEAC Consultants performed a literature review of customer incentive levels in other states. In addition, this research area completed a study to develop an estimate of job creation resulting from program efforts.

L. Research In Progress

In addition to the above statewide EM&V studies which were included in the 2010, 2011 and 2012 Annual Reports and the 2013-2015 Plan, In Progress studies include studies that are in Stage 4: In Progress and Stage 5: Reporting stages. Thirteen studies are currently in progress.

A. Residential

In addition to the completed studies discussed above, there are currently three studies in progress in the Residential research area.

The *Massachusetts Residential New Construction Net Savings Study* is focused on assessing the impacts the RNC program has had on the marketplace over the past seven years, and includes builder survey, Delphi panel and energy modeling components.

Massachusetts is also engaged in a *Residential Lighting – Regional Operating Hours Study* with Connecticut, Rhode Island, and NYSERDA, which will attempt to get a robust look into hours of use of both efficient and non-efficient light bulbs by room and socket type.

Similar to the regional hours of use study, there is a study specific to the low-income population. The *Low Income Programmable Thermostat and Lighting Operating Hours Study* is not only looking to provide hours of use of both efficient and non-efficient light bulbs by room and socket type; but is also going to include a secondary heat analysis.

B. Non-Residential

In addition to the completed studies discussed above, there are currently 9 studies in progress including 5 impact studies, 2 process studies, 1 market assessment or characterization studies and 1 market effects study.

Current impact studies include custom HVAC, upstream lighting, CHP, lighting controls and gas boilers. The process evaluations include an assessment of a whole system approach and a mid-sized customer needs assessment. Finally, the current market assessment or characterization work includes a study of existing buildings and the current market effects study focuses on the LED market for both residential and commercial customers.

C. Cross-Cutting

In addition to the completed studies discussed above, two studies are currently in progress in the Cross-Cutting research area. The Northampton/Pittsfield CMI study focuses on determining the effectiveness of CMI efforts in these two Western MA towns as measured against the CMI's

defined goals. Additionally, the 2013 Pre/Post Campaign Analysis of the 2013 Umbrella Marketing efforts is underway. The goal of this research is to assess the impact of the in-the-field umbrella marketing campaign. [5]

[5] In addition, there is a study in progress addressing program penetration and savings potential in the territories of those PAs with a three-year savings goal more than 20% below the statewide three-year goal. This is not a statewide study, but it is being coordinated with statewide EM&V efforts.

Near Term Priorities

The PAs, EEAC consultants and research area evaluation teams identified the near-term (12-18 months) evaluation priorities outlined in this strategic plan by using three complementary methods.

First, to encourage early participation in the evaluation planning process and solicit input from a wide variety of program stakeholders, the PAs hosted strategic evaluation planning meetings. A strategic evaluation planning meeting for Non-Residential and Cross-Sector was held in February and a Residential Evaluation Strategic Planning Meeting was held in mid-May. The meetings provided a forum for all stakeholders to share their evaluation priorities directly with the PAs and EEAC Consultants. The meetings identified specific potential evaluation activities and as a group, stakeholders developed a preliminary assessment of each activity's relative priority (High, Medium, and Low) and optimal timing. Second, the PAs and EEAC Consultants used the first four evaluation planning priorities outlined above to gauge the evaluation activities identified at the summit. Third, there was active engagement with both program implementers and policymakers to identify additional key research needs and to further refine project recommendations developed at the strategic evaluation planning meetings. Lastly, it is a global near-term priority to strengthen our market assessment efforts.

A. Residential

The near term priorities specific to this research area are as follows:

- For residential lighting, monitor the market to help inform program and policy decisions regarding the overall level of intervention needed to promote efficient lighting and assess considerations between promotion of CFLs versus LEDs or other specialty lighting products.
- For HES, improve our understanding of patterns of adoption, interaction with other programs, and the results being produced by lead vendors, home performance contractors, and independent installation contractors. Inform the evolving program design.
- Continue to support the development of new sources of savings by evaluating new pilots and initiatives.

B. Non-Residential

The near term priorities specific to this research area are as follows:

- For evaluation of gross savings, complete the rotation through the major measure categories that has been driving research efforts for the past several years. In 2013-2014 this includes impact evaluation of Custom HVAC, selected prescriptive non-lighting measures and selected prescriptive gas measures. In 2014-2015 this is anticipated to include any or all of Custom CDA, Process and Compressed Air, Custom Gas and prescriptive electric.

- Support the efforts of program implementers to broaden and deepen the savings achieved, and to meet savings goals.
- Better understand the drivers of differences in outcomes across PAs.
- Conduct studies to inform the development of segment-focused efforts.

C. Cross-Cutting

The near term priorities specific to this research area are as follows:

- Respond to and advance overall policy directives, including increasing attention to market-based and top-down NTG methods.
- Enhance our understanding of NEIs by studying those markets not yet studied and performing targeted studies of selected NEIs.
- Support evolving program approaches, including behavioral programs, codes and standards initiatives and community-based programs.

Planned Research

Planned research includes studies which are in the following stages of evaluation: Stage 1: Conceptual Framework, Stage 2: Preliminary Workplan and Stage 3: Detailed Workplan. Studies which are Stage 1 and Stage 2 have not yet been implemented and there is still an opportunity to add, delete or change specific areas of focus.

The specific studies listed are not intended to be exhaustive; studies will be added as the need for them is identified. Evaluation planning is an iterative process and the study list may change as needed.

A. Residential

Using the process outlined above, the PAs and EEAC consultants identified sixteen specific high priority studies.

These sixteen plans, organized by residential program area (Lighting & Appliances, Retrofit & New Construction, and Global Residential) are as follows:

Lighting & Appliances

- *Lighting Market Assessment* (Stage 2: Preliminary Workplan) – The goal of this effort is to provide ongoing monitoring of the MA lighting market.
- *Lighting Saturation Stagnation Assessment* (Stage 2: Preliminary Workplan) – The purpose of this study is to explore reasons for the current plateau in CFL saturation as well as to determine ways to accelerate LED adoption.
- *Lighting Market Lift Assessment* (Stage 2: Preliminary Workplan) – The goal of this study is to assess the planning and implementation of the Market Lift effort and develop a net-to-gross (NTG) estimate of that effort.
- *Lighting Multi-stage Net-to-Gross* (Stage 1: Conceptual Framework) – The goal of this study is to estimate net-to-gross (NTG) ratios for key product types incented in the ENERGY STAR® Lighting initiative and to assess the associated strategic implications.
- *Appliance Program Evaluation* (Stage 1: Conceptual Framework) – The goal of this study is to explore changes to the way the Appliance initiative is currently delivered, including new marketing strategies or retail partnerships, updated incentives, and other cost-effective options.
- *Incremental Cost Study* (Stage 1: Conceptual Framework) – Provide updated incremental cost data for use in cost-effectiveness screening and setting of customer incentive levels.

Retrofit & New Construction, Standard and Low Income

- *HEHE & CoolSmart Impact Evaluation* (Stage 1: Conceptual Framework) – This is a two phased study to determine gross savings for the HEHE and CoolSmart programs for a variety of space heating and cooling measures. In Phase I, the evaluation team will be focusing on space heating measures during the 2013 - 2014 winter heating season. Phase II will follow the Phase I research and will focus on cooling measures. While this study is in the conceptual framework stage as it is still evolving, Phase I is nonetheless on a fast track in order to get winter metering of heating equipment in.
- *Advanced Power Strips Impact Evaluation* (Stage 1: Conceptual Framework) – The goal of this study is to identify alternative program designs that will generate higher participation and savings per participant.
- *HES Program Delivery Assessment* (Stage 2: Preliminary Workplan) –The study will focus on determining accurate conversion rates (installed measures: recommended measures) and other key performance metrics for HES overall, as well as for Lead Vendors (LVs) and Home Performance Contractors (HPCs) specifically. The study will also explore the effectiveness of linkages between HES and other PA programs (most notably HEHE and CoolSmart) and attempt to identify opportunities for greater and deeper savings for each program, as well as the overall residential portfolio.
- *HEAT Loan Process Analysis* (Stage 2: Preliminary Workplan) – The goal of this study is to understand the extent to which the MassSave HEAT Loan influences customer decision-making, relative to the other factors that influence participation (PA incentives, tax credits, pre-program intentions, etc.) and to explore whether the availability of the HEAT Loan impacts contractor pricing.
- *Low Income Multifamily Impact Assessment* (Stage 2: Preliminary Workplan) – The goal of this study is to provide an inventory of the methods currently used to estimate LIMF savings, explore opportunities for standardization where appropriate, assess whether all data required for evaluation are available, and develop PA-specific realization rates for appropriate measures.
- *Multifamily Process Evaluation* (Stage 2: Preliminary Workplan) – Assess and monitor the current state of the evolution of the Multifamily Program as a standalone or integrated offering with the commercial side and provide an ongoing examination of barriers, program operations, and customer experience.
- *Multifamily High Rise New Construction Baseline Assessment* (Stage 2: Preliminary Workplan) – The goal is to provide a baseline study of new construction building practices in four-story and higher multifamily buildings.

Global Residential

- *Residential Customer Profile Study* (Stage 2: Preliminary Workplan) – The study will compile utility and participation data on residential customers to provide insights into levels of participation, energy consumption, and energy savings relative to consumption.
- *Trade Ally Panels* (Stage 1: Conceptual Framework) – The goal of this effort is to explore if data quality, response rates, and data collection costs can be improved by a more systematic data collection approach across programs, markets, and evaluations.
- *Residential Market Effects Study* (Stage 1: Conceptual Framework) -- The overall objective of this study is to capture the net effects over time of Massachusetts' programs to promote a technology to be determined by the PAs. The development of this market effects study and selection of the targeted technology will be coordinated with the Cross Cutting Research Area's Market Effects Planning work proposed for January to March 2014.

B. Non-Residential

The 14 studies for this research area identified as high priority by the PAs, the EEAC consultants, the Commercial & Industrial evaluation team and other program stakeholders as part of the 2013 Commercial & Industrial Evaluation Strategic Planning Meeting in February and in subsequent discussions at the EMC and with the C&I Management Committee are presented below.

- *C&I Code Compliance Follow-Up Study* (Stage 2: Preliminary Workplan) -- The overall goal of this research is to assist the Massachusetts Efficiency Program Administrators in the development and implementation of programs that support enhanced code compliance rates and promote "beyond code" design and construction.
- *Impact Evaluation of 2012 Prescriptive Non-Lighting Installations* (Stage 2: Preliminary Workplan) -- The objective of this impact evaluation is to provide verification or re-estimation of electric energy and demand savings estimates for a subset of prescriptive electric measures excluding lighting projects through site-specific inspection, monitoring, and analysis. Specific measures will be determined in the next planning phase.
- *Enhanced C&I Customer Profiles* (Stage 2: Preliminary Workplan) -- The goal of this research is to collect, organize and analyze the energy efficiency program tracking data and billed usage data for all Massachusetts C&I gas and electric customers served by the PAs.
- *MA C&I Learning from "Successful" Projects* (Stage 2: Preliminary Workplan) -- The overall objective of this study is to learn how successful projects came about so that these practices can be generalized and duplicated elsewhere.

- *How PA Differences Affect Program Outcomes* (Stage 2: Preliminary Workplan) -- The goal of this research is to identify the factors that lead to differences in the depth and cost of savings among the PAs. This project is intended to provide information and insights that will be useful for the PAs and contractors to identify best practices.
- *Commercial Real Estate Study* (Stage 2: Preliminary Workplan)[6] -- The primary objectives of the study are to provide a comprehensive understanding of the complex relationship between building owners, property managers and tenants; and identify specific program offerings and points in the leasing process that offer opportunities to capture energy efficiency savings.
- *Rooftop Units Baseline Study* (Stage 1: Conceptual Framework) -- The goal of the study is to conduct a technology assessment for specific roof top unit controls, such as the CATAYLST, ENERFIT, and DIGIRTU which regulate fan speed, the amount of outside air, run time, and other features of continuous flow RTU systems.
- *Characterization of Supply Side Populations* (Stage 1: Conceptual Framework) -- The goal of this effort is to characterize the supply-side market actors and to develop effective sample frames and respondent samples (possibly panels) that facilitate collection of important information for program process and impact evaluations..
- *Direct Install Process Evaluation* (Stage 1: Conceptual Framework) -- The goal of this research is to identify how to get more savings from the program. These savings could be from greater or deeper participation. Secondary goals are to identify how to increase cost effectiveness of the program and to describe program processes, especially where relevant to increasing savings or cost effectiveness.
- *Impact Evaluation of 2012 Prescriptive Gas Installations* (Stage 2: Preliminary Workplan) -- The objective of this impact evaluation is to provide verification or re-estimation of energy savings estimates for a subset of Prescriptive Gas projects through site-specific inspection, monitoring, and analysis. Specific measures will be determined during the next planning phase.
- *C&I Market Effects Study* (Stage 1: Conceptual Framework) -- The overall objective of this study is to capture the net effects over time of Massachusetts' programs to promote a technology to be determined by the PAs. The development of this market effects study and selection of the targeted technology will be coordinated with the Cross Cutting Research Area's Market Effects Planning work proposed for January to March 2014.
- *Impact Evaluation of 2013 Custom Electric Installations* (Stage 1: Conceptual Framework) -- The objective of this impact evaluation is to provide verification or re-estimation of electric energy and demand savings estimates for a sample of

[6] This work is currently ON HOLD as the statewide commercial real estate group is in the process of launching a similar study. The two efforts will be coordinate so as to compliment and inform each other.

Custom electric projects through site-specific inspection, monitoring, and analysis. All Custom electric measures have been evaluated in the past three years, and a current Custom HVAC study is being planned. It is expected that a new Custom electric study will be performed on the 2013 program year, and will include any or all of CDA, Process and Compressed Air.

- *Impact Evaluation of 2013 Prescriptive Electric Installations* (Stage 1; Conceptual Framework) -- The objective of this impact evaluation is to provide verification or re-estimation of electric energy and demand savings estimates for a subset of Prescriptive electric projects through site-specific inspection, monitoring, and analysis. Recent Prescriptive impact evaluations include Prescriptive Lighting and Prescriptive Variable Speed Drives. Currently, the evaluation team is scoping a new Prescriptive Non-Lighting impact evaluation. The final measures have not yet been selected for evaluation as of the time of this document. In mid-2014, the evaluation team will begin discussions on the next Prescriptive electric evaluation in the rotation.
- *Impact Evaluation of 2013 Custom Gas Installations* (Stage 1: Conceptual Framework) -- The objective of this impact evaluation is to provide verification or re-estimation of natural gas estimates for a sample of Custom gas projects through site-specific inspection, monitoring, and analysis. In 2014, the evaluation team plans to begin scoping an impact evaluation of 2013 measures, which will include all PAs. This impact evaluation will also include a desk review task to further test this approach for helping to decide when to evaluate these programs.

C. Cross-Cutting

The following section includes evaluation plan summaries for the 12 studies identified as high priority by the PAs, the EEAC consultants,, the Special & Cross-Cutting Evaluation Teams, and other program stakeholders as part of the 2013 Special & Cross Cutting Evaluation Strategic Planning Meeting in February.

- *Behavioral Program Persistence Study* (Stage 1) – The overall goal of this analysis is develop additional information regarding the persistence of savings from behavior programs after reports are discontinued.
- *Codes & Standards Coordination/Planning* (Stage 2) — The goal of this effort is to provide overall coordination with implementation to ensure that as implementation plans develop in this area, they are designed in such a way that the necessary data is being collected in order to evaluate the impact of such efforts along with appropriate attribution to the PAs.
- *Community Mobilization Initiatives – Efficient Neighborhoods+* (Stage 1) – The overall goal of this work is to evaluate the effectiveness of the Efficient Neighborhoods+ initiative.

- *Market Effects – Strategic Planning* (Stage 2)– The goal of this study is to provide guidance to the PAs and EEAC by facilitating the development of a process for the evaluation of market effects.
- *Net-to-Gross – Top-Down NTG Methods* (Stage 2)– This is a two phased study to provide guidance to determine the role of top-down modeling of net energy impacts. Phase I will take place during the 2013 -2014 evaluation period. Phase II will follow the Phase I research. The Phase I study goal is to provide recommendations concerning the utility of top-down approaches in future program evaluations. The Phase II study goal is to implement the recommended approach.
- *Net-to-Gross – Electric C&I NTG* (Stage 2) – The goal of this study is to update the incremental short-term program effects of the C&I sector electric programs.
- *Non-Energy Impacts – Low Income Health NEIs* (Stage 1) – The proposed research is aimed at identifying and quantifying NEIs of energy efficiency measures on the health and well-being of low-income energy efficiency program participants, estimating their costs, and projecting those costs to the year 2050.
- *Non-Energy Impacts – Using C&I NEIs for Project Recruitment* (Stage 3) – The overall goal of this research is to provide sales and marketing personnel with specific talking points for prospects by industry.
- *Non-Energy Impacts – Quantifying C&I New Construction NEIs* (Stage 2)– The goal of this study is to quantify participant non-energy impacts (NEIs) associated with commercial and industrial new construction projects.
- *Umbrella Marketing – Brand Effectiveness* (Stage 1)– The goal of this research is to analyze brand effectiveness for the Cool SMART and Gas Networks brands.
- *Retro Electric DRIPE* (Stage 1)– The PAs will research whether estimates of electric DRIPE developed as a part of recent Avoided Cost studies were accurate.

Other Research

Other research includes research which was proposed and that did *not* rise to the top in our planning process.

A. Residential

Below is a table summarizing all of the medium and low priority studies that have been discussed to date. The PAs are not committing to complete these studies.

Potential Activity	**Evaluation Priority**	**History**
NEI Assessment	Medium	Refine NEIs because current studies are based on an incandescent baseline
Lighting Controls Technical Study	Medium	Concerns about the applicability in existing homes unless having a major renovation, should be addressed. Need to explore the use of occupancy sensors, currently it seems like it is primarily used for exterior lighting. Consider performing a potential study, and if potential is there, conducting a preliminary effort.
Consumer Electronics Evaluability, Baseline, and Lost Opportunities Assessment	Medium	Is secondary research a viable option for this activity? Need to determine whether data exist for NTG and baseline estimates. Media set-top boxes might be a good starting point research under this activity.
Appliance Saturation Study	Low	Lower priority since performed recently but is an easy and low-cost add-on to regular lighting saturation studies
Defining LED Measure Life	Low	California is planning a study. A study with first-to-market technologies may not provide good data on measure life.
Measuring C&I Lighting Sales	Low	Leverage estimates from other states, as this has not been determined for current program models in Massachusetts.
Replace on Failure Research	Medium	It may be useful to develop an end-of-life function based on repair cost, age, and distribution that consumers could reference. The constrictors role in the decision-making process needs to be taken into account. How resistant would implementation contractors be to capturing this data when equipment is removed, and would they be able to capture usable data? An assessment of remodeling or household turnover would shed light on equipment lifetimes. A baseline

Potential Activity	Evaluation Priority	History
		study to assess equipment age and efficiencies by dwelling type, vintage, etc. could provide valuable information.
Upstream Delivery Market Study	Medium	The HEHE / Cool Smart evaluation revealed stocking practices consistent with market transformation. Distributors are aware of, and planning around, MA programs.
Emerging Technologies Assessment	Medium	Technology assessments have begun on drain water heat recovery, smart thermostats and water heating that also serves as space heating in condos. Any activity in this area needs to include the Massachusetts Technical Assessment Committee (MTAC).
Lost Opportunities Assessment	Medium	Review the lost opportunities assessment that was conducted in 2013 based on measures included in the single-family potential assessment. Engage with MTAC to assess whether additional measures should have been included.
Zero Energy Homes/Deep Energy Retrofit (DER)	Medium	Focus on DERs since it is likely there are too few zero energy homes to evaluate. Consider hosting a subcommittee on DERs and zero energy homes. A variation of the DER program is being rolled out next year. Learn more about the new program and assess timing for a focused process evaluation
Asbestos/Mold Market Assessment	Medium	There is some skepticism that these barriers could be cost-effectively overcome with the tools typically used by the program. It is not clear how often these barriers are encountered.
Demand Impact Model Update	Medium	An observation was made that there were two parts to the demand impact model: adding measures and adding precision. We need to identify new measures that should be added to the demand impact model and prioritize existing measures for updates.
Envelope Savings in Mid-High Rise Multifamily	Medium	There is likely already some research on envelope savings for mid-high rise multifamily buildings being conducted under the nonresidential contract. There is some coordination going on with the C&I team for the MF process evaluation.
Home Energy Services Realization Rate Update	Medium	This possible evaluation activity was identified as part of the recent HES realization rate task, and was not discussed at the May stakeholder meeting Identify which PAs have changed HES vendors.
Home Energy Services Secondary	Medium	This possible evaluation activity was identified as part of the ongoing low-income metering study, and was not discussed at the May meeting. Assess after the results of the LI study

Potential Activity	Evaluation Priority	History
Heating Study		are completed. Determine whether audit data supports analysis or whether site visits and metering are necessary
Secondary Research	Medium	Need more clarity on the research objectives for this potential activity.
Long-Term Demand Impact Metering	Medium	This activity is closely related to the Demand Impact Model Update activity. All agree that more reliable information for demand estimation has value. Leveraging site visits for other evaluation activities should be considered.

B. Non-Residential

Potential Activity	Evaluation Priority	History
Impact		
Direct Install Refrigeration measures	High	Already covered by NEEP
Custom Gas	Medium	Study was completed for all PAs in 2010 and 2011. Desk review was completed in 2012 and metering was completed for NSTAR sites.
Lighting Controls	Medium	A study of the current lighting controls market is underway to try to determine why lighting controls savings have declined in recent years. PAs/EEAC to decide after current research is completed whether to scope an impact evaluation.
Expansion of lighting control pre/post study to Direct Install	Low	Re-assess after completion of study under Large C&I
Demand Impact Model	Low	Concern that it would not be applicable due to the non-homogeneity of non-residential customers
Process		
Comprehensive Participant Survey and Benchmarking Study	Medium	Study proposed by contractor team. PAs and EEAC consultants are awaiting more information before deciding whether to move forward with this study.
Channel/ Sector Strategies	Medium	Needs input and buy-in from implementation before moving forward
Industrial Process/	Low	

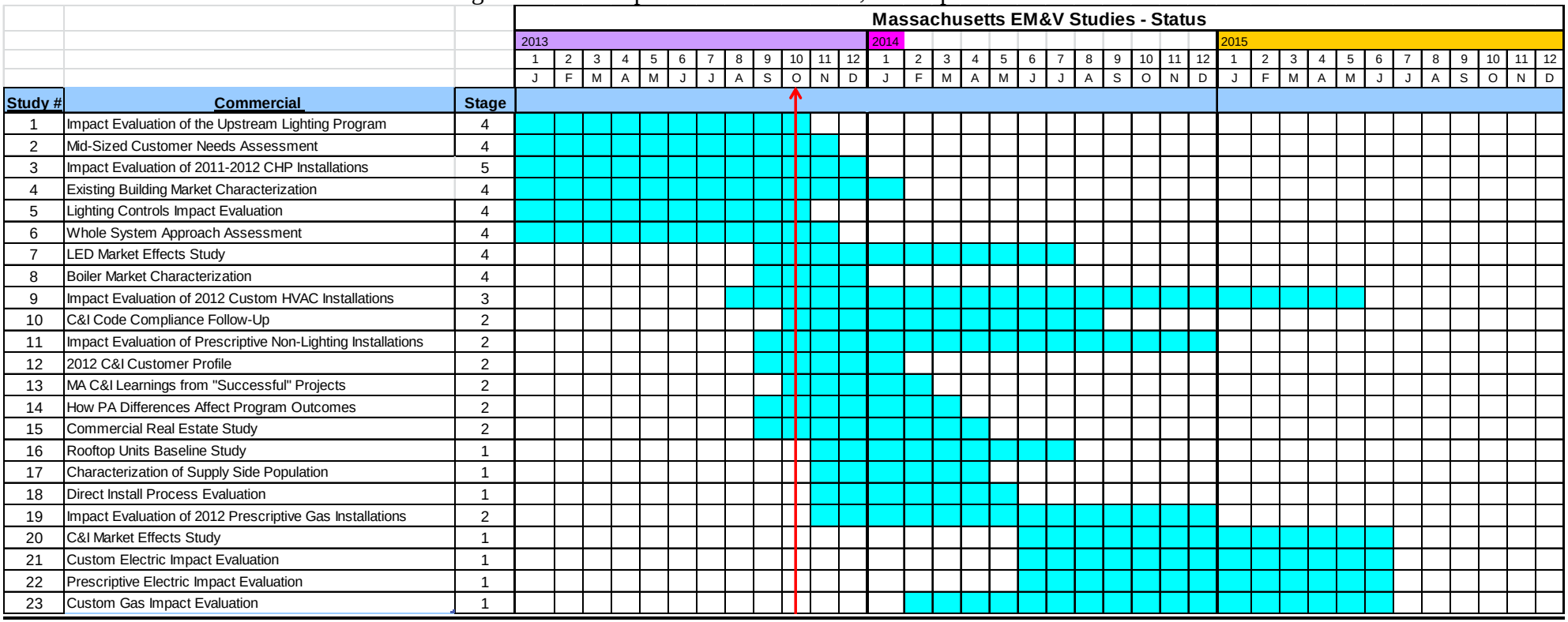
Potential Activity	Evaluation Priority	History
Convenience Store Refrigeration Strategies		
Estimating Energy Savings from Education & Training Programs	Low	Currently not enough training programs supported by PAs to warrant this study
Market Assessment or Characterization		
Additional Building Market Characterization Studies	High	The current existing building market characterization study will identify target markets or building types for on-site and additional research.
Target Marketing Analysis to Estimate Likelihood of Participation and Potential Savings	Medium	
Literature Review of Emerging Technologies	Medium	
Industrial Buildings Market Characterization	Low	
Identify Technical Assistance Opportunities	Low	Technical Assistance is already readily available through current program offerings.
Additional Analysis of Chains and Franchises	Low	
Analysis of Lost Opportunities and Deeper Energy Savings from Interactive Effects	Low	Long Term Project Idea – Needs more thought
Research of How Financial Institutions Value EE	Low	Long Term Project Idea – Needs more thought
Developing a EE-focused Work Force	Low	Long Term Project Idea – Needs more thought

C. Cross-Cutting

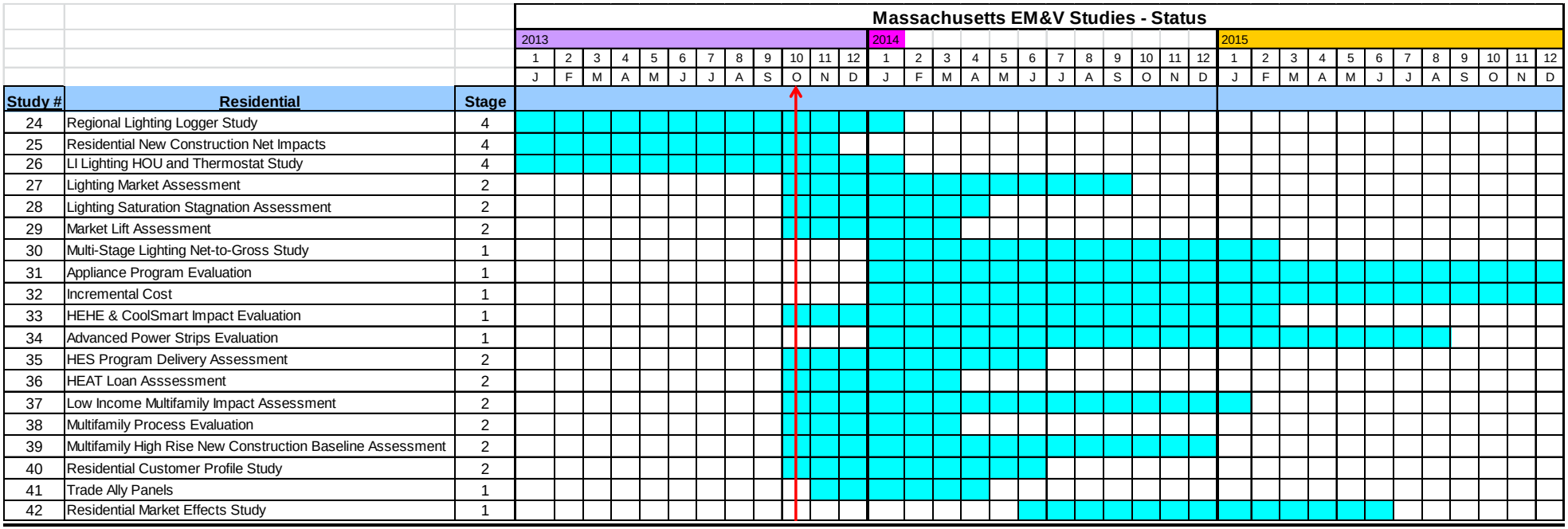
Potential Activity	Evaluation Priority	History
Small PA Behavioral Study	Medium	The evaluation team will develop a plan and detailed scope for this study once the small PAs select vendor(s) and implement behavioral programs.
Behavioral Demand Study	Medium	This study was proposed during the 2013 Planning Meeting, however, after further review and analysis, it was determined that the cost to perform the study would outweigh any benefit gained from the study so it will not be performed at this time.
Residential Statewide Micro-Targeting	Medium	This study was "parked" for 2014 consideration. Larger PAs have recently performed very similar work internally.
Umbrella Marketing Gap Analysis	Low	The work proposed for this study is already included in the Statewide Marketing vendor's Scope of Work. Once that is completed, the team will discuss with implementation if there are any additional research questions that should be investigated.

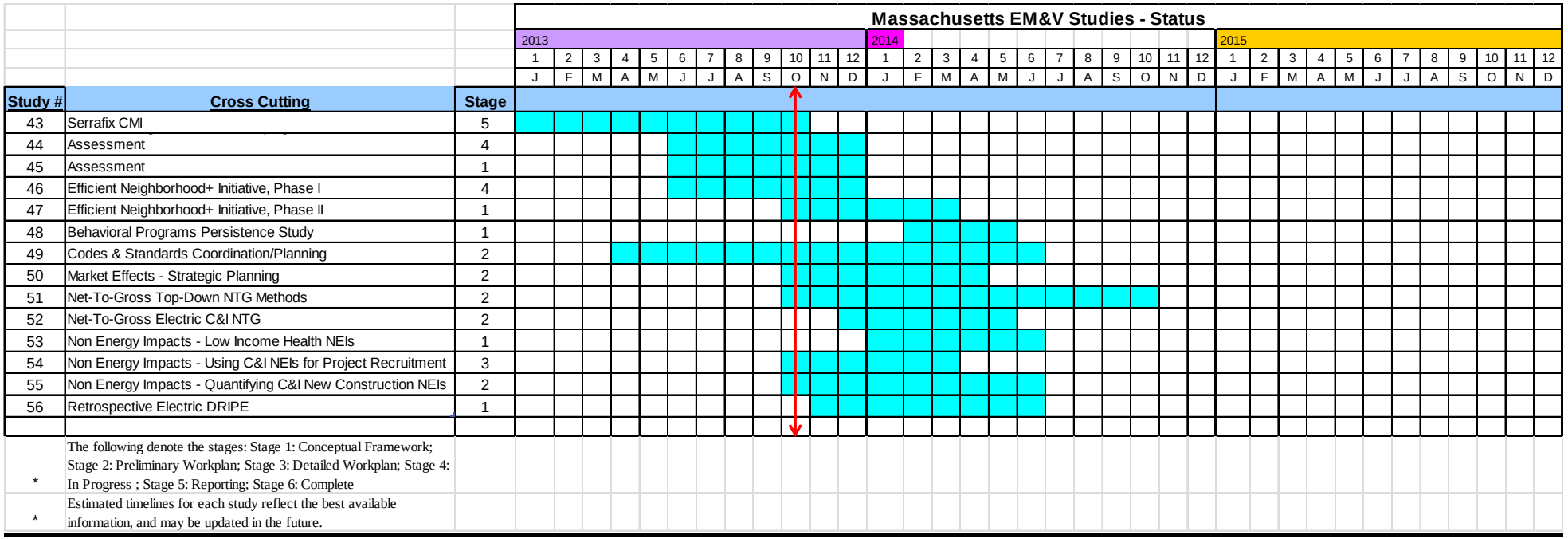
Appendix 1: Gantt Chart

The PAs and the EEAC consultants worked together to develop an EM&V overview, which provides details on evaluation studies.



Study #	Commercial	Stage
1	Impact Evaluation of the Upstream Lighting Program	4
2	Mid-Sized Customer Needs Assessment	4
3	Impact Evaluation of 2011-2012 CHP Installations	5
4	Existing Building Market Characterization	4
5	Lighting Controls Impact Evaluation	4
6	Whole System Approach Assessment	4
7	LED Market Effects Study	4
8	Boiler Market Characterization	4
9	Impact Evaluation of 2012 Custom HVAC Installations	3
10	C&I Code Compliance Follow-Up	2
11	Impact Evaluation of Prescriptive Non-Lighting Installations	2
12	2012 C&I Customer Profile	2
13	MA C&I Learnings from "Successful" Projects	2
14	How PA Differences Affect Program Outcomes	2
15	Commercial Real Estate Study	2
16	Rooftop Units Baseline Study	1
17	Characterization of Supply Side Population	1
18	Direct Install Process Evaluation	1
19	Impact Evaluation of 2012 Prescriptive Gas Installations	2
20	C&I Market Effects Study	1
21	Custom Electric Impact Evaluation	1
22	Prescriptive Electric Impact Evaluation	1
23	Custom Gas Impact Evaluation	1


Massachusetts EM&V Studies - Status
2013
2014
2015
1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
Study # Residential Stage
24 Regional Lighting Logger Study 4
25 Residential New Construction Net Impacts 4
26 LI Lighting HOU and Thermostat Study 4
27 Lighting Market Assessment 2
28 Lighting Saturation Stagnation Assessment 2
29 Market Lift Assessment 2
30 Multi-Stage Lighting Net-to-Gross Study 1
31 Appliance Program Evaluation 1
32 Incremental Cost 1
33 HEHE & CoolSmart Impact Evaluation 1
34 Advanced Power Strips Evaluation 1
35 HES Program Delivery Assessment 2
36 HEAT Loan Asssessment 2
37 Low Income Multifamily Impact Assessment 2
38 Multifamily Process Evaluation 2
39 Multifamily High Rise New Construction Baseline Assessment 2
40 Residential Customer Profile Study 2
41 Trade Ally Panels 1
42 Residential Market Effects Study 1



* The following denote the stages: Stage 1: Conceptual Framework; Stage 2: Preliminary Workplan; Stage 3: Detailed Workplan; Stage 4: In Progress ; Stage 5: Reporting; Stage 6: Complete

* Estimated timelines for each study reflect the best available information, and may be updated in the future.

Appendix 2: One Page Summaries

Study Name: Lighting Market Assessment
Study Manager/PA: Matt Nelson, NSTAR
Evaluation Vendor: The Residential Evaluation Team
Evaluation Stage: Stage 2: Preliminary High-Level Work Plan
Primary Contact @ Vendor: Doug Bruchs, Cadmus
Type of Study: Market Characterization or Assessment
Applicable Fuel(s): Electric

Overall Study Goal:

The goal of this study is to provide ongoing monitoring of the Massachusetts lighting market for the Program Administrators (PAs) and Energy Efficiency Advisory Council (EEAC).

Research Questions:

The study seeks (1) to understand the current and developing state of the market especially as it relates to the Energy Independence and Security Act (EISA), including CFL/LED saturation and sales/market share, availability and pricing of efficient lighting, and supplier and consumer attitudes and expectations; and (2) to quantitatively assess hypotheses developed in the qualitative research on lighting saturation stagnation (described separately).

High-Level Description of Approach/Methodology:

Task 1 (Optional): Identify Comparison Areas

Should the PAs decide to conduct comparison area research (see below), the team will review U.S. Census data and program activity to select the most appropriate comparison areas. During this time, the team will also work with the PAs to identify potential co-sponsors of the comparison area research to possibly defray evaluation costs.

Task 2: Consumer Telephone Surveys

The team will conduct a consumer telephone survey in Massachusetts (n=600, with one-half among occupants of single-family homes and one-half among occupants of multifamily homes) and, optionally, in two to four comparison areas (n=600 each). The survey will serve (1) to recruit for the onsite saturation survey, (2) gather limited information on such topics as satisfaction with efficient lighting and understanding and use of lumens, color temperature, and the Lighting Facts label when selecting light bulbs; and (3) assess changes over time for these selected topics.

Task 3: Onsite Saturation Surveys

The team will conduct an onsite survey (n=150 in Massachusetts and, optionally, 150 each in two to four comparison areas) to estimate the number of CFLs, LEDs, incandescents, and halogens currently installed, as well as in storage, including various types of specialty bulbs; estimate the saturations of each type of bulb; determine the extent of "hoarding" of incandescents because of EISA; estimate the number of CFLs and LEDs that were purchased in the last year; develop and implement a method to consistently distinguish between incandescent bulbs and halogen bulbs; examine variation in use of different types of light bulbs by demographic and home characteristics; estimate remaining potential for CFL and LED saturation; and assess changes over time. An additional option (as described separately in the Lighting Saturation Stagnation Assessment) is to conduct follow-up audits in homes already visited to identify bulbs that have replaced other types of bulbs and occupants' reasons for changing them.

Task 4: Supplier Interviews and Surveys

The team will conduct interviews and surveys with light bulb manufacturers (n=9 to 12), high-level retail lighting buyers (n=3 to 5, plus an additional one to two per optional comparison area), and store managers (n=220 in Massachusetts and, optionally, n=220 in each of two to four comparison areas) to assess their perceptions of past and future effects of EISA on the sales and stocking of different types of light bulbs; assess the market for LEDs, including sales, stocking, and pricing trends; assess their perceptions of the effect of the PAs' program on sales of CFLs and LEDs; and assess changes over time.

Task 5: Lighting Inventory Surveys
The team will work with Lockheed Martin to conduct a survey of lighting inventories among Massachusetts participating retailers (n=100 participating retailers in 2013) and conduct surveys at nonparticipating retailers (n=30), comparing results to previous years efforts. Optionally, we will also conduct similar surveys in two to four comparison areas (n=20 each). The shelf surveys will assess the amount of shelf area and number of available models devoted to CFLs, LEDs, halogens, and incandescents; pricing of CFLs and LEDs compared to incandescents and halogens; and number of bulbs per package and shelf location of CFLs and LEDs compared to incandescents and halogens.

Task 6: Market Adoption Modeling
The team will model likely market changes and responses to program activity concerning the most recent market assessment information (update and modify the market adoption model).

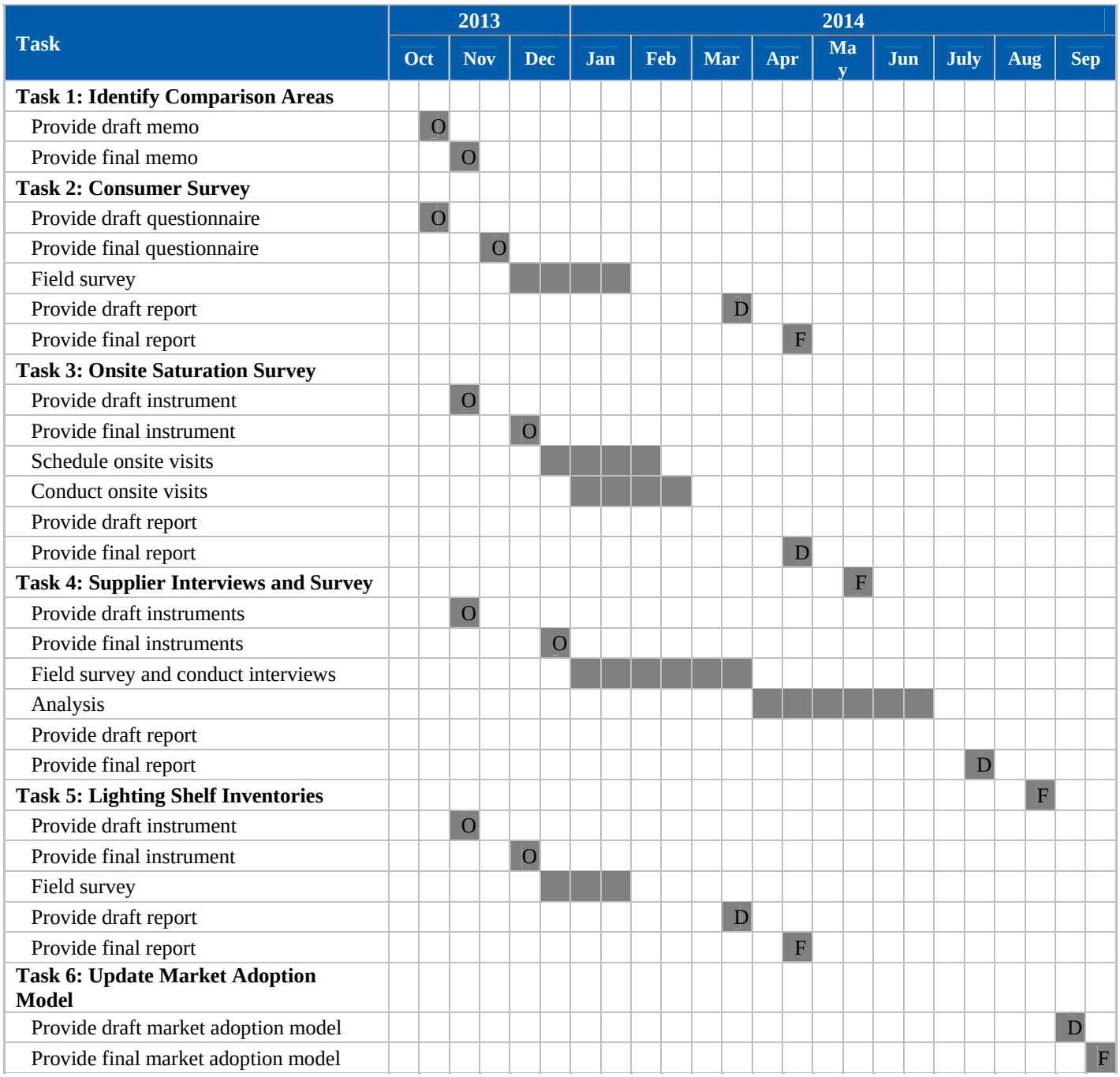
Format of Deliverable:
One report for each of these four data collection activities: consumer telephone survey; onsite saturation survey; interviews and surveys with lighting manufacturers, high-level lighting buyers, and store managers; and survey of lighting shelf inventories. For the market adoption model, there will be two deliverables: (1) a spreadsheet allowing the user to change assumptions and observe the likely effect on the market, and (2) a user's guide. The team will also deliver a memorandum with our recommendations on which comparison areas to use if that option is selected.

Potential Budget:
The following table shows preliminary budgets at three levels. Note that we will determine if PAs in other areas are willing to co-fund some of the comparison-area research.

Tasks and Potential Budgets	Comparison Areas		
	None	Two	Four
Task 1: Identify comparison areas	$0	$35,000	$45,000
Task 2: Consumer telephone survey	$142,500	$409,500	$666,500
Task 3: Onsite saturation Survey	$240,000	$590,000	$940,000
Task 4: Supplier interviews and surveys	$170,000	$410,000	$650,000
Task 5: Lighting shelf inventories	$95,000	$275,000	$445,000
Task 6: Updating market adoption model	$35,000	$35,000	$35,000
Total without Panel	**$682,500**	**$1,754,500**	**$2,781,500**
Onsite saturation panel—follow-up audits with those first audited in January 2013	$180,000	$180,000	$180,000
Total with Panel—Year One Only	**$862,500**	**$1,934,500**	**$2,961,500**

Next Steps:
Develop more detailed scope of work.

Potential Timeline:



O = Other deliverable

D = Draft Report

F = Final Report

Note that only the first-year schedule is shown.

Study Name: Lighting Saturation Stagnation Assessment
Study Manager/PA: Wendy Todd, National Grid
Evaluation Vendor: The Residential Evaluation Team
Evaluation Stage: Stage 2: Preliminary High-Level Work Plan
Primary Contact @ Vendor: Doug Bruchs, Cadmus
Type of Study: Market Characterization or Assessment
Applicable Fuel(s): Electric

Overall Study Goal:

The goal of this study is to explore reasons for the current plateau in CFL saturation and determine ways to accelerate LED adoption; some aspects of this study will be completed through the lighting market assessment (described separately).

Research Questions:

The research will seek to understand and find ways to overcome stagnation in efficient lighting saturation, including the following questions: What are the programmatic, market, and regulatory differences that would explain stagnation of saturation in Massachusetts and New York compared to saturation in California, particularly Southern California Edison territory (where saturation has increased)? Why is the mean number of CFLs per household holding steady while the median is increasing? What are the characteristics of consumers who are increasing their use of CFLs compared to those who are decreasing it or holding it steady, and what keeps the latter types of consumers from increasing their CFL use? For consumers whose CFL use is decreasing, what types of bulbs are they purchasing to replace CFLs? What types of consumers are using LEDs? What types of bulbs are LEDs replacing? What types of bulbs are consumers purchasing to replace the incandescents that are no longer available because of EISA?

High-Level Description of Approach/Methodology:

Task 1: Comparison of Programs and Markets in Massachusetts, New York, and California

The team will review recent saturation estimates in New York and California and confirm that, as in Massachusetts, saturation has virtually stagnated in New York but increased in Pacific Gas & Electric territory and Southern California territory, though significantly more in the latter than in the former. The team will review programmatic differences that could explain this divergence, as well as the role of an earlier implementation of EISA in California, the role of pre-EISA wattage requirements for incandescent bulbs in California (i.e., 5% lower wattage, such that 95-watt incandescent bulbs rather than 100-watt bulbs were available for purchase), and any other salient market differences. This will involve review of evaluation reports, in-depth interviews with program managers, interviews with suppliers (included in the Lighting Market Assessment evaluation summary), and analysis of point-of-sale data in New York, Massachusetts, and California (included in the Multi-Stage Lighting Net-to-Gross (NTG) Study write-up). The team will also examine how field methods could affect saturation estimates and how changes in methods could lead to different results. Access to data and information from New York and California would be facilitated by reciprocal access to data and information from Massachusetts.

Task 2: Saturation Survey Panel

As part of the Saturation Survey included in the Lighting Market Assessment (described separately), the team will revisit homes where saturation surveys have been conducted to perform follow-up saturation surveys. As part of the follow-up, the team will identify any sockets with different types of bulbs than were recorded in the first study and record their characteristics; we will ask the occupants why they replaced one bulb with another type of bulb. We will also ask them to identify CFLs that have replaced CFLs in the interim, although we will be depending on self-reports. Note that saturation survey methods have become more amenable to panels since the last time a panel approach was attempted. For example, technicians now make a map of their path through the home and follow explicit rules on the order in which they examine sockets. They note ambiguous situations and report on rooms or spaces that they could not access. The following is the saturation survey panel design we recommend (for Massachusetts only), with fresh samples to allow us to identify reactive effects of the research:

Cohort	First Audit		Second Audit		Third Audit	
	Month/Year	Number	Month/Year	Number	Month/Year	Number
1	January 2013	150	January 2014	125	January 2015	100
2	January 2014	150	January 2015	125		
3	January 2015	150				

Potential Budget:

$65,000 for comparison of Massachusetts, New York, and California, not including Supplier Interviews (see Lighting Market Assessment) and not including Analysis of point-of-sale data (see Multi-Stage Lighting NTG Study); see the Lighting Market Assessment document for the Saturation Survey Panel budget.

Next Steps:

Develop more detailed scope of work

Potential Timeline:

Task	2013				2014									
	Oct		Nov		Dec		Jan		Feb		Mar		Apr	
Task 1: Comparison of Massachusetts, New York, and California														
Review evaluation results (drafts, if necessary)														
Interviews with program managers														
Supplier interviews (see Lighting Market Assessment)														
Analysis of point-of-sale data (see Multi-Stage Lighting NTG Study)														
Review of field methods														
Provide draft report													D	
Provide final report														F
Task 2: Saturation Survey Panel (See Lighting Market Assessment)														

O = Other deliverable

D = Draft Report

F = Final Report

Study Name: Market Lift Assessment
Study Manager/PA: Matt Nelson, NSTAR
Evaluation Vendor: The Residential Evaluation Team
Evaluation Stage: Stage 2: Preliminary High-Level Work Plan
Primary Contact @ Vendor: Doug Bruchs, Cadmus
Type of Study: Impact Evaluation
Applicable Fuel(s): Electric

Overall Study Goal:

The goal of this study is to assess the planning and implementation of the Market Lift effort and develop a net-to-gross (NTG) estimate of that effort for the Program Administrators (PAs) and Energy Efficiency Advisory Council (EEAC).

Research Questions:

The study seeks (1) to assess whether and to what extent the Market Lift effort was designed and implemented in a way that ensured clear attribution to the effort; (2) to develop a NTG estimate for the Market Lift effort; and (3) if needed, to make recommendations for possible revisions to the program design and implementation to improve the evaluability of the approach and its net impacts.

High-Level Description of Approach/Methodology:

Task 1: Assessment of Planning and Implementation of Market Lift Effort

The team will review available documentation of the Market Lift effort and will interview program managers and planners as well as the program implementation contractor. The team will assess the process and criteria for selecting treatment and control stores, including analyzing store demographics and pre-promotion sales and determining the rationale for allocation of stores to treatment and control groups. We will document the process of and issues involved in negotiating with retailers. Finally, we will review the program implementer's shelf stocking data and sales data for treatment and control stores.

Task 2: Development of Net-to-gross (NTG) Estimate for the Market Lift Effort

The team will analyze treatment and control stores' pre- and post-promotion sales data to develop a NTG estimate and, if necessary, will many any adjustments to account for differences between the treatment and control stores.

Format of Deliverable:

One draft and final report.

Potential Budget:

The following table shows preliminary budgets for these tasks.

Tasks	Potential Budget
Task 1: Assessment of Planning and Implementation of the Market Lift Effort	$55,000-$70,000
Task 2: Development of NTG Estimate for the Market Lift Effort	$5,000-$10,000
Total	**$60,000- $80,000**

Next Steps:

Develop more detailed scope of work.

Potential Timeline:

Task	2013						2014					
	Oct		Nov		Dec		Jan		Feb		Mar	
Task 1: Assessment of Planning and Implementation												
Review documentation												
In-depth interviews												
Review shelf stocking data												
Task 2: Develop NTG												
Provide draft report											D	
Provide final report												F

O = Other deliverable

D = Draft Report

F = Final Report

Study Name: Multi-Stage Lighting Net-to-Gross Study
Study Manager/PA: Matt Nelson, NSTAR
Evaluation Vendor: The Residential Evaluation Team
Evaluation Stage: Stage 1: Conceptual Framework
Primary Contact @ Vendor: Doug Bruchs, Cadmus
Type of Study: Impact Evaluation
Applicable Fuel(s): Electric

Overall Study Goal:

The goal of this study is to estimate net-to-gross (NTG) ratios for key product types incented in the Massachusetts Residential ENERGY STAR® Lighting Program and to assess the associated strategic implications for the MA Program Administrators (PAs) and Energy Efficiency Advisory Council (EEAC).

Research Questions:

The study seeks to develop several estimates for NTG for this upstream program using different methods, including an integrative approach that takes the results from the other methods into account and a discussion of the implications for the program. Moreover, because implementation of EISA is likely to result in rapid changes to the market and possibly the NTG, we recommend repeating at least some parts of this study.

High-Level Description of Approach/Methodology:

Task 1: Decide on Approaches to Use

The first task entails engaging the PAs and the EEAC on strategic goals and then scoping a recommended approach, which may or may not include all the methods described here. We will examine the strengths and weaknesses of each option, including combinations of options, relative to the strategic goals.

Method 1: Supplier Self-reporting

As described in the Lighting Market Assessment evaluation summary, the team will conduct in-depth interviews with participating lighting manufacturers and lighting buyers for large chain retailers as well as Computer-Aided Telephone Interview (CATI) surveys with local store managers. One approach for NTG estimation is for these interviews and surveys to probe, among other topics, what percentage change in sales of various bulb types they attribute to the program as well as their reasons or basis for providing these estimates. If a lighting manufacturer serves multiple retail channels through the program, we will obtain estimates of the program sales impact of the program for each channel they serve. We will also collect information on the program's impact on product prices. We will calculate a NTG ratio for each channel using the sales-weighted averages of the supplier responses separately for specialty and standard CFLs and for specialty and standard LED bulbs. The manufacturer, retail buyer, and store manager samples will each provide a sales-weighted NTG estimate. We will combine these to provide a best estimate for each retail channel, taking into account various considerations such as the robustness of the sample size, consistency of responses across the supply chain for a given retail channel, and their likely knowledge of broader market influences.

Method 2: Demand Elasticity Modeling

Another possible approach is to use demand elasticity modeling to estimate free ridership for the retail markdown program. This analysis would rely on the data gathered for Task 5 of the Lighting Market Assessment. Demand elasticity modeling is based on the same economic principle driving program design: that a change in price and promotion generates a change in quantity sold (i.e., the upstream buy-down approach). Demand elasticity modeling uses sales and promotion information to:

- Quantify the relationship of price and promotion to sales (elasticity)
- Determine the likely level of sales without the program's intervention (baseline sales)
- Estimate free ridership by comparing modeled baseline sales with actual sales

Method 3a: Point-of Sale Data Analysis—Option 1

A third possible approach is for the team to estimate one or more NTG ratios by comparing point-of-sale data in Massachusetts to similar data in several other states. We will purchase statewide market-level bulb sales data from IRi (formerly Symphony IRi), which cover selected channels (grocery, drug, mass merchandise, dollar stores) for Massachusetts

and comparison areas. These sales data include information on dollar, unit and volume sales, package and product type, total bulb count (number of lamps per package), as well as bulb type, color, mechanism, and wattage. The analyses will be conducted at the bulb level and will include estimates for efficient bulb types (standard CFLs, specialty CFLs, and LEDs). The data sources also allow for estimates of EISA-compliant halogen and incandescent bulb sales. After obtaining bulb sales data for Massachusetts and the comparison states, the team will clean the data, bin it by bulb type, and put it in context by examining how differences in program support influenced sales output. In particular, by including New York, which dropped all incentives for standard CFLs in 2012, California, which continued full support, and other areas with varying levels of support, we will investigate the impact of program support on purchasing behavior. This analysis will focus on bulb types collected by IRi, and given that the channels supplying data sell mostly standard rather than specialty CFLs, our analysis is likely to yield the most valuable insights for standard CFL bulbs. NYSERDA, through NMR, has already purchased 2011 and 2012 IRi data for New York, Massachusetts, and Georgia, and it is currently analyzing the data. Moreover, IRi data are relatively inexpensive, and NMR has developed procedures that would facilitate future efforts to bin the data by bulb type. We suggest that the Massachusetts PAs purchase 2013 IRi data for Massachusetts, New York, and Georgia for 2013, as well as 2011-2013 data for California and two other comparison states. We suggest asking NYSERDA for the 2011 and 2012 New York, Massachusetts, and Georgia data and accompanying analysis and, in turn, suggest that the MA PAs offer to reciprocate with the 2013 data and results from the other comparison area.

Method 3b: Point-of Sale Data Analysis—Option 2

The team also offers a "big data" alternative point-of-sale approach to estimating NTG. This approach would model the effect of the Massachusetts program on CFL sales by using IRi data described in Task 3b Option 1 above for 2011 to 2013 from all 50 states, along with other data such as demographic/economic factors, access to home improvement stores, national-level CFL shipments from the U.S. Department of Commerce, electricity prices, latitude, and program activity. (Note that this is more similar to appliance NTG studies done in the past—e.g., http://www.iepec.org/conf-docs/papers/2005PapersTOC/papers/079.pdf—than to the more recent multistate models done for lighting). The team will enter all of these variables into a model that predicts energy-efficient lighting sales. We will then be able to model such sales in the presence or absence of current—and ideally prior—program activity in order to develop a NTG ratio.

Gathering data from various sources will be labor and research intensive—notably the preparation and formatting of the IRi data and the development of independent variables such as the concentration of home improvement and mass merchandise stores, the program activity variable, and possibly a proxy for saturation—and this affects the budget estimate described below. The success of previous efforts to model appliance and CFL saturation led the team to believe that such an endeavor could yield critical insights into the factors driving efficient lighting while also providing another approach to estimate NTG for Massachusetts.

Method 4: Saturation and Market-level Sales Analysis

The fourth possible approach would involve comparison of saturation and market-level sales estimates in Massachusetts and other states developed through Task 3 of the Lighting Market Assessment (described separately). We will also rely on the comparison of Massachusetts, New York, and California constituting Task 1 of the Lighting Saturation Stagnation Assessment (described separately). This effort will not produce quantitative NTG estimates *per se*, but rather will provide the background information and indicators that will help tell the story of market transformation and market effects. For example, the Multistate CFL Modeling completed in 2010 showed that, other things being equal, saturation affects CFL sales: once saturation hits a certain level, CFL sales tend to go down. Last year's analysis of CFL replacement shows that the timing of reaching this saturation plateau also makes a difference in CFL sales; a relatively high level of sales is required simply to maintain that saturation level as older CFLs burn out. Comparison states could include some of those where older saturation estimates exist, such as Kansas, Georgia, Texas (Houston), or South Dakota (Pennington County).

Method 5: Delphi

A fifth approach would entail the use of a Delphi panel to integrate the results of the other NTG estimation methods and develop one or more final recommended NTG estimates. The panel will consist of approximately 20 lighting experts from across the United States and Canada who represent such diverse stakeholders as lighting program administrators, manufacturers, program implementation contractors, and regulators. The panelists will be asked to take part in two rounds of the Delphi process. In the first round, panelists will be provided with an instrument that includes a detailed description of the various NTG estimates and methodologies, along with the strengths and weaknesses associated with each. The team will also provide the panelists with background information on the history of the Massachusetts residential efficient lighting program as well as market and program information from other states. The panelists will comment on each method and provide their own estimates of what they would expect the NTG ratio to be in Massachusetts, given the current market and program design.

The second-round Delphi instrument that will be sent to the panelists will summarize the estimates and comments made by the panel members in round one. Panel members will have an opportunity to modify their initial projections and assumptions, based on the estimates and comments provided by their fellow panelists. The second instrument will also ask

the experts to state any reasons for changing or not changing their projections, along with any comments on the appropriateness of the other assumptions and comments listed. Panelists will be offered a $500 incentive for their time; the incentive will be paid either directly to the panelists or to a charity of their choice.

Potential Budget:

The following table shows preliminary budgets for these tasks.

Possible Methods	Potential Budget
Method: Supplier Self-Reporting (NTG analysis and reporting only—the rest included in Task 4 of the Lighting Market Assessment)	$40,000
Method 2: Demand Elasticity Modeling	$60,000
Method 3a: Point-of-Sale Analysis Option 1	$120,000-$160,000
Method 3b: Point-of-Sale Analysis Option 2	$220,000-$300,000
Method 4: Saturation and Market-level Sales Analysis (NTG analysis and reporting only—the rest included in Task 3 of the Lighting Market Assessment)	$25,000-$50,000
Method 5: Delphi Panel Study	$80,000
Expected Total Budget Range	**$325,000-$530,000**

***The lower range of the budget estimate includes Method 3a but not Method 3b, while the higher estimate includes Method 3b but not Method 3a. Also, the lower range estimate assumes the low-end of the task-specific ranges for all tasks; vice versa for the high-end of the range.

Next Steps/Owners:

Decide on NTG approaches (Task 1).

Potential Timeline*:

The following chart shows the suggested schedule. Please note that many of these approaches will follow or coincide with the tasks described above under Lighting Market Assessment, which is the reason for starting the last approach, the Delphi Study, in August of 2014.

Task	2014																								2015			
	Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec		Jan		Feb	
Task 1: Supplier Self-reporting																												
Analysis																												
Provide draft report											D																	
Provide final report													F															
Task 2: Demand Elasticity Modeling																												
Analysis																												
Provide draft report											D																	
Provide final report													F															
Task 3a: Point-of-Sale Analysis Option 1																												
Acquire data																												
Analysis																												
Provide draft report								D																				
Provide final report										F																		
Task 3b: Point-of-Sale Analysis Option 2																												
Acquire data																												
Analysis																												
Provide draft report											D																	
Provide final report													F															
Task 4: Saturation and market-level sales analysis																												
Analysis																												
Provide draft report											D																	
Provide final report													F															
Task 5: Delphi Panel Study																												
Provide draft round 1 instrument															O													
Provide final round 1 instrument																O												
Recruit panel																												
Round 1 data collection																												
Round 1 analysis																												
Provide draft round 2 instrument																			O									
Provide final round 2 instrument																				O								
Round 2 data collection																												
Round 2 analysis																												
Provide draft report																										D		
Provide final report																												F

O = Other deliverable

D = Draft Report

F = Final Report

Note that only one round of NTG assessment is shown.

Study Name: Appliance Program Evaluation
Study Manager/PA: Wendy Todd, National Grid
Evaluation Vendor: The Residential Evaluation Team
Evaluation Stage: Stage 1: Conceptual Framework
Primary Contact @ Vendor: Doug Bruchs, Cadmus
Type of Study: Impact Evaluation
Applicable Fuel(s): Electric

Background:

According to stakeholders, the MassSave Appliance Rebate program is at the crossroads. The PAs and EEAC are exploring changes to the way this program is currently delivered, including new marketing strategies or retail partnerships, updated incentives, and other cost-effective options. These potential changes are related to the following:

- New U.S. Department of Energy (DOE) standards in 2014 that will impact baseline energy consumption of the two remaining appliances (refrigerators and freezers) where customers still receive incentives for purchasing qualifying high-efficiency equipment.
- How changes to ENERGY STAR® criteria and the new standards will change energy savings.
- Whether the TopTen USA™ designation and appropriate rebate levels can serve as a vehicle to provide cost-effective savings in the appliances and home electronics markets.
- The perception that the program has high free ridership and little spillover, resulting in low net-to-gross (NTG) ratios.

Evaluation and Research Support:

Although it is premature to delineate the specific activities to be performed by the Residential Evaluation Team, it is clear that the work will involve one or more of the following activities:

- Working with the PAs and EEAC to develop research and evaluation activities supporting the new program concepts and designs.
- Collection of sales and market share data. This could include, secondary sources, purchases from vendors who may have this information, trade ally (retailer surveys), and/or customer intercept surveys.
- Estimation of high-efficiency appliance incremental costs relative to the new baselines. This could range from secondary research to primary research, including "tear down" of appliances to isolate energy-efficiency component costs.
- Consumer/trade ally focus groups or surveys to obtain reactions to new program designs, market awareness of high-efficiency equipment, value of features versus energy efficiency versus costs, and/or attribution/NTG.
- Estimation of gross savings via engineering approaches, consistent with new baselines and program designs, including the potential future focus on TopTen USA™.
- Estimation of net savings using a combination of sales data and surveys to assess where the market is now and where it moves as a result of the programs.

Potential Budget:

The budget for the Appliance Program Evaluation will be determined in Task 2. For placeholder purposes we are assuming a range of $200,000 to $500,000.

Potential Timeline:

The Evaluation Team will work with the PAs on program design options and strategic planning of additional evaluation activities over the next three to six months. Additional data collection and research will occur over the next three years, as new appliance standards and program revisions are phased in.

Study Name: Advanced Power Strips Evaluation
Study Manager/PA: Mathew Nelson, Northeast Utilities
Evaluation Vendor: The Residential Evaluation Team
Evaluation Stage: Stage 1: Conceptual Framework
Primary Contact @ Vendor: Doug Bruchs, Cadmus
Type of Study: Impact Evaluation
Applicable Fuel(s): Electric

Background:

Advanced power strips (also referred to as energy-saving surge protectors) automatically control the various items on the power strip and reduce electricity consumption when the various peripherals are not in use. For a home entertainment system consisting of TVs, DVRs, cable boxes, gaming systems, audio equipment, etc., there can be significant savings or none at all, depending on individual customer behavior. In studying the various factors affecting savings, it is helpful to recall the difficulties the energy-efficiency industry has experienced in determining measure savings and cost-effectiveness for setback thermostats. The two measures can be compared as follows:

- The household may already have been manually setting back thermostats or shutting down power strips; therefore, a strict monitoring of post-installation use is not sufficient for determining savings.
- The thermostat and power strip measures require different occupant behavior to achieve energy savings. The power strip must be shut off manually, but the thermostat requires the occupant to let the unit operate automatically once controls are set.
- Each measure can be installed by either a contractor or the occupant.

Power strip savings are therefore dependent on the following:

- Was the unit installed?
- If so, was it set up correctly?
- What loads are connected?
- What shutdowns are established, how regularly, and are the occupant behaviors persisting?
- What shutdowns were previously performed by the occupant before the strip was installed?

Evaluation and Research Support:

The current program, which offers discounted advanced power strips through on-line customer purchases, is not designed to answer these questions and estimate savings. The PA's are more interested in alternative program designs that will generate higher participation and higher savings per participant. In order to determine the impacts of this technology, it is essential we work with the PA implementation team to design a study that can answer these key questions in a context that is consistent with the program design options under consideration at this time. Using the thermostat analogy, we will design a study that incorporates these questions and fits PA's program plans. We present these program design issues for consideration:

- **"New" versus "Retrofit" installations.** New means the installation of new home entertainment system where there may be opportunities for upstream program delivery and professional installation. Retrofit installation generally means the replacement of an existing power strip by the customer and not a professional installer.
- A retrofit power strip could be provided for installation in one of three ways: (1) by professionals (possibly HES auditors), (2) by the occupant with detailed instructions, and (3) by the occupant without accompanying instructions.
- In order to evaluate savings, the design needs to include nonparticipants in both the retrofit and new installation segments to capture baseline equipment and behavior.
- For "New" installations, the baseline will be other new entertainment systems that did not receive a smart strip.
- For "Retrofit" installations, the baseline will be the pre-existing equipment at the participant home.

Potential Budget:

The budget for the Advanced Power Strips Evaluation will be determined in Task 2. For placeholder purposes we are assuming a range of 100,000 to $400,000.

Potential Timeline:

The Evaluation Team will work with the PAs on program design options and strategic planning of additional evaluation activities over the next three to six months. Additional data collection and research would likely occur over the next 18 months.

Study Name: Incremental Cost
Study Manager/PA: Gail Azulay, Cape Light Compact
Evaluation Vendor: The Residential Evaluation Team
Evaluation Stage: Stage 1: Conceptual Framework
Primary Contact @ Vendor: Doug Bruchs, Cadmus
Type of Study: Market Characterization or Assessment
Applicable Fuel(s): Electric, Gas

Background:

The true energy-efficiency related incremental costs of residential products and HVAC equipment are difficult to determine and can change rapidly. The following issues are important to consider:

- New U.S. Department of Energy (DOE) standards and ENERGY STAR® criteria in 2013-2015 will change both the efficient and baseline cases. Incremental costs change rapidly after a change in codes.
- High-efficiency features are more commonly added to top of the line appliances than otherwise basic appliances, which means that it can be difficult to compare prices of equipment where the only difference is the efficiency level
- High-end equipment and products typically have a greater markup by contractors and retailers than basic equipment, which further clouds the comparison between high efficiency and baseline equipment costs

Evaluation and Research Support:

Although it is premature to delineate the specific activities to be performed by the Residential Evaluation Team, it is clear that the work will involve one or more of the following activities:

- Working with the PAs and EEAC on a strategy to prioritize measures, determine the appropriate level of effort, and optimize the data collection schedule.
- Collection of sales and pricing data. This could include, secondary sources, purchases from vendors who may have this information, trade ally (retailer surveys), and/or internet-based retail pricing.
- Estimation of high-efficiency appliance incremental costs relative to the new baselines. This could range from secondary research to primary research, including "tear down" of appliances to isolate energy-efficiency component costs.
- Estimation of high-efficiency HVAC equipment incremental costs using primary research, including "tear down" of equipment to isolate energy-efficiency component costs.

Potential Budget:

The budget for the Incremental Cost Study will be determined in Task 2. For placeholder purposes we are assuming a range of $100,000 to $300,000 over the next three years.

Potential Timeline:

The evaluation team will work with the PAs on refining the strategy and schedule over the next three months. The evaluation tasks will occur over the next three years

Study Name: HEHE/CoolSmart Impact Evaluation
Study Manager/PA: Riley Hastings, NSTAR
Evaluation Vendor: Residential Evaluation Team
Evaluation Stage: Stage 1: Conceptual Framework
Primary Contact @ Vendor: Doug Bruchs. Cadmus
Type of Study: Impact Evaluation
Applicable Fuel(s): Electric, Gas

Background:

The objective of this study is to determine gross savings for the HEHE and CoolSmart programs and provide refined estimates of hours of use and coincidence factor for a variety of space heating, cooling, and water heating measures. The HEHE and CoolSmart programs offer incentives for a variety of heating, cooling, and water heating measures. The following research questions are under consideration:

- What are the true energy and demand savings associated with residential heating, cooling, and water heating equipment in Massachusetts?
- What is the average efficiency of early replacement baseline furnaces and boilers, including oil-fueled equipment?
- What are typical heating, cooling, and water heating loadshapes in Massachusetts?[7]
- What are the benefits of a refined loadshape in terms of being able to deliver these resources into the ISO-NE forward capacity market (FCM)?
- Are condensing boilers controlled in such a way to realize their full potential savings? [8]
- Do heat pumps have higher cooling savings than comparable central ACs?[9]
- Are participants using ductless mini-split heat pumps for heating, or are they using these pumps for cooling only?[10]
- What are the actual savings associated with the quality installation verification (QIV) work performed in Massachusetts?

Evaluation and Research Support:

The team is currently mapping out the sources of uncertainty within each measure of interest in this program to determine the best places to apply evaluation resources. The team is also considering the cost synergies associated with combining multiple onsite studies. Combining site visits generates approximately $750/site in cost savings per overlapping site visit. Although it is premature to delineate the specific activities the Residential Evaluation Team will perform, the following activities and evaluation issues are currently under consideration:

- On-site spot measurements of unit efficiency of both retrofit and new baseline (including existing oil equipment) as well as new participating heating equipment to determine true performance of baseline and efficient systems.[11]
- Metering of heating equipment to determine refined hours of use and peak day gas loads, which are currently estimated by using older, electric heat load shapes. The team would nest onsite samples within a larger first stage billing data disaggregation and phone survey.

---

7 This metering study will allow much more accurate estimates of demand impacts in all of the residential programs with HVAC and shell measures.

8 The high efficiency of condensing boilers relies on having a low boiler return water temperature, which means that differences in installation practices will have a large impact on savings.

9 A recent study in Maryland showed much higher cooling hours of use for central heat pumps than for central AC units, due to differences in sizing methods applied to heat pumps and CAC/furnace systems.

10 Draft results of a recently completed study in the Northeast show very low use of ductless heat pumps for heating in a downstream rebate program focused on new applications.

11 The PAs have not implemented full early retirement programs as of now, but previous evaluations and anecdotal evidence have shown that significant early retirement (and fuel switching) activity is already occurring in the HEHE program.

- Metering of cooling equipment to determine refined hours of use, peak demand and load shapes by efficiency level. The team is currently looking into the ISO-NE FCM benefits associated with this measure and comparing to the evaluation cost.
- Metering of heat pump water heaters and baseline water heating equipment.
- Metering of cooling system efficiency for quality installation participants and non-participants.
- Determination of sizing differences for participant and non-participant equipment.

Potential Budget:

The budget for the HEHE/CoolSmart Impact Evaluation will be refined over the coming weeks. For placeholder purposes, we are assuming a range of $500,000 to $2,000,000.

Potential Timeline:

The evaluation team will work with the PAs to determine optimal timing for evaluation activities, with an objective of completing all studies by February of 2015. Heating system metering, if it occurs, will need to take place this winter.

Study Name: HES Program Delivery Assessment
Study Manager/PA: Mike Goldman, NSTAR
Evaluation Vendor: The Residential Evaluation Team
Evaluation Stage: Stage 2: Preliminary High-Level Work Plan
Primary Contact @ Vendor: Doug Bruchs, Cadmus
Type of Study: Impact Evaluation and Process Evaluation
Applicable Fuel(s): Gas and Electric

Overall Study Goal:

The goal of this study is to provide guidance to the Program Administrators (PAs) and Energy Efficiency Advisory Council (EEAC) regarding the effectiveness of the Home Energy Services (HES) Program to convince audited customers to install recommended measures. The study will focus on determining accurate conversion rates (installed measures : recommended measures) and other key performance metrics for HES overall, as well as for Lead Vendors (LVs) and Home Performance Contractors (HPCs) specifically. The study will also explore the effectiveness of linkages between HES and other PAs programs (most notably HEHE and CoolSmart) and attempt to identify opportunities for greater and deeper savings for each program, as well as the residential portfolio overall.

Research Questions:

The specific research questions assessed through this study include the following:

- What are the critical metrics for assessing performance? Possible metrics will investigate these key questions:
    - What percent of total recommended measures are audited HES customers installing?
    - Are there specific recommended measures that customers install, or do not install, more frequently?
    - Do recommendations or installation rates vary by PA, geography, or delivery channel (LVs/HPCs)?
    - Do realized energy savings or quality installation practices vary by PA, geography, or delivery channel?
- Are HES audits leading to HEHE and CoolSmart participation?
- Are there any meaningful differences by delivery channel? For example:
    - Do the buildings audited/treated by LVs/HPCs face the same conditions?
    - Are LVs/HPCs auditors giving different recommendations?
    - Are customers audited by LVs/HPCs more likely to participate in another program or apply for a Heat Loan?

High-Level Description of Approach/Methodology:

Task 1: Project Planning Meeting

This meeting will include the PAs (implementation and evaluation team members), EEAC, and the Residential Evaluation Team. The goal of this meeting is to review the research questions described above, identify priorities and interests, discuss if the necessary data sources are available (and if not, how to obtain them from historical program records— whether electronic or hard-copy), identify a set of key performance metrics, and develop the set of evaluation activities that will inform the key research objectives.

Task 2: In-Depth Interviews with PAs, Lead Vendors, and HPCs

The Residential Evaluation Team will conduct in-depth interviews with all PA program managers and Lead Vendors and a sample of the most active HPCs. The interviews will start by determining the data sources available to support the evaluation.

Specifically, the Evaluation Team inquiry regarding the availability and completeness of historical data indicating which measures the program recommended and participants installed. We will also attempt to obtain any quality assurance or control reports. If any data are unavailable electronically, our team will work with program stakeholders to collect hard-copies that can be converted into electronic form for analysis.

We will also use the interviews to refine the identified key metrics and determine if PAs or implementers are tracking these metrics internally. We will also ascertain any differences between the HES delivery channels, any program design elements that drive/cause these differences, the specific customers each group serves, and the interaction between HES and other PA programs (such as HEHE and Cool Smart).

Task 3: Analysis

Using HES program data, as well as the analysis completed as part of previous HES evaluations, we will calculate the identified key metrics for each PA and for the Commonwealth overall. We will also calculate metrics for any relevant sub-components of the programs, most notably the different delivery channels. (If an additional impact evaluation is required to calculate all of the identified performance metrics, we will work with the PAs to develop a schedule and coordinate the collection of billing data or any other required data not previously provided.)

Task 4: Findings Discussion with PAs

Once our initial analysis is complete and metrics have been calculated, our team will meet with the PAs to discuss preliminary findings, as well as any recommendations for possible program design improvements identified through the interview and analysis process. During this discussion, the PAs and Residential Evaluation Team will also identify any additional analysis necessary to support or clarify the initial analysis before finalizing the study.

Task 5: Reporting

Our team will provide the PAs with a written report that provides detailed information about HES performance, success of linkages with other programs, and issues related to key program sub-components such as LVs and HPCs. The report will also offer recommendations for program design improvements, as well as potential future research.

Potential Budget:

The following table offers a preliminary budget, subject to change after the task's working group and stakeholders finalize the scope of work.

Tasks	Potential Budget
Task 1: Project Planning Meeting	$5,000
Task 2: In-Depth Interviews*	$3,000-15,000
Task 4: Analysis	$40,000
Task 5: Reporting	$20,000
Total	**$68,000-80,000**

*Depends greatly depending on whether these are separate interviews or combined with concurrent interviews of other evaluation efforts.

Next Steps:

Upon summary approval, convene planning meeting and develop final detailed scope of work

Potential Timeline:

Tasks	2013				2014					
	September	October	November	December	January	February	March	April	May	June
Task 1: Planning		O								
Task 2: Interviews										
Task 3: Analysis										
Task 4: Findings Discussion										
Task 5: Reporting										

O= Other deliverable
D = Draft report
F = Final report

Study Name: HEAT Loan Assessment
Study Manager/PA: Mike Goldman, NSTAR
Evaluation Vendor: The Residential Evaluation Team
Evaluation Stage: Stage 2: Preliminary High-Level Work Plan
Primary Contact @ Vendor: Doug Bruchs, Cadmus
Type of Study: Process Evaluation
Applicable Fuel(s): Gas and Electric

Overall Study Goal:

The goal of this study is to help the Program Administrators (PAs) and Energy Efficiency Advisory Council (EEAC) understand the extent to which the MassSave HEAT Loan Program influences customer decision-making, relative to the other factors that influence participation (PA incentives, tax credits, pre-program intentions, etc.) and to explore whether the availability to the HEAT Loan impacts contractor pricing.

Research Questions:

The specific research questions assessed through this study include the following:

- What percentage of PA program participants are aware of the HEAT loan program?
- Of those participants aware of the program, how did they learn about it and how many applied/received the loan?
- How important is the HEAT loan in customer's decision-making process?
- Was the loan more or less important than the program's incentives, available tax credits, or any other motivational factors?
- At what rate are participants in the major PA programs (i.e., HES, HEHE, CoolSmart) taking advantage of the loan? What about between PAs or delivery channels (lead vendors versus Home Performance Contractors, HPCs)? If a disparity, why?
- How is the HEAT loan marketed? Does this differ by program? Is there a way to increase participation (more houses) or achieve deeper savings (more savings per home) by marketing the program differently?
- Are there any meaningful differences between jobs with and without HEAT loans? For example, are customers with HEAT loans having more measures recommended, installing more measure, or experiencing different prices?

High-Level Description of Approach/Methodology:

Task 1: Project Planning Meeting

This meeting will include the PAs (implementation and Evaluation Team members), HEAT loan administrators, EEAC, and the Residential Evaluation Team. The goal of this meeting is to review the research questions described above, identify priorities and interests, discuss available data sources, and develop the set of evaluation activities that will inform the key research objectives. In preparation for this meeting, we have developed several possible tasks for consideration.

Task 2: In-Depth Interviews

The Residential Evaluation Team's Home Energy Services (HES) Program Delivery Assessment evaluation plan includes in-depth interviews with all PA program managers, HES Lead Vendors, and a sample of the most active HPCs. As part of those interviews, we will also ask these HES stakeholders about the HEAT Loan Program. Specifically, we will ask how the program presents the loan program to potential participants, their sense of the loan program's value and influence on participation, how the contractor bids for potential participants, and any opportunities for improvement in the program's marketing and delivery. We will leverage similar interviews with key HEHE and Cool Smart program stakeholders slated as part of other Evaluation Team efforts. We will also seek out key individuals that administer the loan program for similar interviews. As part of all interviews, we will ask stakeholders to weigh in regarding the appropriate questions to ask loan participants and nonparticipants in order to gauge the effectiveness of the program.

Task 3: Loan Participant and Nonparticipant Surveys

To understand the current effectiveness of the HEAT Loan Program, we will conduct 600 surveys with a stratified random sample of HES, HEHE, and CoolSmart participants, including those who participated in the loan program and those who did not (100 surveys per cell). As with the stakeholder interviews, we will explore opportunities to augment our concurrent

evaluation efforts for these other programs in order to investigate HEAT loan-specific issues at minimal marginal cost. The surveys will focus on participants' loan awareness, if the HEAT loan played a role in their decision-making process, as well as why they decided to install the some or all of the recommended measures. HEAT loan participants will also be asked about the application and approval process itself, as well as a set of questions that the Evaluation Team will use to quantitatively assess the relative influence of various participation factors using the Analytical Hierarchy Process (AHP).

Task 4: Analysis

Our analysis will consist of three elements.

1. We will review all available program data with HEAT loan program indicators with a goal of understanding what type of customers participate, what the average cost of a HEAT loan job is (by measures), and whether HEAT loan customers install a greater percentage of recommended measures.
2. We will qualitatively assess the findings of the stakeholder interviews.
3. We will analyze the findings of the participant and nonparticipant survey described in Task 3. Conducting the AHP is a subset of the survey analysis. AHP is an analytical methodology that assesses the "relative" importance of various factors in a decision-making process through a series of pair-wise comparisons that determine which factor was more important in their decision to participate, but also how much more important that factor was. These pair-wise questions are easy to answer and allow us to develop a matrix and set of weights that indicate, quantitatively, the relative influences of all factors. We believe AHP is ideal for this analysis given the many factors that can influence participants and because the methodology simplifies complex decisions by offering discrete choices between two factors. We will determine the set of participation factor (or "criteria" in AHP parlance) in collaboration with the PAs and through the stakeholder interview process.

Task 5: Reporting

After presenting preliminary results to the PAs and EEAC via webinar, our team will provide the PAs with a written report that details our findings and methodologies. The report will also offer recommendations for program design improvements (for the efficiency programs, or the loan program) or for future research.

Potential Budget:

This preliminary budget is subject to change after the task's working group and stakeholders finalize the scope of work.

Tasks	Potential Budget
Task 1: Project Planning Meeting	$5,000
Task 2: In-Depth Interviews*	$3,000-15,000
Task 3: Loan Participant and Nonparticipant Surveys*	$3,000-$40,000
Task 4: Analysis	$20,000
Task 5: Reporting	$15,000
Total	**$46,000-95,000**

*Depends greatly depending on whether these are separate interviews, or combined with concurrent interviews and surveys supporting other evaluation efforts.

Next Steps:

Upon approval of preliminary high-level plan, convene planning meeting and develop final detailed scope of work.

Potential Timeline:

Tasks	2013																		2014									
	September					October				November				December					January				February				Mar	
	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	16	23	2	9
Task 1: Planning Meeting						O																						
Task 2: Interviews																												
Task 3: Surveys																	O											
Task 4: Analysis																												
Task 5: Reporting																								D				F

O= Other deliverable

D = Draft report

F = Final report

Study Name: Multifamily High Rise New Construction Baseline Study
Study Manager/PA: Mark Sevier, National Grid
Evaluation Vendor: The Residential Evaluation Team
Evaluation Stage: Stage 2: Preliminary High-Level Work Plan
Primary Contact @ Vendor: Doug Bruchs, Cadmus
Type of Study: Market Characterization or Assessment
Applicable Fuel(s): Electric and Gas

Overall Study Goal:

The goal is to provide a baseline study of new construction building practices in four-story and higher multifamily buildings for the Program Administrators (PAs) and Energy Efficiency Advisory Council (EEAC). To date, there has not been a study to document building practices in high rise multifamily buildings. Prior to 2013, high-rise multifamily buildings were addressed through the multifamily pilot. In 2013, the RNC initiative is made up of two major categories—Low Rise and High Rise. The High Rise category consists of both prescriptive and custom paths for buildings that are four stories and higher, with the appropriate path determined by the stage of project development at the time of signing: i.e. planning, pre-construction, or construction. A suite of offerings includes a comprehensive list of measures, such as wall insulation, heating systems, instant savings domestic hot water measures, appliances, lighting, and controls, to maximize energy savings above Massachusetts energy code. A baseline study of multifamily high rise new construction building practices and characteristics in high rise multifamily buildings being constructed outside the RNC initiative will provide a baseline of building characteristics for use in calculating savings.

Research Questions:

All multifamily residential new construction projects (including gut rehabilitation projects) four stories and higher are eligible to participate in the Multifamily Residential New Construction initiative. Three paths are available for participation, with path eligibility determined by the project's schedule and size.

- **Whole Building Simple Prescriptive Path** addresses both in-unit savings and whole building energy savings for all gas and electric energy-efficiency measures.
- **Whole Building Interactive Path** allows participants early in the design phase to fine tune their building design decisions to maximize energy efficiency—both in-unit and whole building Energy Conservation Measures (ECM) are comprehensively addressed.
- **Residential In-Unit Savings Path** focuses on the in-unit residential metered electric savings. The path addresses energy-efficiency opportunities from appliances, lighting, domestic hot water usage, and in-unit hot water production.

At the building level, this study will document building envelope, heating, ventilation, air conditioning, domestic hot water, common area lighting, pump and motor characteristics. At the unit level, this study will document appliances, lighting, and domestic hot water usage characteristics.

,

High-Level Description of Approach/Methodology:

Task 1: Establish Working Group

Establish a working group that includes representation from PAs and evaluation staff, EEAC consultants, and the implementation contractor, as well as the non-residential team to ensure collaboration and coordination with commercial programs addressing multifamily buildings. The purpose of the working group will be to finalize the scope of the study.

Task 2: Bi-weekly Working Group Conference Calls
The team will conduct six bi-weekly conference calls to present data and information that will help the working group finalize decisions on the target market, sampling methodology, sample size (number of projects/buildings to be inspected), participant recruiting, data collection (both what to collect and how), reporting detail, etc. The Evaluation Team will work with the implementation contractor as well as conduct secondary research as needed to define the population of potential projects/buildings eligible for participation in the study and provide other relevant background information for discussion on the conference calls. For example, secondary research could include looking at how other states determine baselines and calculate savings for high rise multifamily buildings.

Task 3: Develop Onsite Data Collection Forms
The team will draft and issue for review data collection forms and then finalize the forms for both building and unit onsite inspections.

Task 4: Recruit Study Participants
The team will recruit study participants. We will ensure access to all areas of newly completed multifamily buildings by recruiting building managers or talking with the developers who can provide building plans and facilitate access to individual units.

Task 5: Conduct Onsite Inspections and Compile Database
The team will conduct onsite building and unit inspections, auditors will submit completed data collection forms for review, all data entries will be checked for accuracy and consistency, and final data will be entered into a database for analysis.

Task 6: Analyze Data
The team will analyze all data collected.

Task 7: Report Findings
A draft report will be issued for review and comment, followed by a final report.

Potential Budget:

The tasks associated with the high-rise multifamily new construction baseline study are listed above, beginning with the development and regular convening of a working group to finalize the scope of the study. A potential budget for these two tasks, based on six bi-weekly conference calls and conducting associated research, is $28,000.

The final overall cost of the study will depend on the working group's decisions on study scope and methodology. At this point, based on initial high level budgeting assuming onsite inspections would be conducted of 15 non-participating buildings from 15 unique projects that would be eligible to participate in the multifamily residential new construction initiative and inspecting five individual units in each selected building, we estimate a total study budget range of $225,000 to $310,000.

Upon approval of a final study scope, the team will develop budgets for each study task. Note that some of the study tasks provided above may need to be revised if the final study design changes.

Next Steps:

Upon approval of preliminary high-level plan, convene planning meeting and develop final detailed scope of work.

Potential Timeline:

Tasks	2013		2014											
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Task 1: Establish Working Group														
Task 2: Bi-weekly Calls														
Task 3: Develop Onsite Data Collection Forms				O										
Task 4: Recruit Participants														
Task 5: Conduct Inspections and Compile Database														
Task 6: Analyze Data														
Task 7: Report Findings												D		F

O = Other deliverable
D = Draft Report
F = Final Report

Study Name: Multifamily Process
Study Manager/PA: Kim Crossman, National Grid
Evaluation Vendor: The Residential Evaluation Team
Evaluation Stage: Stage 2: Preliminary High-Level Work Plan
Primary Contact @ Vendor: Doug Bruchs, Cadmus
Type of Study: Process Evaluation
Applicable Fuel(s): Electric, Gas

Overall Study Goal:

Comprehensive evaluation work around the Multifamily Program and the multifamily sector was performed in 2011 and 2012 that included a process evaluation, an impact evaluation, a market characterization and potential study, and an evaluation of the Four to Eight Story Multifamily New Construction Pilot program. The overall goal of studying this program in 2013 and 2014 will be to assess and monitor the current state of the evolution of the Multifamily Program as a standalone or integrated offering and provide an ongoing examination of barriers, program operations, and customer experience

This broad goal is supported by two primary objectives of interest to the Program Administrators (PAs) and Energy Efficiency Advisory Council (EEAC). The first is to assess program and current technology installation barriers and explore and examine the possibility of integrating the commercial and multifamily program. The second goal is to review PA and vendor tracking data in order to asses these data for sufficiency in providing a foundation for an impact study planned for 2014.

Research Questions:

These are the research questions that we are currently considering.

1. What are the current plans for the Multifamily Program, including those plans associated with communication and coordination among residential and non-residential teams? How do the PAs differ in their plans for integrating the commercial and multifamily programs?
2. How feasible is it to integrate the commercial and multifamily programs? What are the challenges and benefits of integrating the programs?
3. What have the PAs and vendors done in response to participation barriers identified in the 2012 study and have those interventions been successful?
4. Are there barriers to implementing current technologies in this sector, particularly technologies identified as having high potential in the 2012 potential study? If so, what are those barriers?
5. The previous impact evaluation of this program identified some deficiencies in the completeness and consistency in program tracking databases that had hindered prior evaluation efforts. Have these tracking data issues been addressed?
6. How feasible is to aggregate and integrate data from residential and commercial meters and across multiple program years to create the whole multifamily building profile necessary to assess the effectiveness of current efforts to more fully integrate multifamily and C&I program and attain deeper savings?
7. What type and level of rigor should the 2014 multifamily impact study have?
8. Are there multifamily program designs or best practices outside of Massachusetts that have been successful in encouraging deeper energy savings in multifamily buildings and/or in achieving higher participation levels from multifamily property managers/owners?
9. What do Massachusetts multifamily property managers/owners think about the feasibility of alternative program designs or practices that are being used in other states?
10. How do condominium associations differ in their organization (e.g., homeowner associations vs. condo associations, differences in by-laws as to who can do what in the units) and what strategies will work best for the PAs and their contractors to gain the participation of these associations?
11. What are the lost/foregone energy-efficient opportunities in multifamily buildings due to audits not being performed or audit recommendations not being totally followed?

High-Level Description of Approach/Methodology:

Task 1: Impact Assessment Methodology

At the outset of the study, we believe it would be useful and informative to subsequent tasks to gather initial thoughts on what type and level of rigor the PAs, EEAC and other stakeholders are interested in pursuing in the 2014 impact study. We suggest this task for two primary reasons. First, if there is a consensus that metering is desired, we can consider performing metering in the winter of 2013/14 so that winter peak performance can be captured. Installing metering early would also allow for longer term metering to occur yet still have analysis and reporting of that data in 2014. The second reason is that it would be best to perform the assessment of the tracking data (Task 5) with an initial understanding of the type of impact evaluation that the data would be expected to support.

Task 2: Interview Program Administrators and Vendors and Condominium Association Trade Representatives

We plan to conduct in-depth interview with representatives of each PA involved with the Multifamily Program, a representative of the Multifamily Market Integrator, and representatives of the three primary program vendors. Discussions of this research task during a September 24th Multifamily Working Group meeting indicated that the purpose of these interviews will be to assess plans related to the integration of the Multifamily Program into the commercial program portfolio and ascertain their perception of the challenges and/or ways in which the new program structure might or might not improve the availability, promotion, and sales of energy-efficient products in the multifamily market. These interviews will also assess what has been undertaken to overcome the barriers identified in the 2012 Process Evaluation, Impact Evaluation, and Market Characterization and Potential Studies, and the results of those efforts. This task will also encompass any necessary coordination and communication with the commercial/industrial and cross-cutting Evaluation Teams to provide guidance on integration, if that is pursued. The September 24th meeting also revealed that while the smaller PAs should be able to cover the Multifamily/C&I program integration issue in a single manager/staff interview, for the larger PAs this issue will likely have to be covered by two separate interviews—one with the Multifamily Program representative and one with the C&I Program representative. Therefore, we are anticipating completing 12 program staff/manager interviews and three vendor interviews.

During the September 24th meeting there was interest by multiple PAs in learning more about how condominium associations differ in their organization (e.g., homeowner associations vs. condo associations, differences in by-laws as to who can do what in the units), and what strategies will work best for the PAs and their contractors to gain the participation of these associations. To inform this discussion we plan to complete interview with four representatives of condominium association trade representatives.

Task 3: External Best Practices Study: (Optional)

The Working Group meeting also revealed interest in a research task to explore if there are multifamily program designs or best practices outside of Massachusetts that have been successful in encouraging deeper energy savings in multifamily buildings and/or higher participation levels from multifamily property managers/owners. During this meeting, it was also revealed that the EEAC consultants had recently completed a preliminary external best practices study for existing multifamily buildings and there was concern from the PAs about duplication of effort.

If it is determined that this preliminary EEAC consultant best practices study needs to be supplemented, the Evaluation Team will conduct an additional external best practices study. The initial phase of this study will be to review the EEAC consultant best practices study to determine where additional research might be beneficial. Once these additional research needs are identified, the evaluators would conduct a literature search to locate any published reports and conference papers on these topics. If the literature search finds that there is something of value to be learned from these non-Massachusetts multifamily programs that cannot be gleaned adequately from published reports or papers, we will supplement this literature search with in-depth interviews with the managers of these non-Massachusetts multifamily programs. We are currently budgeting for six in-depth interviews with non-Massachusetts program managers.

Task 4: Focus Groups

A series of focus groups will be performed under this task; which are required under the Three-Year Plan and must be completed by the first quarter of 2014. The groups will be broken up into large market rate property managers, small market rate property managers, building owners, and building tenants. The multifamily property manager/owner focus groups will explore:

- Their reaction to recent changes in program design such as the integration of multifamily and commercial programs and the addition of the Multifamily Market Integrator.
- Their reaction to possible alternative program designs or practices as informed by the Task 3 External Best Practices

Study.

- Their feedback on possible barriers to deeper and broader measure installations in multifamily projects.
- Their feedback on possible barriers to the implementation of energy-efficient measures which were identified as having high potential in the 2012 multifamily potential study.
- Their reaction to various possible marketing strategies.
- Their feedback on other barriers to energy efficiency implementation in their sector.
- Their experience participating in the multifamily and/or commercial program and the relative importance of different program features.
- Their interaction with trade allies.
- Energy-efficient measures they might have considered but did not implement.

The tenant focus group will focus on more generic barriers to program participation and energy-efficiency implementation and on their reaction to various marketing strategies.

Task 5: Review of Tracking Systems and Integrating Data from Multiple Meters and Program Years

The Team will gather information from all vendor tracking systems and perform an assessment of the ability of these systems to support an impact evaluation and, if not, what changes would be necessary, and/or what limitations the tracking systems might impose on the types of impact evaluations available. Regardless of the nature of the impact study undertaken (billing analysis, on-sites with M&V, meta study, etc.), it will be necessary to ensure that the data from all disparate vendors have consistent data fields and definitions to support an evaluation of program impacts.

The evaluators will also interview PA data management experts to determine:

- The feasibility of aggregating data from residential and commercial meters in a given multifamily building to create more of a whole building profile.
- The feasibility of aggregating energy savings data from multiple years at the building level.

The ability to aggregate and integrate these data from different types of customer meters and over different program years will be important in helping to measure if the integration of the multifamily and C&I programs are producing deeper savings at the site level.

If this data aggregation proves feasible, the Residential Evaluation team will merge C&I multifamily data (which DNV GL currently possesses), with multifamily residential data. Individual records will be tied together, where possible using account data linkage for National Grid and/or addresses for other PAs. The report will compile statistics on overlap in incentives between commercial and residential projects. The report will also provide details on overall size of projects, type and number of measures installed. This could be used to understand how integration is working over time

Task 6: CATI Phone Surveys

The evaluators will also conduct Computer-Aided Telephone Interviews (CATI) surveys with a random sample of 200 multifamily property owners/managers across the state. Because focus groups can be subject to self-selection effects, the phone survey will serve as an additional source of information on property manager/owner perspectives. These phone surveys could also be used to recruit focus group participants. The topics covered by these phone interviews will be similar to those for the focus groups; these will include exploring barriers to program participation and energy-efficiency implementation and gathering feedback on possible alternative program designs. We would stratify the phone survey sample in a similar manner as the focus groups. The cost estimate for this task assumes that we would be able to reuse a sample frame from the 2012 Massachusetts multifamily market characterization and potential study, but we recognize that some data cleaning and re-stratification of this sample frame will likely be necessary.

Task 7: In-Depth Phone Interviews

The evaluators will also conduct 50 in-depth telephone interviews with:

- 30 participating property managers/owners
- 10 condominium association representatives
- 10 C&I contractors who are active in the multifamily sector

These in-depth telephone interviews will explore issues in more depth than the CATI surveys while avoiding some of the self-selection effects of the mandatory focus groups. The September 24th meeting revealed that the C&I tracking systems

should be able to identify C&I contractors who work on multifamily projects. The topics covered in these interviews will be very similar to those covered in the focus groups including:

- Their reaction to recent changes in program design such as the integration of multifamily and commercial programs and the addition of the Multifamily Market Integrator.
- Their reaction to possible alternative program designs or practices as informed by the Task 3 External Best Practices Study.
- Their feedback on possible barriers to deeper and broader measure installations in multifamily projects.
- Their feedback on possible barriers to the implementation of energy-efficient measures which were identified as having high potential in the 2012 multifamily potential study.
- Their reaction to various possible marketing strategies.
- Their feedback on other barriers to energy efficiency implementation in their sector.
- Their experience participating in the multifamily and/or commercial program and the relative importance of different program features.
- Their interaction with trade allies.
- Energy-efficient measures they might have considered but did not implement.

The condominium association interviews will also explore some of the issues described in Task 2 for the condominium association trade representative interviews.

Task 8: Assessment of Foregone Opportunities

This task will compare the measures taken to the potential measures available at the property. There are two approaches that will be used. For those sites that received a comprehensive audit, the evaluation will compare the recommended list to the installed lists. For those projects without a comprehensive audit, the consulting team will perform whole building audits to identify measures that remain that would likely have been recommended has a full audit been performed..

Potential Budget:

Below is our proposed evaluation budget.

Task	Potential Budget
Task 1: Impact Assessment Methodology	$10,000
Task 2: Interview Program Administrators, Vendors, and Condo Trade Representatives	$16,250
Task 3: External Best Practices Study (Optional)	$22,400
Task 4: Focus Groups and Analysis	$55,000
Task 5: Review, Analysis of Tracking Systems and Data Merging	$59,000
Task 6: Phone Surveys and Analysis	$70,500
Task 7: In-Depth Interviews with Multifamily Property Manager Owners, Condo Industry Representatives, and C&I Contractors	$36,400
Task 8: Assessment of Foregone Opportunities	TBD
Reporting and Project Management	$50,000
Total	$319,550

Next Steps:

Upon approval of preliminary high-level plan, reconvene with multifamily program implementers and develop final detailed scope of work.

Potential Timeline:

Tasks	2013					2014			
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Task 1: Impact Assessment Methodology									
Conversation at Initiation about options and desirable methods	O								
Brief contacts with PAs, EEAC and other stakeholders		O							
Memo of findings and recommendation for moving forward			O						
Task 2: Interview Program Administrators and Vendors									
Develop interview guides		O							
Conduct interviews									
Task 3: Focus Groups									
Focus group planning (identify and reserve facilities)									
Generate draft and final recruitment script				O					
Generate draft and final discussion guide					O				
Perform focus groups									
Analysis of focus group data									
Task 4: Tracking System Review									
Data request		O							
Data acquisition and compilation									
Data review and assessment									
Task 5: Telephone Surveys									
Population data gathering and sample design			O						
Develop draft and final survey instruments			O	O					
Field surveys									
Analysis of phone survey data									
Reporting									
Writing draft report								D	
Finalizing report									F

O = Other deliverable

D = Draft Report

F = Final Report

Study Name: Low Income Multifamily Impact Assessment
Study Manager/PA: Riley Hastings, NSTAR
Evaluation Vendor: The Residential Evaluation Team
Evaluation Stage: Stage 2: Preliminary High Level Work Plan
Primary Contact @ Vendor: Doug Bruchs, Cadmus
Type of Study: Process Evaluation and Impact Evaluation
Applicable Fuel(s): Gas and Electric

Overall Study Goal:

The goal of this study is to provide the Program Administrators (PAs) and Energy Efficiency Advisory Council (EEAC) with an inventory of the methods currently used across the Commonwealth to estimate Low Income Multifamily (LIMF) savings, explore opportunities for standardization where appropriate, assess whether all data required for evaluation are available, and develop PA-specific realization rates for appropriate measures.

Research Questions:

The specific research questions assessed through this study include the following:

- Research and document the measure-specific savings calculations and assumptions currently employed by each PA.
- Develop a process for comparing current calculations/assumptions across PAs with the intent of standardizing where appropriate.
- Review the data currently collected (electronically and in hard copy) by the Community Action Agencies (CAA) administering the LIMF and determine if the data are sufficient to support a robust impact evaluation.
- If the data review identifies gaps in data collection (either to the participants, the buildings served, or the measures installed), offer specific recommendations for improvement that will enable future study. Recommendations may also stem from best practices used in other states identified through the literature review.
- Offer process-related recommendations or insights identified during interviews with PA and CAAs, as well as through the data collection and review process.
- Collaboratively determine the most appropriate methodology or methodologies for estimating measure-specific savings; possibilities include whole building or tenant-level billing analysis, engineering algorithms, calibrated building simulation, and building/end-use metering.
- Estimate measure-specific energy savings and develop PA-specific realization rates (which PAs can use to adjust *ex ante* savings estimated by CAAs).

High-Level Description of Approach/Methodology:

Task 1: Stakeholder Workshop I

At the outset of the study, the Residential Evaluation Team will identify LIMF stakeholders and convene a meeting to discuss potential evaluation activities. The goal of the meeting will be to determine the set of tasks that provides the PAs with the greatest value and accurately assesses the true energy impact of the LIMF program, as well as the optimal timing for each task. The meeting will also explore process-related issues such opportunities for standardization. To minimize costs and inconvenience to stakeholders, we will schedule this meeting in conjunction with an existing Low Income Best Practices Working Group meeting, The output of this task will be a detailed evaluation plan documenting next steps.

Task 2: In-Depth Interviews with PA and CAA LIMF Implementation Staff

The Residential Evaluation Team will conduct in-depth interviews with each PA's LIMF implementation manager, as well as key CAA staff, to understand (1) how measure-specific programs' savings are currently calculated and claimed, (2) the range of data collected as part of the program cycle, (3) anticipated changes in data collection, data management, or savings calculations as part of upcoming program cycles, and (4) the process by which the LIMF is delivered and how it differs from the single-family program. As part of these interviews, we will also request copies of program documentation, including any documents outlining savings calculations/assumptions, all electronically available program databases, meta-data regarding the software tools used to estimate savings, and a sample of the hardcopy forms (populated with participant data) used by CAA field staff.

Task 3: Data Review

Using the gathered information, the team will closely review program documents and data for consistency (across PAs and CAAs), breadth (for example, are some CAAs gathering more detailed participant and/or measure information?), and completeness. As part of this process, we will also identify best practices and the key data fields necessary to complete the impact assessment. Our team will consider cost implications when recommending any additional data collection.

Task 4: Initial Impact Assessment

As part of the initial impact assessment, we will use the data gathered during the aforementioned review to estimate per-unit gross savings for measures that CAAs currently estimate using engineering algorithms (either their own or those provided by the PAs). This initial impact assessment will help gauge the appropriateness of the current *ex ante* savings values and embedded assumptions, as well as the magnitude of any differences between PAs.

Task 5: Stakeholder Workshop II

After completing the data review and initial impact assessment, our team will meet with PA and CAAs to (1) confirm our assessment of their data, (2) discuss preliminary impact assessment findings, (3) determine the feasibility of collecting the any key data fields identified as missing during the our data review, and (4) discuss opportunities for standardization. Any discussion of program changes or standardization will focus on understanding the potential changes and their implications. As part of this meeting, we will also finalize the appropriate methodology for the full impact assessment.

Task 6: Impact Assessment

Following the identified methodologies, our team will estimate average per-unit energy savings. Most likely, we will employ a combination of the following approaches: whole building or tenant-level billing analysis, engineering algorithms, calibrated building simulation, and building/end-use metering.

Task 7: Reporting

Our team will provide the PAs with a written report that compares the current savings calculations and assumptions used by all PAs and documents the data review findings, as well as the savings determined through the impact assessment. The report will also offer specific and actionable recommendations, which will consider program cost implications and reductions in uncertainty regarding planning and evaluated energy savings and focus on these topics:

- Improving and standardizing claimed savings methodologies until an impact evaluation is completed (based on identified best practices and our team's experience with low income and multifamily programs in Massachusetts and other regions).
- Improving and standardizing data collection, including a list of the key fields necessary to support future evaluation.

Potential Budget:

The following table shows preliminary budget for this study, by task.

Tasks	Potential Budget
Task 1: Stakeholder Workshop I	$10,000
Task 2: In-depth Interviews (Wave 1)	$20,000
Task 3: Data Review	$18,000
Task 4: Initial Impact Assessment	$10,000 - 30,000
Task 5: Stakeholder Workshop II	$10,000
Task 6: Impact Assessment	$30,000-$120,000
Task7: Reporting	$15,000
Total	**$113,000 - $223,000**

Next Steps:

Upon approval of preliminary high-level plan, meet with multifamily program implementers and develop final detailed scope of work.

Potential Timeline:

Tasks	2013			2014												2015		
	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Task 1: Stakeholder Workshop I			O															
Task 2: In-depth Interviews (Wave 1)																		
Task 3: Data Review																		
Task 4: Initial Impact Assessment											O							
Task 5: Stakeholder Workshop II												O						
Task 6: Impact Assessment																		
Task7: Reporting																D		F

O= Other deliverable

D = Draft report

F = Final report

Study Name: Residential Customer Profile Study
Study Manager/PA: Kim Crossman, National Grid
Evaluation Vendor: The Residential Evaluation Team
Evaluation Stage: Stage 2: Preliminary High Level Work Plan
Primary Contact @ Vendor: Doug Bruchs, Cadmus
Type of Study: Market Characterization or Assessment
Applicable Fuel(s): Electric, Gas

Overall Study Goal:

The Residential Customer Profile study will compile utility data on residential customers in Massachusetts and data on participants in the portfolio of residential programs offered by Massachusetts program administrators (PAs) to provide insights into levels of participation, energy consumption, and energy savings relative to consumption. We will accomplish this through integration of data from various sources, including program tracking systems, other data from implementation contractors, and external sources such as the American Housing Survey (AHS), census data, and the Residential Energy Consumption Survey (RECS). The consolidated data will serve as a platform for additional analysis to support ongoing evaluation efforts.

This project is very similar to the recently completed Commercial and Industrial (C&I) Customer Profile study that was completed in June 2013, but it is focused on residential customers rather than C&I customers. Therefore, the types of analysis and reporting will likely be very different; there will be lessons to learn from the process of integrating the data and there may also be some overlap from some of the programs, such as multi-family.

Additional uses of the data resulting from this study include:

- Informing potential studies
- Informing market transformation metrics
- Identifying underserved geographic areas
- Identifying relationships among program elements, for example, participants in program X participate in program Y (within Z months)

High-Level Description of Approach/Methodology:

Task 1: Review of Existing Tracking System Data

The team will gather information from all vendor tracking systems that Residential Research Area evaluators have received in response to data requests over the last couple of years. We will assess the available data to populate key fields in a consolidated database. We will identify any additional data required to support this effort and submit formal requests for these data.

Task 2: Work with Evaluation Management Committee (EMC) to Finalize Project Scope and Timeline

We will work with the EMC to confirm project objectives and to finalize the scope and timeline. This will include discussion of the time periods for the consolidated data (for example, 2010, 2011, and 2012) and depending on the extent of any gaps in these time periods, with 2010 likely to be the most problematic.

We also plan to discuss the initial analysis of the data. The analysis will initially be based on data provided in the C&I Customer Profile study, which we will modify to align with the residential sector, along with suggestions for additional analysis that may be of interest. It should be noted that multifamily housing presents some interesting challenges, such as issues related to master-metered or unit-metered buildings and the handling of some multifamily projects through the C&I programs. We will discuss these issues with the C&I Customer Profile study team.

Task 3: Integrate Data

We will develop a list of the key information required to support the output and reports specified in the scope of work. We will handle all data according to the project data security protocol to ensure protection of personally identifiable information (PII).The team will coordinate with the C&I Customer Profile study team to learn from their efforts and establish

consistency in the structure and conventions.

When consolidating data we will work closely with the PA data teams to confirm our full understanding of the data, while being conscientious of their time.

Task 4: Integration of External Data
External data required to support specified reporting will be integrated with program data. Again, external data may include, but is not limited to: AHS, census data and RECS.

Task 5: Analysis (including GIS) and Reporting
Analysis and reporting will be set up to provide the outputs/reports as specified in the scope of work. The output will be integrated into a formal project report that will include a discussion of the approach, key issues and recommendations resulting from the integration process including recommendations for changes in tracking system practices to streamline the process and/or significantly improve the value of the data, and additional analysis and reporting that may be of interest,

Where advantageous, our team will use ArcGIS—a geographical information system (GIS) software—to analyze data and maximize the value of the integrated data. The Residential Research Team includes staff skilled in GIS mapping utilizing ArcGIS. GIS analysis allows for efficient analysis of where savings is occurring and integration of information with characteristics of the residents of the geographic area, such as number of households, or total energy use of those households.

Upstream programs will be included in the analysis and reporting, even though these programs do not have the type of tracking systems common with resource acquisition programs. We can explore using GIS mapping tools to better understand the distribution of savings realized through the upstream programs. Regardless, the savings from these programs can be included in savings intensity analysis.

Format of Deliverables:

The main deliverables for this project will be:

1) Final scope and timeline
2) Data review memo
3) Data request
4) Data security protocol
5) Project report

Potential Budget:

Below is our proposed evaluation budget.

Task	Potential Budget
Task 1: Review of Existing Tracking System Data	$10,000-$15,000
Task 2: Work with EMC to Finalize Project Scope and Timeline	$15,000-$20,000
Task 3: Integrate PA Data	$80,000-$120,000
Task 4: Integrate External Data	$25,000-$40,000
Task 5: Analysis (including GIS analysis) and Reporting	$60,000-$90,000
Total	**$190.000 - $285,000**

Next Steps:

Upon approval of preliminary high-level plan, convene planning meeting and develop final detailed scope of work.

Potential Timeline:

Tasks	2013													2014										
	October				November				December					January				February				March			
	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	16	23	2	9	16	23
Task 1: Review Existing Data					O																				
Task 2: Work with EMC						O																			
Task 3: Integrate PA Data						O																			
Task 4: Integrate External Data																									
Task 5: Analysis & Reporting																					D				F

O= Other deliverable

D = Draft report

F = Final report

Study Name: Trade Ally Panels
Study Manager/PA: Melanie Coen and Wendy Todd, National Grid
Evaluation Vendor: The Residential and C&I Evaluation Teams
Evaluation Stage: Stage 1: Conceptual Framework
Primary Contact @ Vendor: Doug Bruchs, Cadmus
Type of Study: Market Evaluation
Applicable Fuel(s): Electric and Gas

Background and Objectives:

Energy-efficiency rebate and incentive programs have always been plagued by the difficulty of obtaining information from trade allies and market actors: manufacturers, distributors, retailers, builders, and contractors. The current program-by-program method of obtaining product sales and market share data, as well as collecting information to support program attribution/net-to-gross (NTG) studies, has seen declining response rates for over a decade. The goal of this effort is to explore if data quality, response rates, and data collection costs can be improved by a more systematic data collection approach across programs, markets, and evaluations.

Other key issues relating to this objective include:

- Characterizing the various trade allies and market actors in the key programs and markets of interest—who they are, how many, their distribution in terms of sales volumes, and how they interact with one another as well as customers.
- Coordinating, where feasible and appropriate, market characterization and, potentially, data collection from trade allies across the Residential and Commercial and Industrial (C&I) sectors.
- Determining if the development of trade ally/market actor panels and regular scheduling of data collection activities will be an improvement over current evaluation practices.

Evaluation and Research Support:

Given the scoping nature of this project, and the fact that the C&I Evaluation Team is undertaking a similar process, the Residential and C&I teams are proposing an initial joint scoping study to assess the feasibility and efficacy of developing and implementing trade ally panels. Coordination meetings have already taken place, and based on these discussions we are proposing that this initial effort focus on HVAC equipment markets where we know there is an important overlap in the small commercial market segment that will directly benefit from joint research activities.

Possible High-Level Description of Approach/Methodology:

Task 1: Market Characterization

This initial task will address the first bullet above in the HVAC marketplace. The entire range of trade allies and market actors will be included: manufacturers, distributors, and contractors. In addition to the quantitative market data noted above, the assessment will provide logic models delineating the movement of HVAC equipment from manufacturing to the customer across the various market segments. For example, some manufacturers distribute directly to HVAC installation firms, and understanding the extent of this direct sales model will inform panel design. We expect this market characterization to include a graphic market model.

Task 2: Assess Feasibility and Efficacy of Trade Ally Panel Data Collection

The next step is to develop an outline of potential Residential, C&I, and joint panel plans and assess the feasibility, costs, and benefits of moving to this approach. This task will necessarily be iterative in nature and will require significant involvement by the PAs and EEAC and, ultimately, their decision to move forward with one or more HVAC trade ally panels. If panel development is approved, the next phase would be the development of trade ally panels and data collection plans.

Potential Budget:

The cost for these tasks ranges from $100,000 to $200,000. The final budget will be set after additional discussions among the PAs, EEAC, and the Residential and C&I Evaluation Teams.

Potential Timeframe:

Depending on the duration of planning efforts, we will likely complete these two tasks over the next six months.

Study Name:	**Residential Market Effects Study – Technology to be determined**
Study Manager/PA:	TBD
Evaluation Vendor:	The Residential Evaluation Team
Evaluation Stage:	Stage 1: Conceptual Framework
Primary Contact @ Vendor:	Doug Bruchs, Cadmus
Type of Study:	Market Evaluation
Applicable Fuel(s):	Gas and Electric (TBD)

Overall Study Goal:

Similar to the concurrent C&I Market Effects study, the overall objective of this study is to document and quantify the net effects of Massachusetts' residential programs on the market for specific technologies (which the PAs will determine at a later date). We will develop the study and select targeted technologies in coordination with the Cross Cutting Research Area's Market Effects Planning work proposed for January to March 2014. Specifically, the Cross Cutting Research Area's planning study will provide guidance to the Program Administrators (PAs), the Energy Efficiency Advisory Council (EEAC) and the Residential Evaluation team by facilitating the development of a process for the evaluation of market effects, and helping to ensure methodological consistency with the C&I research area.

High-Level Description of Approach/Methodology:

This study will coordinate with the Cross Cutting team's planning study to select the specific technology and analytic approach for this market effects study. The Cross Cutting study will provide recommendations concerning the following:

- Methods for assessing market effects
- Criteria for selecting methods
- Suggested approaches for up to six selected programs or sets of programs.

The Residential Evaluation Team will implement these recommendations upon completion of the Cross Cutting work. Typically, Market Effects studies include one or more of the following elements:

- Interviews with market actors to examine baseline conditions and change to promotional activity, specification practices, product acceptance, viability, pricing, costs;
- Surveys of end users or analysis of publically available data to establish market size;
- Review of program tracking data to establish in-program savings;
- Use of comparison area or Delphi panel to establish counter factual; and
- Where possible, estimation of untracked spillover.

While the specific technologies studied will be finalized at a later time, the efficient lighting and heating/cooling markets are likely candidates for a Market Effects study given the PAs' long-standing intervention in these critical residential markets and the upstream designs of the lighting (manufacturer/retailer buy-downs) and heating/cooling (contractor trainings) programs.

Potential budget:	TBD
Next Steps/Owners:	Initial Scoping Discussions (The Residential Evaluation Team/Cross Cutting Team. PAs/EEAC)
Potential Timeline:	June 2014 through June 2015

Study Name: C&I Code Compliance Follow-Up Study
Study Manager/PA: Bill Blake, National Grid
Evaluation Vendor: ERS
Primary Contact @ Vendor: Brian McCowan
Type of Study: Market Characterization
Applicable Fuel(s): Gas and Electric
Study Status: Stage 2: Preliminary Workplan

Overall Study Goal:

The overall goal of this research is to assist the Massachusetts Efficiency Program Administrators in the development and implementation of programs that support enhanced code compliance rates and promote "beyond code" design and construction. An additional goal is to assist the Commonwealth in meeting the code compliance commitments associated with ARRA funded energy efficiency efforts.

High-Level Description of Approach/Methodology:

Task 1: Work Plan Development
ERS and DNV KEMA have continued to support the PAs and EEAC Consultants on code compliance topics since the completion of the 2012 Code Compliance Baseline Study. Research efforts summarized in Tasks 2 through 5 have been identified by the PAs and EEAC Consultants for investigation.

Task 2: Green Communities Code Compliance Summary
2012 Code Compliance Baseline Study reported estimates of commercial code compliance rates to determine what trends in baseline methodologies and code compliance rates are evident and what opportunities they offer for programmatic activities to advance practices and improve energy efficiency. ERS revisited the analysis to investigate differences between communities that eventually became Green Communities (adopters of the Stretch Code) and communities that have not become Green Communities.

Task 3: Baseline Assumptions Data Mining
The 2012 Code Compliance Baseline Study collected data needed to assess commercial energy code compliance from 75 newly constructed buildings in Massachusetts. The data were used to assess code compliance but in many cases were collected at finer levels of detail than needed for the pass/fail determination for code compliance. The team will mine the 2012 Code Compliance Baseline Study data for information to inform current measure level baseline assumptions used by the programs.

Task 4: Verifying Code Compliance in Current Construction
The majority of sites visited in the 2012 Code Compliance Baseline Study were fully constructed; therefore many of the construction features associated with code compliance requirements were not directly observable. The team will assess active new construction projects and develop a sample of 25 sites covering a broad range of facility types and characteristics. The sites sampled and considered for this effort will all be pre-completion and early enough in the construction process to enable detailed inspection of all primary code requirement features. Such details will include key building envelope, system insulation and sealing, and operational commissioning, as well as other building features. The

site data will be analyzed using the revised DOE/PNNL method developed by the team in 2012 to facilitate comparisons and combining with the 2012 study results.

Task 5: Support Program Development Efforts for Targeted New Construction Efforts

The PAs are involved in multiple efforts to develop and implement programmatic efforts to enhance code compliance and/or promote "stretch" codes. ERS and DNV KEMA will use the data collected and knowledge gained through 2012 Code Compliance Baseline Study, Tasks 2 through 4 above, and other research efforts currently being performed for other jurisdictions to provide valuable information in support of those efforts. The goal of this task is to enhance the knowledge base of the program development efforts.

Potential budget:	$400,000 - $500,000
Next Steps/Owners:	Submit draft work plan / ERS and DNV KEMA
Potential Timeline:	October 2013 – August 2014

Study Name: Impact Evaluation of 2012 Prescriptive Non-Lighting Installations
Study Manager/PA: Whitney Brougher, National Grid
Evaluation Vendor: DNV KEMA
Primary Contact @ Vendor: Chad Telarico
Type of Study: Impact Evaluation
Applicable Fuel(s): Electric
Study Status: Stage 2: Preliminary Workplan

Overall Study Goal:
The objective of this impact evaluation is to provide verification or re-estimation of electric energy and demand savings estimates for a subset of Prescriptive Non-Lighting projects through site-specific inspection, monitoring, and analysis. The results of this study will be used to determine new deemed savings values and/or savings parameters for selected Prescriptive Non-Lighting energy efficiency measures installed in 2013 or 2014. Evaluation results will be determined at the statewide level. The evaluation sample for this study will be designed in consideration of the 90% confidence level for energy (kWh) and the 80% confidence level for coincident peak summer and winter demand (kW).

Secondary Evaluation Goal(s)/Objective(s):
Specific research objectives will include the following:

- Develop Sample Design
- Develop Group Measurement and Evaluation Plans
- Data Gathering and Analysis
- Report Writing and Follow-up

High-Level Description of Approach/Methodology:

Task 1: Develop Sample Design
The goal of the study is to design a sample to provide new statewide deemed savings values and/or savings parameters for selected end-uses. While the primary variable of interest for the sample design is annual kWh savings, the PAs are also interested in coincident peak summer and winter kW because it is used in the ISO-NE Forward Capacity Market (FCM). The target for annual kWh will be set at the traditional ±10% at 90% confidence, while the target for summer and winter kW will be set at ±10% precision at 80% confidence during the design.

Task 2: Develop Site Measurement and Evaluation Plans
DNV KEMA will develop end-use specific measurement, verification and analysis (MVA) plans for each selected measure type. The plans outline on-site methods, strategies, monitoring equipment placement, calibration and analysis issues. The PAs and EEAC will provide comments and edits to clarify and improve the plans prior to them being finalized.

Task 3: Data Gathering and Analysis
Data collection will include physical inspection and inventory, interview with facility personnel, observation of site operating conditions and equipment, short-term metering of usage and EMS trends. At each site, evaluators will perform a facility walk-through that focuses on verifying the post-retrofit or installed conditions of each energy conservation measure (ECM). DNV KEMA will apply the

model-assisted stratified ratio estimation methodology to aggregate the site results, and expand to the program population.

Task 4: Report Writing and Follow-up
DNV KEMA will provide the PAs with a written report containing the evaluation results and key findings.

Potential budget:	$400,000 to $500,000
Next Steps/Owners:	Develop sample design
Potential Timeline:	September 2013 – December 2014

Study Name: Enhanced C&I Customer Profile
Study Manager/PA: Whitney Brougher, National Grid
Evaluation Vendor: DNV KEMA
Primary Contact @ Vendor: Ryan Barry
Type of Study: Market Characterization
Applicable Fuel(s): Gas and Electric
Study Status: Stage 2: Preliminary Workplan

Overall Study Goal:

The goal of this research is to collect, organize and analyze the energy efficiency program tracking data and billed usage data for all Massachusetts C&I gas and electric customers served by the Massachusetts Program Administrators (PAs). Similar to the 2012 C&I Customer Profile the principle research objectives of the 2013 study are:

- Characterize the Massachusetts energy efficiency market by analyzing recent customer usage and program participation data.
- Develop a single database to provide a consistent source of program tracking and billing data to support ongoing evaluation efforts.
- Estimate the extent to which customers of various sizes and types participated in energy efficiency programs during 2012.
- Document the processes used to consolidate and normalize PA data, and recommend enhancements to tracking systems to improve accuracy of results.

High-Level Description of Approach/Methodology:

Task 1: Work Plan Development
DNV KEMA will develop the work plan for the 2013 C&I Customer Profile with guidance and direction from the PAs and EEAC Consultants.

Task 2: Compilation of Program Tracking and Billing Data
A data request for 2013 PA program tracking and billing data for all C&I customers was submitted on March 6, 2013. In parallel to the development of the 2013 C&I Customer Profile work plan, the requested data for the Customer Profile have been used for on-going projects and the development of new projects (e.g.: sample designs for Custom HVAC and Prescriptive Non-lighting impact evaluations).

Task 3: Consolidation, Normalization and Validation of Data Received
DNV KEMA built common definitions, rules and programs to convert disparate data file contents into a singular data structure. DNV KEMA will work with the PAs to ensure the provided data are accurately interpreted and no additional data are missing.

Task 4: Analysis and Reporting
The analysis and report will be consistent with the 2012 C&I Customer Profile. Additionally DNV KEMA will include several enhancements, including:

- an assessment of the completeness and quality of the provided PA data;
- comparison of 2011 and 2012 participation and savings trends;

- investigation of repeat customer participation and multi-measure projects (within PA); and
- incorporation of geographic information system (GIS) to explore geographic trends in participation.

Task 5: Additional Profile Enhancement Scoping Study

DNV KEMA will explore the feasibility of constructing a statewide customer database of program tracking and usage data. The database would link accounts to customers within PAs and across fuels and PAs. DNV KEMA will investigate the usefulness of potential PA and third party data sources, incorporate current PA efforts to link accounts to third party data; and coordinate with the statewide tracking database initiative. The deliverable for this task will be a research outline with a proposed timeline and budget.

Potential budget:	$200,000 - $400,000
Next Steps/Owners:	1.) Final Summary of Data Received Memo / DNV KEMA 2.) Submit Draft Work Plan for review / DNV KEMA
Potential Timeline:	March 2013 – January 2014

Study Name: MA C&I Learning from "Successful" Projects
Study Manager/PA: Erik Mellen, Northeast Utilities
Evaluation Vendor: DNV KEMA
Primary Contact @ Vendor: Lisa Stefanik
Type of Study: Process Evaluation
Applicable Fuel(s): Gas and Electric
Status of Study: Stage 2: Preliminary Workplan

Overall Study Goal:
The overall objective of this study is to 'learn how successful projects came about so that these practices can be generalized and duplicated elsewhere'.[12] This project will begin with the DNV KEMA team seeking input from PAs and the EEAC Consultants on "successful" project definition options, and increasing their program knowledge through in-depth interviews with program leads. Research activities will also include mining billing and program tracking data previously acquired by DNV KEMA from the PAs through prior MA project work, designing in-depth interview guides and interviewing a sample of "successful" project decision makers, and analyzing and reporting on the acquired data.

High-Level Description of Approach/Methodology:
As part of the effort to define "successful projects" and gather customer feedback about the project process, components, support mechanisms, reporting requirements and ultimate benefits of participation, we recommend the following tasks:

Task 1: Seek input from the PAs/EEAC consultants on how to define "successful projects".
Defining "successful projects" and / or "average projects" will be a major component of this project. For example, while this definition is likely to take program tracked energy savings into account; it may also expand to include other achievement measure alternatives, such as repeat projects, functional customer / account manager relationships, depth of savings and ex-post savings where available. In order to explore these definition options, we propose seeking input on 1) data-driven energy savings thresholds, and 2) possible alternative, or non-energy benefits definitions of "success", through the following subtasks:

- DNV KEMA plans to complete some initial data mining in order to present *possible* data-based project energy savings thresholds (i.e., higher than average energy savings, average savings, etc.) to use in "success" definitions.
- We propose in-depth interviews and/or meetings with the C&I program management leads, and the EEAC consultants C&I program team, respectively. These conversations are expected to flush out:

  A) Reactions to initial, *possible* data-based definitions of "success" that the DNV KEMA data mining team will explore in-depth within Task 2
  B) Possible alternative options to define "success".
- DNV KEMA will review the PAs 2013-15 EE program plan to assess the C&I program priorities and weigh their measurability within this evaluation.

[12] From the Final Short-term Strategic Planning Summary Memo to the Massachusetts Program Administrators (PAs) Research Team and the Energy Efficiency Advisory Council (EEAC) EM&V Consultants on May 1, 2013.

Task 2: Data mining for "successful" project contacts. DNV KEMA will examine the achieved energy savings C&I customers reported through their project participation as one approach towards isolating "successful" projects. DNV KEMA expects to compare and contrast C&I participant customer groups by their level of achieved energy savings. DNV KEMA plans to sample among C&I participant groups from the last two years of available project tracking and customer billing data.

Task 3: Survey & sample design. DNV KEMA will draft in-depth interview survey instruments intended to gather data from targeted program participants about what factors contribute to a "successful" project. DNV KEMA will develop a sampling approach based on input from PAs/EEAC Consultants, early project in-depth interviews with C&I program management leads, and data mining results.

Task 4: Interview "successful" project contacts. DNV KEMA will move on within this task to interviewing successful project participants and extracting their best practices. Other subjects, such as program managers and trade allies may also be interviewed within this task, depending on project need and resource availability.

Task 5: Analysis and reporting. DNV KEMA will provide the PAs and the EEAC Consultants with a written report containing the results and analysis of the in-depth interviewing and, where appropriate, the data mining efforts.

Potential Budget:	$150,000
Next Steps/Owners:	Submit draft work plan for review / DNV KEMA
Schedule:	October 2013 - February 2014.

Study Name: How PA Differences Affect Program Outcomes
Study Manager/PA: Wendy Todd, National Grid
Evaluation Vendor: DNV KEMA
Primary Contact @ Vendor: Shawn Bodmann
Type of Study: Process Evaluation
Applicable Fuel(s): Gas and Electric
Study Status: Stage 2: Preliminary Workplan

Overall Study Goal:

The goal of this research is to identify the factors that lead to differences in the depth and cost of savings among the PAs. This project is intended to provide information and insights that will be useful for the PAs and EEAC to identify best practices.

High-Level Description of Approach/Methodology:

Task 1: Work Plan Development
The first step in this evaluation will be to develop and agree upon a work plan. Due to the potentially sensitive nature of the results of this evaluation, a key step in this task will be to identify and obtain stakeholder agreement on the specific program outcome metrics and PA differences that we will analyze. We intend to conduct some informal interviews with some PA implementation manager and EEAC consultants to gather input about important outcomes and differences to consider. We are currently considering using the following information and expect to refine this list during Task 1:

- Outcome metrics: Annual savings (kWh and therms, normalized to annual sales); Cost effectiveness ($/kWh saved or $/therm saved); Per capita participation (% customers who participated); Per project savings (kwh or therms per project. Possibly normalized to customer annual usage if possible to determine); # projects/customer
- PA differences: Annual sales; Fuel mix; Customer Firmographics; PA process differences

Task 2: Secondary Research and Data Mining
The second task will be to gather any relevant data we can from existing studies and data sources. At a minimum, DNV KEMA is currently considering the following reports and data sources as relevant to this task:

- Program tracking and customer billing data for 2011 and 2012
- Current Three Year Plan
- Previous impact and process evaluations conducted by ODC and DNV KEMA
- Ongoing DNV KEMA evaluations including: Mid-sized Customer Needs Assessment, C&I Customer Survey, Enhanced Customer Profile, Learning from Successful Projects, and Direct Install Process Evaluation.

Task 3: Primary Research
The difference that the PAs have the most ability to influence or change are their own internal processes. We intend to leverage as much existing process evaluation work as possible in Task 2 to identify these differences, and we expect to find some gaps. Task 3 will focus on in-depth interviews with key PA personnel to fill in those gaps and give us a more robust picture of PA implementation differences.

Task 4: Analysis and Reporting

DNV KEMA will provide the PAs and EEAC with a written report containing the analysis results. The format of this report will be consistent with other DNV KEMA reports.

Potential budget:	$150,000 - $200,000
Next Steps/Owners:	Discuss metrics & differences with PAs & EEAC consultants / DNV KEMA
Potential Timeline:	September 2013 – March 2014

Study Name: Commercial Real Estate Study
Study Manager/PA: Wendy Todd – National Grid
Evaluation Vendor: DNV KEMA
Primary Contact @ Vendor: Shawn Intorcio
Type of Study: Market Characterization
Applicable Fuel(s): Gas and Electric
Study Status: Stage 2: Preliminary Workplan

Overall Study Goal:

The PAs and the Energy Efficiency Advisory Council (EEAC) Consultants want to conduct a market characterization study of the Commercial Real Estate (CRE) market in Massachusetts.[13] The primary objectives of the study are to provide a comprehensive understanding of the complex relationship between building owners, property managers and tenants; and identify specific program offerings and points in the leasing process that offer opportunities to capture energy efficiency savings. The study will address the following research topics:

1. Identify the key building features and services that tenants consider in selecting a property.
    a. Role of energy costs and energy efficiency
    b. Importance of building and/or property amenities
    c. Relative importance of features and services
2. Identify how building owners and property managers market their properties
    a. Advertising channels
    b. Decision making process for determining the type and timing of building improvement projects
    c. Identify the type of services offered to tenants
3. Determine the type and role of financial limitations (e.g., debt accumulation, hold periods) and how they affect investment in energy efficiency
4. Understand the leasing process and the role of energy efficiency

High-Level Description of Approach/Methodology:

[13] DNV KEMA is coordinating the development of the CRE Study with a similar effort sponsored by the PA Implementers. The CRE Study is currently on hold pending feedback from the PA Implementers.

Task 1: Literature Review: DNV KEMA will conduct a literature review of research studies focusing on the CRE market in the United States. The CRE is the focus of numerous studies sponsored by industry experts. The literature review will identify the issues discovered in the studies that are relevant to the Massachusetts CRE market and that warrant further investigation in this study.

Task 2: CRE Market Actor Interviews: The market actors will include large multi-site property owners and managers, tenants, trade associations, government agencies, and working groups. The objectives of the interviews are to obtain a thorough understanding of the CRE market based upon their actual experience in the Massachusetts market and determine if energy efficiency actions and behavior varies based upon who is financially responsible for energy costs.

Task 3: Massachusetts C&I Customer Survey Analysis: DNV KEMA is utilizing the C&I Customer Survey to collect information specific to the CRE market.

Task4: Reporting and Project Management: DNV KEMA will provide a written report of the findings from the CRE Study to the PAs and EEAC consultant.

Potential budget:	$150,000 - $250,000
Next Steps/Owners:	Project on-hold pending feedback from PA implementers / PA Implementers
Potential Timeline:	September 2013 – April 2014 (on-hold)

Study Name:	Rooftop Units Technology Assessment Study
Study Manager/PA:	Gail Azulay, CLC
Evaluation Vendor:	DNV KEMA
Primary Contact @ Vendor:	Noel Stevens
Type of Study:	Market Characterization
Applicable Fuel(s):	Gas and Electric
Study Status:	Stage 1: Conceptual Framework

Background and research objectives:

The goal of the study is to conduct a technology assessment for specific roof top unit controls, such as the CATAYLST, ENERFIT, and DIGIRTU which regulate fan speed, the amount of outside air, run time, and other features of continuous flow RTU systems.

Interest in this study was prompted by a pilot study of the CATALYST. While such controls provide an opportunity for savings, particularly in open space retail, offices, warehouses, and school gymnasiums and auditoriums, the addressable market for them and corresponding savings potential may be limited. Limiting factors include: facilities setting RTUs to "auto mode," or indoor air quality controllers that can override exterior RTU controls to limit the amount of CO2 in the building during operating hours. In addition, integrated controls in New Construction or Retrofits may impact the upstream program, as some newer rooftop HVAC units already include the controls. The market for these RTU controls can be further impacted by maintenance and repair practices of the units themselves. This study will size the overall market for continuous flow RTUs in Massachusetts and identify the prevalence of such market barriers for RTU controls.

Defining the addressable market size for these controls and prevalence of technology barriers will enable the PAs to optimize their resource allocation to promote this technology as a viable source of savings.
Specific research objectives may include the following:

- Establish the overall size of the RTU market in Massachusetts;
- Identify the prevalence of barriers to RTU controls such as the CATALYST ENERFIT, and DIGIRTU among continuous flow RTUs including, but not limited to, use of "auto mode" and interior HVAC CO2 controls;
- Investigate the extent to which installation, repair and maintenance practices impact the market for RTU controls;
- Estimate the size of the addressable market for the RTU controls such as the CATALYST ENERFIT, and DIGIRTU.

High-Level Description of Approach/Methodology:

DNV KEMA will use data collected from publicly available sources, the Existing Buildings and other on-going C&I evaluation research activities, and a series of in-depth interviews and surveys to estimate the addressable market for the Controls. The potential target audience for data collection may include the following:

- HVAC program managers for programs that include controls;
- Architects, engineers and controls contractors who design HVAC systems;

- HVAC and controls contractors who install and maintain RTUs and controls
- RTU and controls manufacturers

DNV KEMA will establish the overall size of the RTU market based on data from public sources and data from other C&I studies. We will use vendor interview responses to identify the proportion of RTUs that have barriers to implementing the RTU controls, and isolate the addressable market for the technology. Where possible, we will coordinate data collection efforts with the other on-going Massachusetts C&I research efforts. Through the scoping phase of this study, we will identify the range of potential barriers to the technology and consider using the Existing Building on-site research to investigate specific technology settings that may impact the addressable market. KEMA will provide draft and final versions of all research instruments, sample designs, and a report containing the research findings.

Potential budget: $100,000 - $125,000
Next Steps/Owners: Continue project scoping / DNV KEMA
Potential Timeline: October 2013 - July 2014

Study Name: Characterization of Supply Side Populations
Study Manager/PA: Wendy Todd, National Grid
Evaluation Vendor: APPRISE
Primary Contact @ Vendor: David Carroll
Type of Study: Market Characterization
Applicable Fuel(s): Electric and Gas
Study Status: Stage 1: Conceptual Framework

Overall Study Goal:
The goal of this effort is to characterize the supply-side market actors and to develop effective sample frames and respondent samples (possibly panels) that facilitate collection of important information for program process and impact evaluations. Specifically, this effort will:

- Trade Ally Types – Identify what types of trade allies are involved in each part of the C&I energy efficiency market (e.g., new construction, building additions/renovations, equipment replacement).
- Business Types - Determine what types firms are active in only one part of the market (e.g., new construction) and how they compare to firms that deliver more comprehensive services.
- Market Sectors – Assess the extent to which firms operate in different parts of the C&I market (commercial, institutional, industrial), and for which types of trade allies there is overlap between the C&I and Residential Markets (particularly small commercial and residential).
- Sample Frames –Develop sample frames that furnish comprehensive coverage of the most important trade ally groups and help to eliminate duplication between C&I and Residential trade ally frames.
- Panel Design – Explore the opportunity to develop panels for certain types of trade allies that will effectively manage respondent burden and will increase the quality and comprehensiveness of information for both C&I and Residential trade ally studies.

High-Level Description of Approach/Methodology:
Task 1: Work Plan Development
The C&I Team will work with the PAs and EEAC to develop an initial scoping study to assess the feasibility and efficacy of characterizing the C&I HVAC supply-side market actors, developing sample frames for the most important trade allies, and implementing panels for certain trade ally groups. The C&I Team will coordinate Residential Evaluation Team to assess overlap and potential collaboration with Residential Research Area studies.

Task 2: Analysis of Available C&I Data
The C&I team proposes an examination of existing data resources (Dodge new construction/addition data, PA program databases, and D&B data) to assess whether these resources can furnish the information needed to characterize markets. One special component of that assessment will focus on the HVAC equipment market and will involve collaboration with the Residential Team to compare trade allies identified in the C&I market with those active in the residential market. If the scoping study suggests that this approach has a high probability of success, the C&I and Residential teams will develop a coordinated plan for moving forward. For those sectors where research shows that there is a high degree of overlap between C&I and Residential market actors, a joint approach will be used. Where C&I and Residential Market actors are clearly separate, each team will propose independent projects to support the characterization of markets and development of sample frames and panels.

Task 3: Reporting

The C&I Team will submit a scoping study report that presents an initial review of available resources to develop preliminary information on supply side market actors and assess the feasibility of market characterization and frame development proposals. Pending the results of the scoping study likely targeted market characterizations include New Construction Suppliers, Retrofit Suppliers and Supply Chain for HVAC.

Potential budget:	$75,000 - $150,000
Next Steps/Owners:	Submit Draft Work Plan for review / APPRISE
Potential Timeline:	October 2013 – February 2014

Study Name: Direct Install Process Evaluation
Study Manager/PA: David Weber, NSTAR
Evaluation Vendor: DNV KEMA
Primary Contact @ Vendor: Shawn Bodmann
Type of Study: Process Evaluation
Applicable Fuel(s): Gas and Electric
Study Status: Stage 1: Conceptual Framework

Overall Study Goal:

The goal of this research is to identify how to get more savings from the program. These savings could be from wider or deeper participation. Secondary goals are to identify how to increase cost effectiveness of the program and to describe program processes, especially where relevant to increasing savings or cost effectiveness.

High-Level Description of Approach/Methodology:

Task 1: Work Plan Development
DNV KEMA will work closely with the PAs and EEAC Consultants to identify specific researchable questions. The first task will be to develop a work plan that establishes those questions and a plan to answer them. The primary component of Task 1 will be to conduct in-depth interviews with PA staff and EEAC contractors to identify their concerns, "pain points", and the type of information they would find helpful. The remaining tasks are currently tentative based on the outcome of Task 1.

Task 2: Program Materials Review
DNV KEMA may review program materials such as marketing materials, training documents, and tracking databases. Some specific perspectives we may examine include: consistency, electricity/gas integration, selling energy efficient solutions, and opportunities to streamline.

Task 3: In-Depth Interviews
DNV KEMA anticipates conducting additional in-depth interviews with direct install contractors and PA staff to cover topics such as training, marketing practices, standardization of offers, audit procedures, inter-company communication, invoicing and tracking procedures, and QA/QC procedures.

Task 4: Surveys
DNV KEMA anticipates conducting participant and non-participant surveys. Participant surveys may cover topics such as the decision making process, drivers, measure selection, and satisfaction. Non-participant surveys may cover topics such as program awareness, best potential marketing channels, and barriers to participation.

Task 5: Analysis and Reporting
The team will provide the PAs with a written report containing the analysis results. The format of this report will be consistent with other DNV KEMA reports.

Potential budget: $150,000 - $200,000

Next Steps/Owners:	Discuss researchable questions with implementers / DNV KEMA
Potential Timeline:	Oct 2013 - May 2014

Study Name:	Impact Evaluation of 2012 Prescriptive Gas Installations
Study Manager/PA:	Tony Larson, Berkshire Gas
Evaluation Vendor:	DNV KEMA Energy & Sustainability
Primary Contact @ Vendor:	Michael Smalec
Type of Study:	Impact Evaluation
Applicable Fuel(s):	Gas
Study Status:	Stage 2: Preliminary Workplan

Overall Study Goal:
The objective of this impact evaluation is to provide verification or re-estimation of energy savings estimates for a subset of Prescriptive Gas projects through site-specific inspection, monitoring, and analysis. The results of this study will be used to determine new deemed savings values and/or savings parameters for selected Prescriptive Gas energy efficiency measures installed in 2012. Evaluation results will be determined at the statewide level. The evaluation sample for this study will be designed in consideration of the 80% confidence level for energy savings (therms).

Program-Wide Prescriptive Measure Savings Analysis Goal(s)/Objective(s):
Following several years of focused evaluation on specific prescriptive measures the task of selecting which measures to focus evaluation efforts in order to maximize program benefits becomes a critical task. Current ongoing project scoping efforts have been expanded to involve analysis of 2012 Prescriptive, Direct Install and Custom Program Data as well as historic trending of the achieved savings by different energy savings measure.

1. Prescriptive Program - Savings by measure by program year,
2. Prescriptive Program - Lifetime savings by measure,
3. Prescriptive Program - Measure savings comparison program year vs. lifetime,
4. Direct Install Program - Annual savings and lifetime savings by measure,
5. Custom Program - Annual savings and lifetime savings by measure for short lifetime measures.

Cross-Cutting All Gas Program Investigation:
While historic Prescriptive Program evaluation has focused on the measures within the traditionally defined (per TRM designation) measures; an in-depth literature search is proposed for all gas measures to target specific measures where evaluation work exists or is lacking in order to better identify where future evaluation efforts should focus to achieve program benefit. The research effort will be compiled in a manner that provides an analytic tool for the ongoing selection of evaluation measure focus.

High-Level Description of Approach/Methodology For Each Selected Measure(s):
At the present time Pre-Rinse Spray Valves is a measure selected for focused evaluation. Other measures may be selected based on the findings of the in-depth literature search,research efforts and ongoing discussions with program administrators.

Task 1: Develop Sample Design
The goal of the study is to design a sample to provide new statewide deemed savings values and/or savings parameters for selected end-uses. The target precision for therms savings by end-use will be set at ±20% at 80% confidence.

Task 2: Develop Site Measurement and Evaluation Plans
DNV KEMA will develop end-use specific measurement, verification and analysis (MVA) plans for each selected measure type. The plans outline on-site methods, strategies, monitoring equipment placement, calibration and analysis issues. The PAs and EEAC will provide comments and edits to clarify and improve the plans prior to them being finalized.

Task 3: Data Gathering and Analysis
Data collection will include physical inspection and inventory, interview with facility personnel, observation of site operating conditions and equipment, short-term metering of usage and EMS trends. At each site, evaluators will perform a facility walk-through that focuses on verifying the post-retrofit or installed conditions of each energy conservation measure (ECM). DNV KEMA will apply the model-assisted stratified ratio estimation methodology to aggregate the site results, and expand to the program population.

Task 4: Report Writing and Follow-up
DNV KEMA will provide the PAs with a written report containing the evaluation results and key findings.

Potential budget:	$200,000 - $400,000
Next Steps/Owners:	1.) In-Depth literature search of all gas program measures (DNV GL)
	2.) Develop sample design for selected measure(s) (DNV GL)
Potential Timeline:	1.) Literature Review: November 2013 – February 2014
	2.) Measure Evaluation: November 2013 – December 2014

Study Name: C&I Market Effects Study – Technology to be determined
Study Manager/PA: TBD
Evaluation Vendor: DNV KEMA
Primary Contact @ Vendor: Noel Stevens
Type of Study: Market Evaluation
Applicable Fuel(s): Gas and Electric (TBD)
Study Status: Stage 1: Conceptual Framework

Overall Study Goal:

The overall objective of this study is to capture the net effects over time of Massachusetts' programs to promote a technology to be determined by the PAs. The development of this market effects study and selection of the targeted technology will be coordinated with the Cross Cutting Research Area's Market Effects Planning work proposed for January to March 2014.

DNV KEMA completed a market effects study of high-bay lighting in 2011 and is currently working on an LED market effects study. The Cross Cutting Research Area's planning study will provide guidance to the Program Administrators (PAs) and the Energy Efficiency Advisory Council (EEAC) by facilitating the development of a process for the evaluation of market effects, and helping to ensure methodological consistency across research areas and programs. Upon completion of that work, DNV KEMA will implement recommendations of the Cross-Cutting study in selecting a technology and analytical approach to conduct a market effects study later in 2014.

High-Level Description of Approach/Methodology:

This study will coordinate with the Cross Cutting team's planning study to select the specific technology and analytic approach to be used in this market effects study. The Cross Cutting study will provide recommendations concerning the following:

- Methods for assessing market effects
- Criteria for deciding which methods
- Suggested approaches for up to six selected programs or sets of programs.

DNV KEMA will implement these recommendations upon completion of the Cross Cutting work. Typically, Market Effects studies include one or more of the following elements:

- Interviews with market actors to examine baseline conditions and change to promotional activity, specification practices, product acceptance, viability, pricing, costs;
- Surveys of end users or analysis of publically available data to establish market size;
- Review of program tracking data to establish in-program savings;
- Use of comparison area or Delphi panel to establish counter factual; and
- Where possible, estimation of untracked spillover.

Potential budget: $250,000 - $500,000
Next Steps/Owners: Initial Scoping Discussions (DNV KEMA/PAs/EEAC)
Potential Timeline: June 2014 through June 2015

Study Name: Impact Evaluation of 2013 Custom Electric Installations
Study Manager/PA: TBD
Evaluation Vendor: DNV KEMA
Primary Contact @ Vendor: Chad Telarico
Type of Study: Impact Evaluation
Applicable Fuel(s): Electric
Study Status: Stage 1: Conceptual Framework

Overall Study Goal:
The objective of this impact evaluation is to provide verification or re-estimation of electric energy and demand savings estimates for a sample of Custom electric projects through site-specific inspection, monitoring, and analysis. The results of this study will be used to determine the final realization rates for Custom Electric energy efficiency measures installed in 2014. Realization rates will be separately determined for National Grid and NSTAR, as well as at the statewide level. The evaluation sample for this study will be designed in consideration of the 90% confidence level for energy (kWh) and the 80% confidence level for coincident peak summer and winter demand (kW).

Traditionally, Custom electric measures have been evaluated as part of a rotation. Recent Custom impact evaluations include 2009 Comprehensive Design Assistance (CDA), 2009 HVAC, 2010 Process and Compressed Air, 2011 Refrigeration, Motor, Other. All Custom electric measures have been evaluated in the past three years, and a current Custom HVAC study is being planned to cover the 2012 program year. It is expected that a new Custom electric study will be performed on the 2013 program year, and will include any or all of CDA, Process and Compressed Air. Planning discussions will begin in the second quarter of 2014.

Secondary Evaluation Goal(s)/Objective(s):
Specific research objectives will include the following:

- Develop Sample Design
- Develop Group Measurement and Evaluation Plans
- Data Gathering and Analysis
- Report Writing and Follow-up

High-Level Description of Approach/Methodology:

Task 1: Develop Sample Design
The goal of the study is to design a sample to estimate realization rates for a number of measurements (annual kWh, percent of kWh savings on-peak, summer on-peak kW, and winter on-peak kW). While the primary variable of interest for the sample design is annual kWh savings, the PAs are also interested in coincident peak summer and winter kW because it is used in the ISO-NE Forward Capacity Market (FCM). The target for annual kWh will be set at the traditional ±10% at 90% confidence, while the target for summer and winter kW will be set at ±10% precision at 80% confidence during the design.

Task 2: Develop Site Measurement and Evaluation Plans
DNV KEMA will develop site specific measurement, verification and analysis (MVA) plans for each sampled site. The plans outline on-site methods, strategies, monitoring equipment placement,

calibration and analysis issues. The PAs and EEAC will provide comments and edits to clarify and improve the plans prior to them being finalized.

Task 3: Data Gathering and Analysis

Data collection will include physical inspection and inventory, interview with facility personnel, observation of site operating conditions and equipment, short-term metering of usage and EMS trends. At each site, evaluators will perform a facility walk-through that focuses on verifying the post-retrofit or installed conditions of each energy conservation measure (ECM). On-site evaluation procedures and site analysis will be presented in a site report for each sampled site. DNV KEMA will apply the model-assisted stratified ratio estimation methodology to aggregate the site results, and expand to the program population.

Task 4: Report Writing and Follow-up

DNV KEMA will provide the PAs with a written report containing the evaluation results and key findings.

Potential budget:	$500,000 to $1,000,000 (Dependent on selected measures and sample size)
Next Steps/Owners:	Initial Scoping Discussions (DNV KEMA/PAs/EEAC)
Potential Timeline:	June 2014 – June 2015

Study Name: Impact Evaluation of 2013 Prescriptive Electric Installations
Study Manager/PA: TBD
Evaluation Vendor: DNV KEMA
Primary Contact @ Vendor: Chad Telarico
Type of Study: Impact Evaluation
Applicable Fuel(s): Electric
Study Status: Stage 1: Conceptual Framework

Overall Study Goal:
The objective of this impact evaluation is to provide verification or re-estimation of electric energy and demand savings estimates for a subset of Prescriptive electric projects through site-specific inspection, monitoring, and analysis. The results of this study will be used to determine new deemed savings values and/or savings parameters for selected Prescriptive electric energy efficiency measures. Evaluation results will be determined at the statewide level. The evaluation sample for this study will be designed in consideration of the 90% confidence level for energy (kWh) and the 80% confidence level for coincident peak summer and winter demand (kW).

Traditionally, Prescriptive electric measures have been evaluated as part of a rotation. Recent Prescriptive impact evaluations include 2011 Prescriptive Lighting and 2011/2012 Prescriptive Variable Speed Drives (VSD). Currently, the evaluation team is scoping a new Prescripitve Non-Lighting, Non-VSD impact evaluation. The final measures have not yet been selected for evaluation as of the time of this document. In mid-2014, the evaluation team will begin discussions on the next Prescriptive electric evaluation in the rotation.

Secondary Evaluation Goal(s)/Objective(s):
Specific research objectives will include the following:

- Develop Sample Design
- Develop Group Measurement and Evaluation Plans
- Data Gathering and Analysis
- Report Writing and Follow-up

High-Level Description of Approach/Methodology:
Task 1: Develop Sample Design
The goal of the study is to design a sample to provide new statewide deemed savings values and/or savings parameters for selected end-uses. While the primary variable of interest for the sample design is annual kWh savings, the PAs are also interested in coincident peak summer and winter kW because it is used in the ISO-NE Forward Capacity Market (FCM). The target for annual kWh will be set at the traditional ±10% at 90% confidence, while the target for summer and winter kW will be set at ±10% precision at 80% confidence during the design.

Task 2: Develop Site Measurement and Evaluation Plans
DNV KEMA will develop end-use specific measurement, verification and analysis (MVA) plans for each selected measure type. The plans outline on-site methods, strategies, monitoring equipment placement, calibration and analysis issues. The PAs and EEAC will provide comments and edits to clarify and improve the plans prior to them being finalized.

Task 3: Data Gathering and Analysis

Data collection will include physical inspection and inventory, interview with facility personnel, observation of site operating conditions and equipment, short-term metering of usage and EMS trends. At each site, evaluators will perform a facility walk-through that focuses on verifying the post-retrofit or installed conditions of each energy conservation measure (ECM). DNV KEMA will apply the model-assisted stratified ratio estimation methodology to aggregate the site results, and expand to the program population.

Task 4: Report Writing and Follow-up

DNV KEMA will provide the PAs with a written report containing the evaluation results and key findings.

Potential budget:	$400,000 to $500,000
Next Steps/Owners:	Initial Scoping Discussions (DNV KEMA/PAs/EEAC)
Potential Timeline:	June 2014 – June 2015

Study Name: Impact Evaluation of 2013 Custom Gas Installations
Study Manager/PA: TBD
Evaluation Vendor: DNV KEMA
Primary Contact @ Vendor: Michael Smalec
Type of Study: Impact Evaluation
Applicable Fuel(s): Gas
Study Status: Stage 1: Conceptual Framework

Overall Study Goal:
The objective of this impact evaluation is to provide verification or re-estimation of natural gas estimates for a sample of Custom gas projects through site-specific inspection, monitoring, and analysis. The results of this study will be used to determine the final realization rates for Custom Gas energy efficiency measures installed in 2014. Realization rates will be separately determined for Columbia Gas, National Grid and NSTAR, as well as at the statewide level. The evaluation sample for this study will be designed in consideration of the 80% confidence level for energy (therms).

Beginning with program year 2009, Custom gas measures have been evaluated each of the past three years. The reason for the annual Custom Gas studies was that this was the first time evaluating Custom gas measures, and the program had seen significant growth in each of the past three years. In 2012, the evaluation team decided that only NSTAR would undergo an impact evaluation due to significant program changes that occurred between 2010 and 2011 as reported by NSTAR. This decision was made following a desk review of a sample of project files from each of the PAs. This review culminated with a decision based on an agreed upon set of criteria from which to guage the change in the program delivery based on these desk reviews versus benchmarks from the previous impact evaluation of 2010 installations. In 2013, the evaluation team decided not to evaluate the 2012 program year to allow for more time for the recommendations from the previous studies to take effect. In 2014, the evaluation team plans to begin scoping an impact evaluation of 2013 measures, which will include all PAs. This impact evaluation will also include the desk review task that was discussed above to further test this approach for helping to decide when to evaluate these programs.

Secondary Evaluation Goal(s)/Objective(s):
Specific research objectives will include the following:

- Develop Sample Design
- Desk Review and Decision Criteria Memo
- Develop Group Measurement and Evaluation Plans
- Data Gathering and Analysis
- Report Writing and Follow-up

High-Level Description of Approach/Methodology:

<u>Task 1: Develop Sample Design</u>
The goal of the study is to design a sample to estimate realization rates for gross energy (therms) savings. The target for annual kWh will be set at ±20% at 80% confidence.

<u>Task 2: Desk Review and Decision Criteria Memo</u>

This task will include a desk review of project documentation and billing data for a sample of program participants. The desk review will include a larger sample of sites than that expected for the on-site measurement and verification work. This process will mimic the same process used in 2012 to help determine if any or all PAs should be evaluated again. The results of the decision criteria memo will be compared to the final impact evaluation results to further test this approach for potential future use.

Task 3: Develop Site Measurement and Evaluation Plans

DNV KEMA will develop site specific measurement, verification and analysis (MVA) plans for each sampled site. The plans outline on-site methods, strategies, monitoring equipment placement, calibration and analysis issues. The PAs and EEAC will provide comments and edits to clarify and improve the plans prior to them being finalized.

Task 4: Data Gathering and Analysis

Data collection will include physical inspection and inventory, interview with facility personnel, observation of site operating conditions and equipment, short-term metering of usage, billing data and EMS trends. At each site, evaluators will perform a facility walk-through to verify the post-retrofit or installed conditions of each energy conservation measure (ECM). On-site evaluation procedures and site analysis will be presented in a site report for each sampled site. DNV KEMA will apply the model-assisted stratified ratio estimation methodology to aggregate the site results, and expand to the program population.

Task 5: Report Writing and Follow-up

DNV KEMA will provide the PAs with a written report containing the evaluation results and key findings.

Potential budget:	$750,000 to $1,000,000 (Dependent on selected measures and sample size)
Next Steps/Owners:	Initial Scoping Discussions (DNV KEMA/PAs/EEAC)
Potential Timeline:	February 2014 – June 2015

Study Name:	**Market Effects Planning**
Study Manager/PA:	Monica Cohen, Columbia Gas
Evaluation Vendor:	Tetra Tech Team
Evaluation Plan Type:	**Scoping**
Primary Contact @ Vendor:	Lynn Hoefgen, NMR Group
Type of Study:	Impact
Applicable Fuel(s):	Electric and Gas

Overall Study Goal:

The goal of this study is to provide guidance to the Program Administrators (PAs) and the Energy Efficiency Advisory Council (EEAC) by facilitating the development of a process for the evaluation of market effects, and helping to ensure methodological consistency across research areas and programs.

Research Questions:

The study seeks to help the PAs and the EEAC: 1) understand and agree to working definitions of what market effects are, and what conditions could lead to them; 2) identify and prioritize existing or planned programs or sets of programs that could reasonably be expected to lead to market effects large enough to appreciably affect program value and planning; 3) for programs and sets of programs identified as having market effects potential, develop suggested methodologically consistent approaches for assessing market effects; and 4) identify how program administrators can improve the market effects evaluability of programs.

High-Level Description of Approach/Methodology:

Task 1: Participate in Market Effects Workshop with Working Group

At a workshop devoted to the topic, the team will prepare a presentation to describe the concept of market effects and how they are measured, with specific examples, including market effects work recently conducted in Massachusetts. The team will then lead a discussion about what current and planned programs and sets of programs may lead to market effects. It will be important for the PAs to articulate which programs are likely to lead to significant market effects and how they expect that to happen.

Task 2: Review Program Design and Current Understanding of Targeted Markets

For up to ten programs or sets of programs identified as having market effects potential, the team will review program materials and interview program designers and implementers to review the definition and understanding of the targeted market, and the clarity of these understandings. The team will also examine how the program(s) is/are expected to work within the market structure to increase the adoption of energy-efficient technologies and practices, if possible based on program and market logic models.

Task 3: Develop Suggested Approaches for Assessing Market Effects

Based on existing literature, the team will describe the range of methods available for assessing market effects and the criteria for deciding which methods to use in order to help achieve methodological consistency across research areas and programs. Based on these criteria, the team will develop suggested approaches for up to six selected programs or sets of programs. For the selected programs, the team will review and suggest improvements to program and market logic models, and if necessary develop preliminary versions of new ones. The suggested approaches will include specific recommendations for data to be collected, the frequency of data collection, and the types of analysis that should be employed for each program. For programs where understanding of the market is insufficient, approaches may include market characterization studies, the refinement of program and

market logic models, and baseline studies. In addition, we will identify program design elements that could be added to improve future evaluability of market effects.

List of Deliverables:
Task 1—workshop
Task 2—draft and final summary memo
Task 3—draft and final report.

Potential Budget:
The following table shows preliminary budgets for these tasks.

Tasks	Budget
Task 1: Participate in market effects workshop	$41,463
Task 2: Review program design and current understanding of targeted markets	$65,643
Task 3: Develop suggested approaches for assessing market effects	$127,620
Total	**$234,726**

Next Steps/Owners:
Develop more detailed scope of work.

Timeframe:

Task	2013			2014			
	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Task 1: Workshop							
Plan workshop							
Conduct workshop		O					
Task 2: Review Programs and Targeted Markets							
Identify programs and markets							
Review program materials							
Interview program staff							
Provide draft memo				O			
Provide final memo					O		
Task 3: Develop Suggested Approaches							
Develop initial approaches							
Provide draft report						D	
Provide final report							F

O = Other deliverable
D = Draft Report
F = Final Report

Study Name:	**Codes and Standards**
Study Manager/PA:	Bill Blake, National Grid
Evaluation Vendor:	Tetra Tech Team
Evaluation Plan Type:	**Scoping**
Primary Contact @ Vendor:	Greg Clendenning, NMR Group
Type of Study:	Impact
Applicable Fuel(s):	Electric and Gas

Overall Study Goal:
The goal of this study is to provide guidance to the Program Administrators (PAs) and the Energy Efficiency Advisory Council (EEAC) by developing guidelines for evaluation of the new codes and standards initiative.

Research Questions:
The study seeks to help the PAs and the EEAC develop methodologies for evaluating the code and standards initiative. After reviewing the work plan to be provided by the implementation contractor,[14] the team will develop guidelines for evaluation of the PA's planned commercial and residential code and standards efforts.

High-Level Description of Approach/Methodology:
Task 1: Develop evaluation work plan
Members of the cross-cutting team will attend the implementation kickoff meeting and review the implementation work plan. The team will review the literature about code and standards program evaluation, including the recent NEEP report,[15] and then will develop a work plan for the evaluation.

Task 2: Develop evaluation guidelines
The team will develop guidelines for evaluating the PA's planned commercial and residential code and standards efforts. These guidelines will include specific recommendations for data to be collected, the frequency of data collection, and the types of analysis that should be employed for each program. In addition, the guidelines will specify which data should be collected by the implementation contractor and which by the commercial and residential evaluation contractors. On an ongoing basis, as study plans are developed and implemented by the residential and commercial areas, the team will review them for consistency with the guidelines.

List of Deliverables:
Task 1—draft and final work plan
Task 2—draft and final report.

[14] As of this writing, the team is unaware of an implementation contractor being hired.
[15] http://neep.org/Assets/uploads/files/emv/emv-products/NEEP_IMT_IEE_Codes%20Attribution%20FINAL%20Report%2002_16_2013.pdf

Potential Budget:
The following table shows preliminary budgets for these tasks.

Tasks	Budget
Task 1: Develop evaluation work plan	$20,000
Task 2: Develop evaluation guidelines	$50,000-$90,000
Total	**$70,000-$110,000**

Next Steps/Owners:
Develop more detailed scope of work.

Timeframe:
We assume that Task 1 would be completed before the end of 2013 and that Task 2 would be completed by the end of the second quarter of 2014.

Study Name:	**Top-down modeling of net energy impacts**
Study Manager/PA:	Monica Cohen, Columbia Gas
Evaluation Vendor:	Tetra Tech Team
Evaluation Plan Type:	**Scoping**
Primary Contact @ Vendor:	Noel Stevens, DNV KEMA
Type of Study:	Impact
Applicable Fuel(s):	Electric and Gas

Overall Study Goal:
The Program Administrators (PAs) and the Energy Efficiency Advisory Council (EEAC) expressed an interest in determining whether top-down modeling should play a role in net energy impact evaluation. This study will assess and employ alternative techniques for using top-down modeling to measure net energy impacts. The long term goal is to develop and apply a top-down method for MA, and to understand the strengths and limitations of that method. To that end, we will assess the effectiveness of different top-down modeling techniques in estimating net energy impacts. In addressing this goal, this proposed research will meet the following objectives during the 2013-2014 research period:

- Review existing top-down modeling techniques, and recommend specific methods to be used in MA;
- Obtain the necessary data for employing one or more agreed approaches; and
- Implement one or more agreed approaches to provide an initial demonstration of the contribution that Top-down modeling may make to on-going evaluation efforts.

Research Question:
The research questions for this study are: Can top-down methods for modeling net energy impacts provide a reasonable alternative to the traditional bottom-up approaches, and can these top-down methods be used to benchmark or triangulate the true level of program impacts?

High-Level Description of Approach/Methodology:

Task 0: Development of work plan
The Tetra Tech team will meet with the working group (Task 2) to develop the scope of work and set budgets. Through the working group meetings, the Evaluation team will refine the scope for this project as defined by the following research tasks.

Task 1: Review and selection of top-down empirical technique(s)
The Evaluation Team presents several possible approaches for the review and selection of research options which will be determined through collaborating with the working group. The option(s) selected for this Task will impact the overall project budget, the focus of the Task 2 Working Group, and the timing of empirical results developed in Task 3. These options are presented for further discussion and refinement by the Working Group.

- *Option 1, Comprehensive Literature Review and Data Review*: We will complete a review of existing top-down methods and data requirements before making recommendations to the working group and moving forward with the empirical research. This option will include a literature review and interviews with evaluators and/or reviewers to identify top-down studies. We will also review the data available to implement each technique, including those data already being compiled for other MA C&I and residential evaluation efforts. Additionally, this option will assess the limitations and biases involved in the reviewed approaches, with a discussion on how the limitations and biases can be

mitigated. These studies include, but are not limited to Demand Research, LLC (2012)16, CADMUS Group, Inc. (2102)17, and Lawrence Masland's approach to modeling differences between municipal and investor owned utilities. Finally, this review may include an assessment of how a top-down approach might be integrated with results from bottom-up research (i.e. our typical program process/impact studies). Under this option, Task 3 will not commence until the review is completed and method selected.

- *Option 2 Pilot Quantitative Analysis with Refinements*: We will propose one or more top-down techniques to implement based on our current knowledge of existing techniques. We will conduct research to revise our approach and report our progress as part of the working group (Task 2). Through the working group we will continue to investigate potential enhancements to the chosen technique(s), improving upon them as the analysis phase progresses. Under this option, we will select methods up front and implement the approach shortly after the methods are selected. We will revise the selected methods throughout the course of the project as needed, and review any proposed revisions through the working group.

- *Option 3 Limited Literature Review Preceding Pilot Quantitative Analysis*: We will conduct a quick literature review of a select few studies to define the data requirements, as well as the advantages and limitations of possible techniques. This review will likely consider the Demand Research, CADMUS, and Masland studies mentioned above. We will continue to investigate potential enhancements to the chosen technique(s), and use the working group to discuss improvements to them as the analysis phase (Task 3) progresses. This approach will select the approach(s) after the abbreviated literature review is completed and will revise the selected methods throughout the course of the project as needed, and review any proposed revisions through the working group.

Task 2: Establish and coordinate with top-down modeling working group

The Evaluation Team will coordinate with the PAs and EEAC to establish a working group designed to make recommendations regarding the use of top-down evaluation techniques and the research agenda. The specific focus of the working group will depend upon the option selected in Task 1. The group will hold regular meetings to review the information identified in Task 1, and to advise on the Task 3 research design.

Task 3 Implement Top-down Modeling Technique(s)

Based on the recommendations from Tasks 1 and 2, the Evaluation team will implement one or more top-down evaluation techniques to estimating program and policy impacts. As inputs to these models, we will employ the billing and tracking database developed by DNV KEMA through the C&I contract or Cadmus through the residential contract (if available). While the details of this research plan will be determined through the Task 1 and 2 research activities, the evaluation team will coordinate with ongoing C&I and residential evaluation efforts to maximize the value of data resources already compiled.

List of Deliverables:

Task 1 – Draft and final memo;
Task 2 – Meeting summaries; and
Task 3 – Draft and final research plan for Stage II research.

[16] Demand Research, LLC. "Macro Consumption Metrics Pilot Study Technical Memorandum – Preliminary Findings." Prepared for the California Public Utilities Commission. August 21, 2012.
[17] CADMUS Group, Inc. "CPUC Macro Consumption Metric Pilot Study (Final Report)." Prepared for the California Public Utilities Commission. October 19, 2012.

Potential Budget:
The following table shows the range of preliminary budgets resulting from the differing research options presented above.

Task	Low estimate	High estimate
Task 0: Develop work plan	$ 20,000	$ 20,000
Task 1: Review and selection of top down empirical technique(s)	$ 25,000	$ 70,000
Task 2: Establish and coordinate with top-down modeling working group	$ 75,000	$ 140,000
Task 3: Implement top down modeling technique(s)	$ 125,000	$ 160,000
Total	**$ 245,000**	**$ 390,000**

Next Steps:
Develop a more detailed scope of work.

Timeframe:

Tasks	2014																											
	Sep		Oct		Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct	
Task 1: Review																												
Draft scope of work																												
Identify relevant literature																												
Review relevant literature (Option 1 only)											O																	
Draft IDIs with evaluators (Option 1 only)										O		O																
Implement evaluator IDIs (Option 1 only)																												
Prepare draft memo																	O											
PA / EEAC Review; Prepare final memo																					O							
Task 2 : Establish and coordinate top-down modeling working group																												
Ongoing bi-weekly meetings																												
Advise on top down research plan																												
Select initial preliminary methods																												
Task 3: Develop Stage II research plan																												
Inventory data availability																												
Develop analytic approach																												
Obtain data for model																												
Construct preliminary models																												
Report on modeling progress to date																			D			F						
Ongoing implementaiton of models																												

O = Other deliverable

D = Draft Report

F = Final Report

Study Name:	**New construction non-energy impacts**
Study Manager/PA:	Marie Abdou, National Grid
Evaluation Vendor:	Tetra Tech Team
Evaluation Plan Type:	**Scoping**
Primary Contact @ Vendor:	Noel Stevens, DNV KEMA
Type of Study:	Non-energy impacts
Applicable Fuel(s):	Electric and Gas

Overall Study Goal:

The goal of this study is to provide guidance to the Program Administrators (PAs) and the Energy Efficiency Advisory Council (EEAC) by quantifying participant non-energy impacts (NEIs) associated with commercial and industrial new construction projects. NEIs associated with retrofit projects were covered by a previous NEI study completed in 2011, however, due to resource constraints, the evaluation team limited that analysis to retrofit projects.

Research Question:

What are the gross NEIs per unit of energy savings resulting from commercial and industrial new construction electric and gas measures and practices?

High-Level Description of Approach/Methodology:

Task 1: Work plan development/Project management/Team meetings

The evaluation team will work closely with the PAs and EEAC staff to develop a work plan for estimating gross NEIs. The evaluation team's Cross Cutting Study Area's NEI evaluation project manager (Noel Stevens) will also hold regular meetings with representatives from each of the PAs, the EEAC, and the evaluation team to review the following: completed and upcoming research activities; key decisions or variations from the research plan; upcoming deliverables and review periods; budgetary and scheduling updates and concerns; and methodological issues.

Task 2: Sample selection

We will coordinate our research with on-going research of the C&I evaluation team to develop the sample frame for this study. The C&I evaluation team is currently developing a database of 2012 program billing and tracking records for all C&I customers. We expect this database to be done in late 2013 or early 2014, and we will select our sample from the population of new construction projects contained in that database assuming it is available. Our preliminary budget presented below assumes a sample size of 200 measures. The Evaluation team will determine the most statistically appropriate sample size during the scoping phase of the study.

Task 3: Instrument development

We will leverage the research instrument developed for the 2011 NEI study of C&I retrofit measures as the basis for the instrument design for the new construction projects. This should reduce the overall instrument design costs and allow us to investigate areas in which we may be able to link NEIs associated with new construction projects to those associated with retrofit projects.

Task 4: Interview administration

We will use trained energy analysts to conduct in-depth interviews similar to those conducted for the 2011 C&I retrofit NEI study.

Task 5: Data Analysis

We will employ a similar analytic technique as used in the 2011 C&I retrofit NEI study. However, the approach used for new construction projects will take additional steps to ensure that NEIs reported are restricted to those associated with energy efficiency rather than the newness of the measure.

Task 6: Reporting

We will prepare a draft and final report documenting the findings of this study.

List of Deliverables:
Task 1 – Draft and final work plans
Task 2 – Sample design memo
Task 3 – Draft and final survey instruments
Task 4 – Regular status report on interview administration
Task 5 – No deliverables for this task
Task 6 – Draft and final report, presentation of findings.

Potential Budget:
The following table shows preliminary budgets for the study.

Tasks	Budget
Task 1: Work plan development/Project management/Team meetings	$ 15,000
Task 2: Sample selection	$ 7,500
Task 3: Instrument development	$ 7,500
Task 4: Interview administration	$ 128,000
Task 5: Data Analysis	$ 20,000
Task 6: Reporting	$ 21,000
Total	$ 199,000

Next Steps:
Develop more detailed scope of work.

Timeframe:

Tasks	2014																					
	Sep		Oct		Nov		Dec		Jan		Feb		Mar		Apr		May		Jun	
Task 1:Work plan development and team meetings																				
Ongoing bi-weekly meetings																				
Task 2: Sample selection																				
Draft sample design					D															
Final sample design						F														
Task 3: Instrument development																				
Draft interview guide								D												
Final interview guide									F											
Task 4: Interview administration																				
Task 5: Data Analysis																				
Task 6: Reporting																				
Draft report															D					
Final report																				F

O = Other deliverable
D = Draft Report
F = Final Report

Study Name:	**NTG--C&I Electric Self Report Survey**
Study Manager/PA:	Monica Cohen, Columbia Gas
Evaluation Vendor:	Tetra Tech Team
Evaluation Plan Type:	**Scoping**
Primary Contact @ Vendor:	Pam Rathbun, Tetra Tech
Type of Study:	Impact (Commercial)
Applicable Fuel(s):	Electric

Overall Study Goal:

The goal of this study is to provide guidance to the Program Administrators (PAs) and the Energy Efficiency Advisory Council (EEAC) on updates to the incremental short-term program effects of the C&I sector electric programs.

Research Question:

This study seeks to help the PAs and the EEAC update electric NTG factors in the C&I sector. The last electric NTG study was completed in 2011, and the last gas NTG study was completed in 2012. While the preferred method would be to conduct one joint electric and gas NTG study, given the direction in MA of coordinating electric and gas projects among the PAs, the infrastructure to do so will not be in place until late 2013 or early 2014 to efficiently implement a joint study. Given the need for this information, we propose to repeat the electric study in early 2014 with recent participants (within the last six months to minimize recall error), and recommend holding off on conducting a joint study until the database is finalized.

High-Level Description of Approach/Methodology:

Task 1: Sample Design

This task will involve collecting C&I electric program participation records by program from all PAs for the previous six months. This information would then be aggregated up to a measure category level for purposes of selecting a representative sample by program and PA. As part of this sample effort, the cross-cutting team will need to coordinate with the PAs and the C&I Evaluation Team to: 1) understand any nuances in the design and/or delivery of the programs and the relationship of market actors in the program, and 2) make sure customers are not being sampled for multiple evaluation efforts.

Task 2: Implement Surveys

This task consists of three survey efforts.

1. Customer Survey--Sampled customers will be attempted over the course of 6-8 weeks to complete a telephone survey, using methods to maximize response rates and minimize the potential for nonresponse bias.
2. Influential Market Actor Survey-- For customers who specify that a market actor was most influential in the decision to install the equipment through a program, we will conduct a separate survey with the market actor to determine program attribution. These market actors will also be asked nonparticipant spillover questions (see 3 below).
3. Market Actor Nonparticipant Spillover Survey--Finally, to provide a conservative estimate of like nonparticipant spillover, we will attempt to survey all market actors listed in the participant tracking records.

Task 3: Analysis and Reporting

Using the C&I self-report methodology developed in 2011 for MA, the team will analyze the data to determine a NTG ratio by measure category, program, PA, and overall. As part of the analysis, the cross-cutting team will discuss the resulting NTG ratios with the C&I Evaluation Team, the PAs and the EEAC. This discussion will enable the cross-cutting team to understand ratios based on our

understanding of the programs, our previous NTG study, and the C&I team's experiences evaluating the program. Based on this discussion and the analysis, the cross-cutting team will produce a draft report for review by the PAs and the EEAC, and a final report.

List of Deliverables:
Task 1—Data request memo, sample design memo
Task 2—Finalized advance letter and survey instrument, response rate status reports during data collection
Task 3—Preliminary analysis presentation with the C&I Evaluation team, draft and final report.

Potential Budget:
The following table shows preliminary budgets for these tasks. Note that Task 2 assumes the same number of completed surveys as done in 2011 (950 Large C&I, 593 Small C&I, 67 Trade Allies). The Task 2 cost will be less if the number of participants over a six month study is less than in 2011.

Tasks	Budget
Task 1: Sample design	$31,750
Task 2: Implement surveys	$172,900
Task 3: Analysis and reporting	$34,500
Total	**$239,150**

Next Steps:
Develop more detailed scope of work.
Timeframe:

		2013	2014										
		December		January		February		March		April		May	
Task 1. Sample Design													
	Data request memo												
	Meet with C&I Evaluation Team												
	Sample design memo												
Task 2. Implement Survey													
	Finalize letter and survey instruments												
	Mail advance letter												
	Implement surveys												
	Final response rate disposition												
Task 3. Analysis and Reporting													
	Preliminary analysis												
	Meet with C&I Evaluation Team												
	Draft report											D	
	Final report												F

Study Name: Low-Income Health Benefits
Study Manager/PA: Marie Abdou
Evaluation Vendor: TBD
Primary Contact @ Vendor: TBD
Type of Study: impact Evaluation
Applicable Fuel(s): Electric, Gas

Overall Study Goal:

The overall objective of this study is to conduct a literature review to assess the health-related non-energy impacts ("NEIs") of high household energy costs on low-income households. The proposed research is aimed at identifying and quantifying NEIs of energy efficiency measures on the health and well-being of low-income energy efficiency program participants, estimating their costs and projecting these costs to the year 2050.

High-Level Description of Approach/Methodology:

The overall approach and methodology utilized by the study is under development.

Potential budget: TBD
Next Steps/Owners: Initial Scoping Discussions (PAs/EEAC)
Potential Timeline: Q4 2013 through June 2014

Study Name: Retrospective DRIPE
Study Manager/PA: Monica Kachru
Evaluation Vendor: TBD
Primary Contact @ Vendor: TBD
Type of Study: impact Evaluation
Applicable Fuel(s): Electric

Overall Study Goal:

The overall objective of this study is to assess the level and accuracy of Demand Reduction Induced Price Effects ("DRIPE") as set forth in the 2011 Avoided Energy Supply Cost Study. The study is intended to help inform and optimize the accuracy of DRIPE in the future avoided cost studies. The development of this study will be coordinated with the Cross Cutting Research Area's Planning work proposed for last Quarter 2013 to mid 2014.

High-Level Description of Approach/Methodology:

The overall approach and methodology utilized by the study is under development.

Potential budget: TBD
Next Steps/Owners: Initial Scoping Discussions (PAs/EEAC)
Potential Timeline: Q4 2013 through June 2014

Study Name: Efficient Neighborhoods+ – Initiative Evaluation (Phase I)
Study Manager/PA: Melanie Coen, National Grid
Evaluation Vendor: Opinion Dynamics
Primary Contact @ Vendor: Kessie Avseikova
Type of Study (Process/Impact/Market Characterization): Process, Impact
Applicable Fuel(s): All Fuels

Overall Study Goal:

As part of this scope, Opinion Dynamics will plan and execute the evaluation of the EN+ [SM] initiative. Through the tasks proposed below we will define initiative's success indicators, capture baseline conditions, assess the performance of the initiative against those indicators, and explore opportunities for improvement.

Research Questions:

To best achieve the goals described above, we propose structuring the evaluation and research efforts in two phases:

- Evaluation Planning and Readiness Phase
- Initiative Evaluation Phase

Each phase will be comprised of several tasks that we view as essential to conducting a rigorous evaluation. Those tasks are described in greater detail below.

High-Level Description of Approach/Methodology:

Phase 1 – Evaluation Planning and Readiness

To kick-off this phase, we will schedule a "regroup" meeting as well as individual interviews with the PAs and their implementation partners to understand and document the final community selections for the EN+ [SM] initiative, as well as the implementation strategies planned as part of the initiative (marketing and outreach, any changes to program delivery, etc.). Following the meeting, we will work with the PAs and the implementation partners to define an agreed-upon set of success indicators for this initiative and ensure that the program tracking mechanisms capture those indicators.

Establishing baselines against which the success of the initiative will be measured is critical for a rigorous and meaningful evaluation. Since the EN+ [SM] initiative builds upon the existing HES program, for most PAs we will establish baselines using past HES program activity in the EN+ [SM]-targeted community, as well as HES program activity (past and EN+ [SM]-concurrent) in comparison communities. We will also look at the differences in the adoption rates of specific measure categories.
For most PAs, to analyze program effectiveness, we will employ a quasi-experimental research design known as "difference in differences." For each success indicator (initiated contacts, completed audits, etc.), we will calculate the percent change between the past activity (pre-period) and EN+ [SM] activity (treatment period).[18] We will calculate the percent change separately for the EN+ [SM]-targeted communities and the comparison communities. We will then calculate the difference between the percent change observed in the EN+ [SM] community and the comparison community. The table below presents a hypothetical example of the analysis using completed projects as an indicator.[19] This analysis will be performed as part of Phase 2 of the evaluation research (described below).

[18] Note that we will use eligible customers as the base for calculating activity rates, be it initiated contact rate, audit rate, project completion rate, etc. That is, we will flag and eliminate customers with low-income rate codes and customers residing in multi-family (5+ unit homes) from the eligible pool of customers. Completed audits, projects, and the resulting energy savings will be determined using project initiation date. That is, only audits, projects and energy savings that were initiated within the timeframe of interest (past and EN+ [SM]-concurrent) will be retained in the analysis.
[19] Note that when analyzing the energy savings data, we will normalize the savings by the total number of customers. We will calculate savings per customer in the pre- and post-period for both the EN+ and comparison communities. We will then employ the difference of differences approach to estimate savings that are due to the EN+ [SM] initiative (by multiplying the incremental savings per account by the total number of accounts).

When establishing baselines and selecting comparison communities, we will use the following considerations:

1) **Past period (baseline) selection**
2) **Comparison community selection**
3) **Comparison cohort selection**

To support the establishment of baselines and selection of comparison communities, we will request participation[20] and other data from the PAs.[21] We will work closely with the PAs throughout the process of setting baselines.

Due to unique program design of the EN+[SM] initiative by CLC, it is impossible to apply the same method to evaluate the success of the CLC initiative. Reasons include:

1) Difficulty selecting a matched comparison community. CLC offers the initiative across all towns in its service territory. Furthermore, CLC service territory is unique in its geography, household, and customer characteristics.

2) Difficulty comparing participation among the target segment. CLC targets a specific income group through the EN+[SM] initiative (customers with incomes between 80% and 100% of the state median). However, participant income levels are not tracked as part of the program tracking databases. As a result, comparisons can be made at the overall program participation level in the pre-period and the treatment period, but not among the target income customer cohort.

Given these challenges, one approach would involve matching CLC customer and participant data to income and household size data obtained from a secondary source (e.g., Experian). We could then compare the lift in activity (initiated contacts, energy assessments, participation, etc.) to a representative period in the past within the targeted segment. It should be noted, however, that this approach is imperfect because of the likely errors in matching income and household data to CLC customers and participants.[22] If we were to pursue this approach, we would conduct due diligence quality assurance and validation checks to ensure that the results are as accurate as possible. One of the checks could include validating the accuracy of the matched income data against income eligibility data tracked through the EN+[SM] initiative implementation.

It is our understanding that CLC is considering conducting a penetration study. There might be opportunities to leverage the study to support and enhance this evaluation. We will work with CLC to identify and leverage those opportunities.

Timeframe: September-October, 2013.

Format of Deliverable: Deliverables for this phase will include data requests, meetings and/or conference calls with the PAs and/or implementation partners, and a memo documenting the target communities, implementation approach, success indicators, as well as baseline method and the comparison community selection method.

Budget: Billing will occur upon completion of each milestone.

Milestone 1: $28,000 Will include fielding of data requests, completion of interviews with the initiative implementation partners, development of a set of success indicators, and selection of comparison communities.

Milestone 2: $7,000 Will include meetings with the PAs to finalize and obtain an approval on the selection of comparison communities and success indicators.

[20] Past participation data request will include a period of June 1, 2012 to November 30, 2012. Requesting this data will ensure consistency in comparison of participation lift over time in the comparison community and in the EN+ [SM]-targeted community.

[21] Note that for a number of PAs, we have already received at least some past participation data. We will not be request data from those PAs again.

[22] The match will have to be based on address and address generally is considered a less stable matching field.

Phase 2 – Initiative Evaluation

This phase will include primary and secondary research efforts to assess the performance of the EN+[SM] initiative using the success indicators defined during Phase 1. Through our analysis of program tracking, we will document, among other things, marketing and outreach intensity, participation levels (audits and projects), and energy savings as a result of the initiative. We will compare these indicators of the initiative's activity to a representative period in the past and to comparison communities (using the difference in differences approach for most PAs described in greater detail in Phase 1 section above). Through phone surveys, the evaluation will also explore the influence of the initiative's marketing, outreach, and design components on customers' decision to complete an audit/installation, thus establishing attribution.[23] Finally, the evaluation will explore the relevant process-related topics, such as reasons for participation, satisfaction with the participation process, and recommendations for the initiative moving forward. We will work closely with the PAs to specify topic areas and questions that participant surveys or in-depth interviews will explore.

Depending on participation levels, primary research efforts will include interviews with participating and nonparticipating customers to support an assessment of the following topic areas:

- HES program awareness and knowledge
- Sources of program information and marketing effectiveness
- Barriers to participation
- Satisfaction with the participation process
- Attribution

Currently the budget is scoped to include a small number of customer interviews over multiple communities with a brief streamlined initial evaluation report. We will discuss the appropriate level of effort with the PAs and re-scope as needed.

Following the approval of the approaches proposed in this memo, we will develop and submit for approval a more detailed scope of work for this second phase of the evaluation.

Timeframe: Fall 2013 – Winter 2014

Format of Deliverable: Initiative evaluation report
Budget: Billing will occur upon completion of each milestone. Milestones will be determined as the scope of work develops. The overall expected budget for this phase of the evaluation is $90,000.

Next Steps/Owners:

- Develop more detailed scope of work

Additional Background: None

[23] Details around the attribution approach will be provide in a detailed scope of work following the approval of the high level evaluation scope provided in this document.

Study Name: 2013 Umbrella Marketing Studies
Study Manager/PA: Phil Moffitt, CLC
Evaluation Vendor: Opinion Dynamics
Primary Contact @ Vendor: Hannah Arnold
Type of Study: Process
Applicable Fuel(s): Gas and Electric

Overall Study Goals:

Following are the research goals for the 2013 Umbrella Marketing studies:

1) To address the following language contained in the Gas and Electric Term Sheets agreed to by the PAs in connection with development of the 2013-2015 Energy Efficiency Plan: "Support of the Mass Save mark and statewide brand is an important priority. The PAs commit to statewide marketing efforts that include the prominent integration and placement of the Mass Save mark as the statewide brand. PAs will include the Mass Save mark on statewide program, outreach and marketing materials and will include a link to the Mass Save website on the portion of their PA websites that is focused on energy efficiency services in Massachusetts, except where expressly limited by internal corporate website policies. PAs, in collaboration with DOER and the EEAC, will conduct an evaluation of the effectiveness of all joint statewide branding efforts to ensure that such brands support clear and recognizable messages that help promote program awareness. Such an evaluation will be completed by the end of 2013 and submitted to the EEAC."
2) For the Mass Save brand, to gauge the immediate impact of the 2013 campaign among residential and Commercial and Industrial (C&I) customers

Given that the brand strategies for COOL SMART and GasNetworks have different goals and different target markets from those of the Mass Save joint statewide brand (i.e. COOL SMART and GasNetworks marketing is fuel specific and focuses on contractors, while Mass Save focuses on customers in a fully integrated all-fuels manner), this research will focus on the Mass Save joint statewide brand and support of the Mass Save mark and statewide brand.

Study Name: 2013 Mass Save Statewide Campaign Post Campaign Study
Study Manager/PA: Phil Moffitt, CLC
Evaluation Vendor: Opinion Dynamics
Primary Contact @ Vendor: Hannah Arnold
Type of Study: Process
Applicable Fuel(s): Gas and Electric

Overall Study Goal:
This goal of this study is to address the language contained in the Gas and Electric Term Sheets, and gauge the impact of the 2013 campaign among residential and Commercial and Industrial (C&I) customers.

Secondary Evaluation Goal(s)/Objective(s):
Specific research objectives may include the following:

- Explore brand awareness, knowledge and associations with Mass Save
- Assess branding effectiveness
- Assess the influence of Mass Save marketing on participation in PA programs

High-Level Description of Approach/Methodology:

Task 1: In-Depth Interview with Marketing Staff
The team will conduct check-in interviews with PA marketing staff, as well as representatives from KSV, the campaign implementer, to understand how the marketing plan was ultimately executed in 2013. This task will provide the team with a basis for updating the survey instruments if needed.

Task 2: Survey Design
As part of this task, the team will update existing survey instruments to ensure they include questions specifically designed to meet the requirements of the term sheet. Based on that document, the study must determine whether branding is communicating clear and recognizable messages, and leading to greater levels of PA energy efficiency program awareness.

Task 3: Sample Design and Survey Fielding
The team will implement a sample design consistent with the pre-campaign survey effort, which involved conducting telephone surveys with a random sample of residential and C&I PA customers. As part of this task, the team will also request updated customer data from each of the PAs and make changes to the sample frame based on the new data. For budgeting purposes, we have assumed 300 and 400 interviews for C&I and residential customers respectively, which is sufficient to detect a change of 7% in awareness from the pre-campaign period. However, we can discuss other options with the team if greater resolution is desired.

Task 4: Analysis and Reporting
The team will provide the PAs with a written report containing the results and analysis of survey data. The format of this report will be consistent with that provided for the Mass Save statewide marketing effort.

Potential budget: $108,000
Next Steps/Owners: PA Review and Approval
Potential Timeframe:

Research Task	Sept				Oct				Nov				Dec					Jan			
	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27
Customer Data Request																					
Customer Data Update																					
Sample Preparation																					
Marketing Team Interviews																					
Survey Development																					
Survey Review and Comment Period																					
Survey Testing																					
Campaign Completion												*									
Survey Fielding																					
Analysis and Reporting																					

Study Name: 2013 COOL SMART and GasNetworks Brand Assessment
Study Manager/PA: Phil Moffitt, CLC
Evaluation Vendor: Opinion Dynamics
Primary Contact @ Vendor: Hannah Arnold
Type of Study: Process
Applicable Fuel(s): Gas and Electric

Overall Study Goal:
The goal of the study is to address the language contained in the Gas and Electric Term Sheets.

Secondary Evaluation Goal(s)/Objective(s):
Specific research objectives may include the following:

- Provide documentation of the brand strategy and branding efforts undertaken to date for the COOL SMART and GasNetworks brands
- Explore brand awareness, knowledge and associations
- Assess branding effectiveness for each brand

High-Level Description of Approach/Methodology:

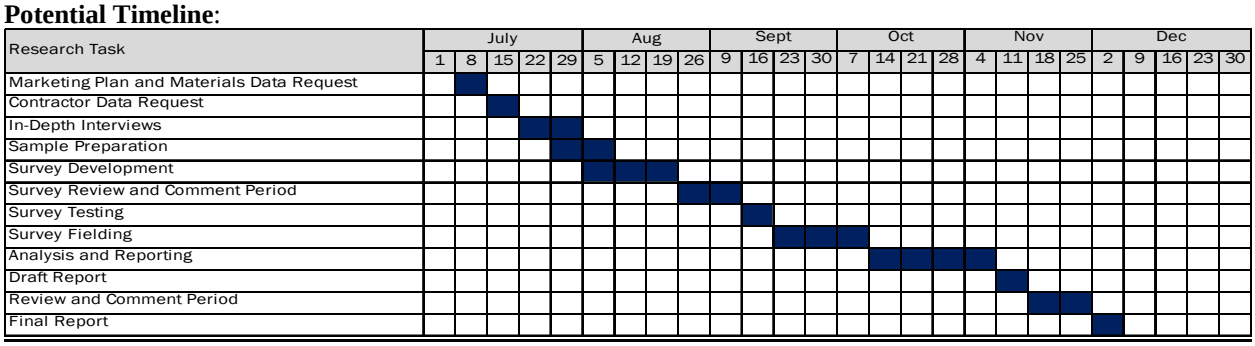
Task 1: In-Depth Interview with Marketing Staff
The team will conduct in-depth interviews with brand managers and other appropriate marketing staff to understand the brand idea and strategy underlying COOL SMART and GasNetworks, as well as the target audience and branding activities conducted to date. Through this task, the team will document key differences between the two brands as their brand strategy and branding may differ.

Task 2: Survey Design
As part of this task, the team will develop survey instruments that gather data on the effectiveness of COOL SMART and GasNetworks branding efforts. The survey will include questions specifically designed to determine whether branding is communicating clear and recognizable messages, and leading to greater levels of PA energy efficiency program awareness.

Task 3: Sample Design and Survey Fielding
The team will develop the sampling approach based on in-depth interviews with marketing staff. For budgeting purposes, we have assumed our approach will provide a point estimate of awareness at one point in time. We will field the survey via telephone through our Call Center.

Task 4: Analysis and Reporting
The team will provide the PAs with a written report containing the results and analysis of survey data. The format of this report will be consistent with that provided for the Mass Save statewide marketing effort.

Potential budget: $85,000 (assumes 6 in-depth interviews, and 500 surveys)
Next Steps/Owners: PA Review and Approval
Potential Timeline:



Study Name: Behavioral Program Persistence Study
Study Manager/PA: Michael Goldman, Northeast Utilities/Rachel Henschel, National Grid
Evaluation Vendor: Opinion Dynamics
Primary Contact @ Vendor: Hannah Arnold and Jeevika Chhatwal
Type of Study (Process/Impact/Market Characterization): Impact
Applicable Fuel(s): Gas and Electric

Overall Study Goal:
The Opinion Dynamics Evaluation team recommends completing a persistence study for the Massachusetts Cross-Cutting Behavior Programs. Here, we define persistence as the extent to which a program treatment effect continues to generate savings above the control group after treatment has been discontinued.

To assess persistence, we propose to work with the Massachusetts Cross-Cutting Behavior team to randomly select customers from each of the gas and electric program cohorts to discontinue treatment in order to monitor changes in savings after ending treatment. Any changes in savings will be observed over time through bi-annual billing analyses to detect savings decay in the absence of the treatment. This impact analysis will help assess whether savings will continue into the future which could help determine program cost effectiveness.

The overall goal of this analysis is to provide PA behavioral staff with valuable information regarding future savings potential from the behavior programs.

Research Questions:
Specific research questions for this study may include:

- To what extent do program savings persist without treatment?
- If savings persist without treatment, how might the measure life of the programs change as of the findings?
- Can the PAs change their treatment models based on the persistence findings?

High-Level Description of Approach/Methodology:

Task 1: Analysis and Reporting
Once the treatment is stopped/changed, the team will conduct bi-annual billing analysis to determine the before and after kWh savings as well as any decay in savings. The team will then analyze the results and report findings in the form of a report.

Potential Timeframe: TBD with the PA Behavioral Advisory Group

Potential budget: TBD

Next Steps/Owners: PA Review and Approval