Review of the Program Administrator-Proposed Mid-Term Modifications for 2011

Consultant Report
to the
Energy Efficiency Advisory Council

Revised
December 9, 2010

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I. Introduction and Recommendations

On October 29 the eleven Program Administrators (PAs) submitted their mid-term modification (MTM) proposals to the Department of Public Utilities (DPU). As the PAs indicated in their draft proposals presented to the Energy Efficiency Advisory Council before and during the October Council meeting, the filings consist of more than the specific PA proposals that are required in the DPU's 08-50 Guidelines on the MTMs (see Appendix A), as the PAs have interpreted them. Specifically, the PAs have included:

- Formal requests by individual PAs for DPU approval of specific mid-term modifications, in response to the DPU's 08-50 Guidelines on the MTMs, as the PAs collectively have interpreted the guidelines (i.e., changes in budgets, savings, or performance incentives greater than 20% of plan at the program level over the three-year period);
- Formal responses by the PAs to the DPU's several directives on the 2011 EM&V Plan, budgets for pilots, and updates to the performance incentive model and metrics;
- In addition, following discussions with several Councilors and the Consultants, these filings include several other set of materials:
    1. To address any concerns about bill impacts, the PAs agreed to include individual PA formal requests to the DPU for approval of any changes at the sector level that lead to a 20 percent increase in the residential or low income budgets or to a 15 percent increase in the C&I budget for 2011.
    2. The PAs agreed to provide, for informational purposes to the Council and DPU, any changes in budget, savings, or performance incentive that was greater than 20 percent at the program level for 2011.
    3. The PAs have also agreed to provide to the Council and the DPU, separate from the MTM filings to the DPU, a text report highlighting significant modifications to programs or other aspects notable updates to the PAs' 2011 plans that are not included in the mid-term modifications.
    4. The PAs have included as part of their filings the recent completed draft of the Technical Reference Manual (TRM).

All of the proposed changes are in the context of the PAs' update of their DPU approved plans for 2011, part of the three year plans approved in January 2010. Those plans include statewide and individual PA savings and benefits targets agreed to by the PAs and the EEAC for each of the three years. These targets formed the basis for near and long-term program strategy and program design, marketing and outreach, information feedback (evaluation, measurement, and verification), and the myriad of other elements to the overall deployment of the three year plans. The current updates for 2011 to those plans reflect the PAs' efforts to maintain the previously agreed to savings and benefits targets, key priorities for the Council. The specific changes in budget, savings, or performance incentive, some reflected in these filings due to their magnitude, are the result of the PAs' choices within their program portfolios to meet those targets.

This report presents for the Energy Efficiency Advisory Council's consideration its Consultants' review and assessment of the 2011 mid-term modifications which the PAs have submitted to the DPU, of the additional materials the PAs provided to the DPU as noted in their filings, and of

information which was developed by the PAs in their course of preparing the filings that the Consultants highlight for the Councilors.

The report includes recommendations to the Council that address issues that arose during the review. These are listed below and described more fully within the body for the report. Based on the review of the PAs' filed documents with the DPU, the Consultants recommend that the Council:

- Continue to set the expectation that the PAs should achieve all of the goals of the original Three-Year Plans, including total benefits.[1] Any shortfall in the achievement of goals in any one year should be made up in other years, so that the total goals for the approved Three-Year Plans are achieved over the 2010-2012 period.

- Request that the DPU establish a process to revisit the mid-term modification guidelines to strike an appropriate balance between flexibility and clarity regarding ratepayer/public risk.

- Approve the individual PA proposed mid-term modifications with the caution that data differences exist across PAs which are not now sufficiently explained and which could affect the cost, savings, benefits, or performance incentive values for one or more PAs.

- Encourage the PAs to develop and propose a more defensible set of savings and/or CFL measure lifetime assumptions to more accurately estimate the actual lifetime savings of CFLs.

- Encourage the PAs to aggressively pursue other program funding in 2011.

- Seek specific revisions to the 2011 Plan Version TRM, the 2011 Report Version TRM (for actual reported savings), and the 2012 Plan Version of the TRM

- Indicate to the PAs that it is a high Council priority that the PAs revise their assumptions in the 2011 Plan Version TRM for NTGRs for natural gas prescriptive measures where no directly applicable evaluation study has been done, adopting values of 90% for C&I prescriptive measures and 80% for residential prescriptive measures.[2] The Consultants also recommend that the Council request the DPU to require such modifications.

- Accept most of the EM&V plan in its current form and indicate that it is a high Council priority that specific deadlines be set for the completion and application of research on net-to-gross ratios, specifying that in each major customer sector (residential and non-residential) net-to-gross assumptions used in the 2011 Plans that account for at least 80% of total statewide claimed savings be updated based on timely, defensible empirical research no later than mid-June for both electric and gas, in time to inform the 2010

[1] As discussed below, the PA-proposed MTMs result in a 10.1% decrease in 2011gas benefits and a much smaller (0.6%) decrease in 2011 electric benefits relative to the Plans.

[2] The risk of not making these adjustments is one the PAs may choose to accept, recognizing that timely evaluation results (Net-to-Gross studies) will update those planning values with field-derived and current values.

annual reports[3], the 2012 MTM planning process, and the 2012 TRM Plan version.[4]. The Consultants also recommend that the Council request the DPU to require such modifications to the EM&V plan and the application of results, and that the schedule for both be strictly adhered to.

- Indicate to the PAs that it is a high Council priority that program EM&V studies must be conducted as soon as possible and results of all kinds must be applied as soon as available to inform the 2010 annual report filings; for purposes of program planning and benefit/cost screening to inform the 2012 MTM planning process; and to inform the 2012 TRM Plan version to establish, along with other planning inputs, 2012 savings, benefits, and incentive targets, and from which LBR will be calculated. We also recommend that the Council request the DPU to require such modifications to the EM&V plan and the application of results, and that the schedule for both be strictly adhered to.

- Reserve judgment on the performance incentives for 2011 until several issues and concerns regarding performance incentives, as discussed in the performance incentive section of this report, are addressed.

- Approve National Grid Electric's and CLC's pilots and their related budgets, which exceed the 1.0% notification threshold.

- Endorse Berkshire Gas' proposal to eliminate funding for their Deep Energy Retrofit pilots in 2011 and 2012 with the stipulation that, should a viable pilot project appear in their territory, they will consider co-funding it with the applicable electric company.

- Advise the PAs to undertake a greater amount of common program planning, using consistent assumptions, methods, and data, to support enhanced statewide planning and delivery of programs to customers, and meet, at the appropriate time in the MTM development process, to examine and address differences that are known from prior filings (such as this one) or observed as the MTMs are developed.

The report is not intended as a document that describes and discusses the many accomplishments that have been achieved to date. Many of their outcomes are reflected in the content of the PAs' MTM filings, either indirectly in the proposed savings targets for 2011 or in such aspects of the

[3] We recommend that gas NTGR research be completed along with electric in time to inform the 2010 annual reports because, although the gas performance incentives are to be based on deemed savings values for 2010, we believe it is important that public reporting of gas savings be based on EM&V-adjusted results, with performance incentive calculations being presented secondarily. This issue is discussed in more detail in the next section of this report. Mid-June is indicated as this is the general deadline by which studies need to be completed to inform the annual reports. This deadline can be adjusted by agreement within the EM&V PA/EEAC consultant process if it will not hinder the delivery of study results to inform the annual reports.

[4] Given the process for revision of savings assumptions laid out in the proposed 2011 Plan Version TRM, the 2012 plan version of the TRM is chronologically the first milestone at which EM&V results can be applied to post-2010 program years. The first milestone at which EM&V results can be applied to program year 2011will be the 2011 annual report version of the TRM, which comes after the 2012 plan version of the TRM chronologically despite the fact that it bears on an earlier program year.

filed materials as the 2011 EM&V plan and the draft final 2011 Plan Technical Reference Manual (TRM). In this report the Consultants focus primarily on key remaining issues and concerns; the report would be longer if the Consultants were asked to summarize all of the places where we recommend support for or acceptance of the PA-proposed MTMs.

The report also does not address the challenges that remain to set the Commonwealth on a path to achieve the savings targets established through the end of the current three year plan period and those anticipated in subsequent three year plans, which will focus more on achieving high efficiency savings targets through 2020 as the least expensive way to support emissions reductions targets soon to be established by the Secretary for Energy and Environmental Affairs.

This report also does not examine changes from data for 2012, which individual PAs may have chosen to make as they developed their proposed modifications to the approved 2010-2012 Plans. Our focus was on the proposals the PAs have made for their 2011 programs through the MTMs.

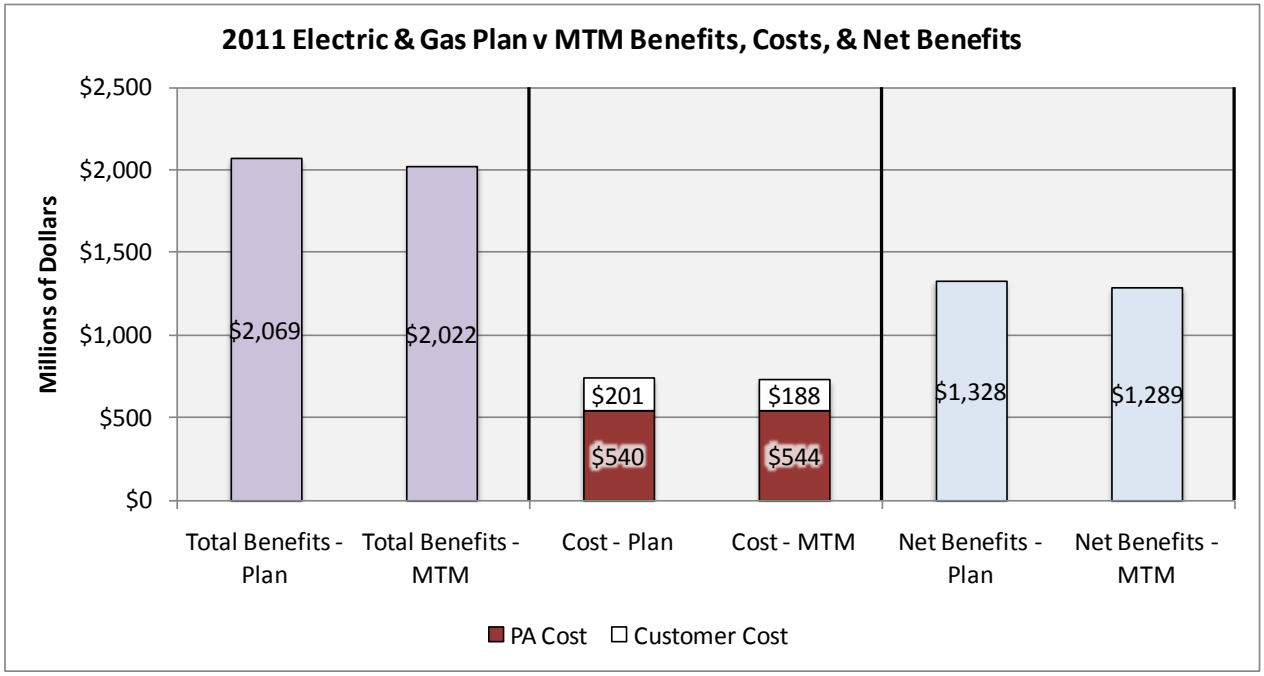
II. Consultant Review and Assessment of Mid-Term Modification Materials

A. Statewide savings, benefits, and net benefits

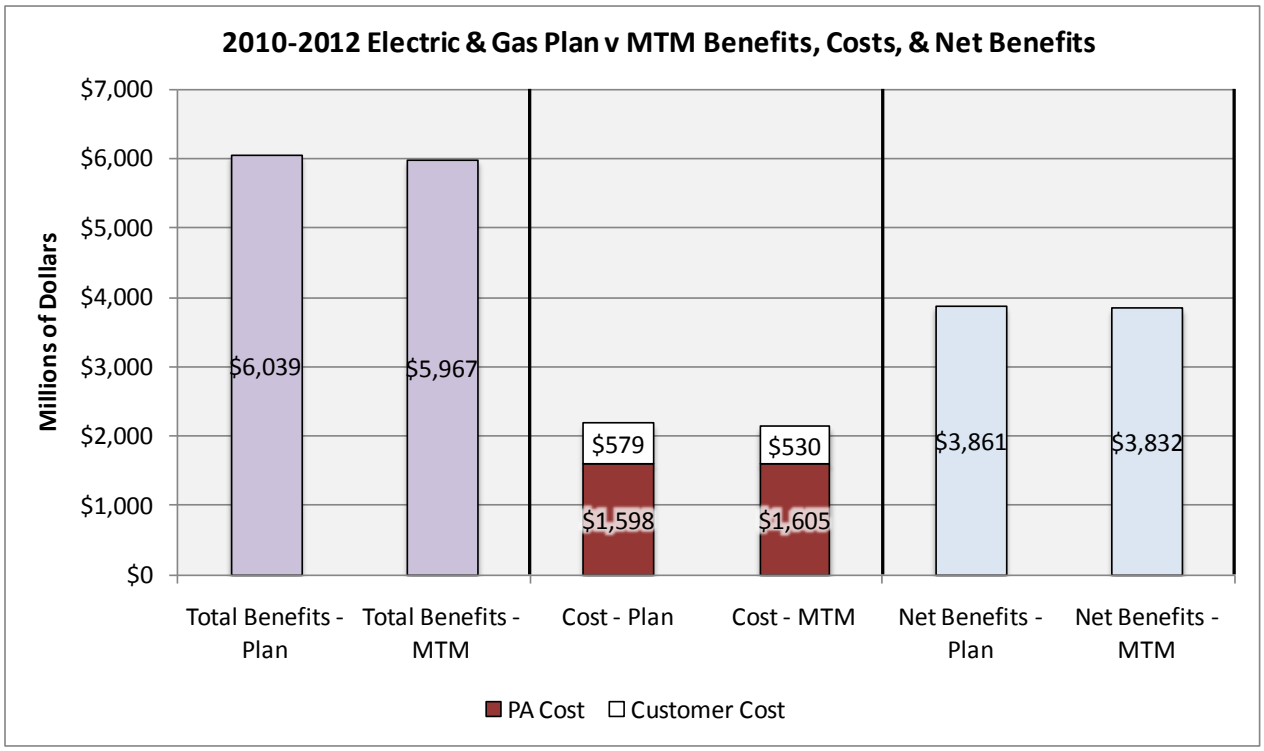
As part of the analysis of the PA-proposed 2011 Mid-Term Modifications, we reviewed the filed data on savings, benefits, costs, and net benefits and compared the MTM values to the DPU-approved 2011 values in the original Three-Year Plans (Plan). Below is a summary of the results. Additional charts with data on statewide and individual PA values are included in Appendix B.

Overall, for the combination of electric and gas programs, the modifications proposed by the PAs have relatively small effects on the statewide 2011 savings, benefits, costs, and net benefits, as shown in the chart below. The 2011 electric annual savings are 1.1% higher than Plan and the gas annual savings are 3.8% lower than Plan. The proposed modifications result in a $47 million (2.3%) decrease in benefits and a $39 million (2.9%) decrease in net benefits for 2011 statewide. The decrease in 2011 benefits is due primarily to a material decrease in gas benefits (10.1%) combined with a small decrease in electric benefits (0.6%), as discussed further below.

The Consultants recommend that the Council continue to set the expectation that the PAs achieve all of the goals of the original Three-Year Plans, including total benefits. Any shortfall in the achievement of goals in any one year should be made up in other years, so that the total goals for the approved Three-Year Plans are achieved over the 2010-2012 period.



The proposed 2011 modifications result in changes to the three-year (2010-2012) benefits, costs, and net benefits as well, and the effects are also relatively small, as shown in the following chart. The PA-proposed modifications result in a $72 million (1.2%) decline in benefits and a $29 million (0.8%) decline in net benefits for the 2010-2012 three-year period. Overall, Massachusetts would still receive about $6 billion in benefits (present value) from the energy efficiency programs and measures implemented in 2010-2012.

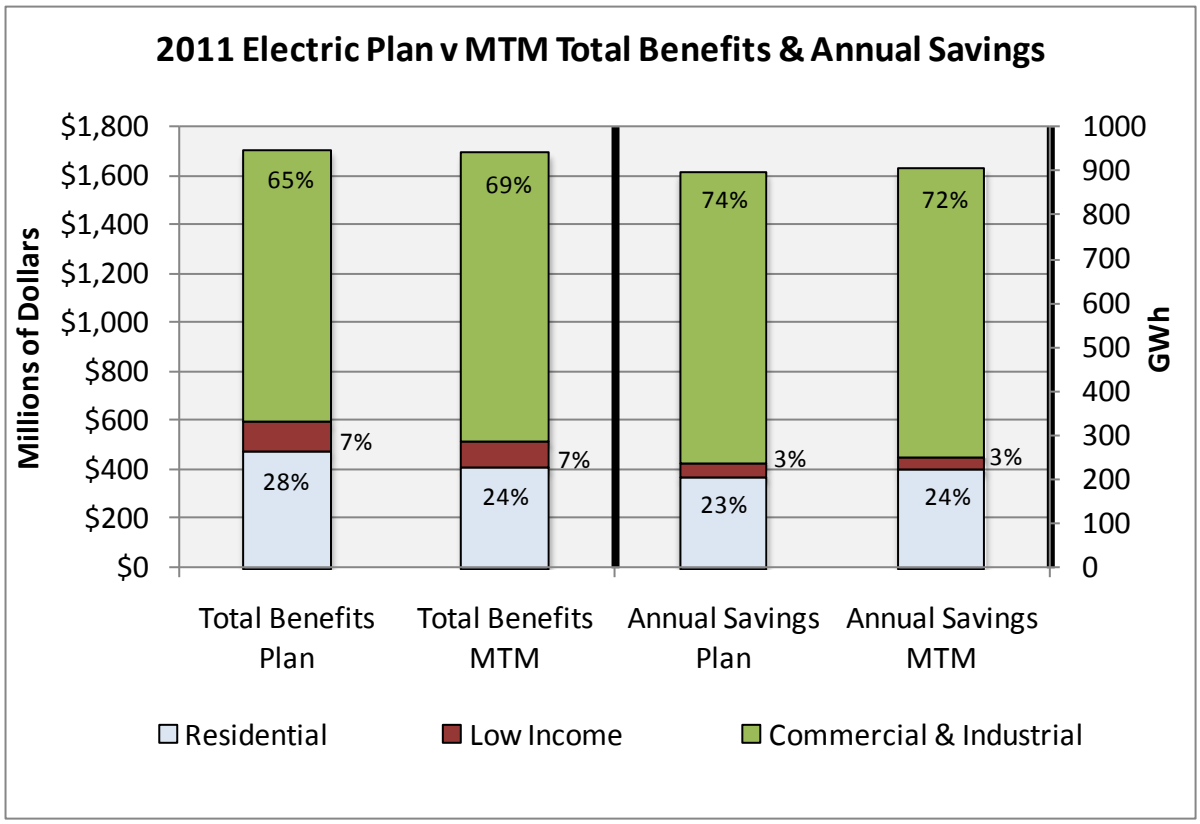


The lower energy savings (gas) and lower benefits (gas and electric) are mostly in the residential programs, and are primarily due to the results of recent evaluation studies. In general, the PAs attempted to make up the loss of Residential savings and benefits by increasing savings and benefits in the C&I sector programs. Some PAs also increased their Residential efforts in behavior/feedback and residential lighting programs.

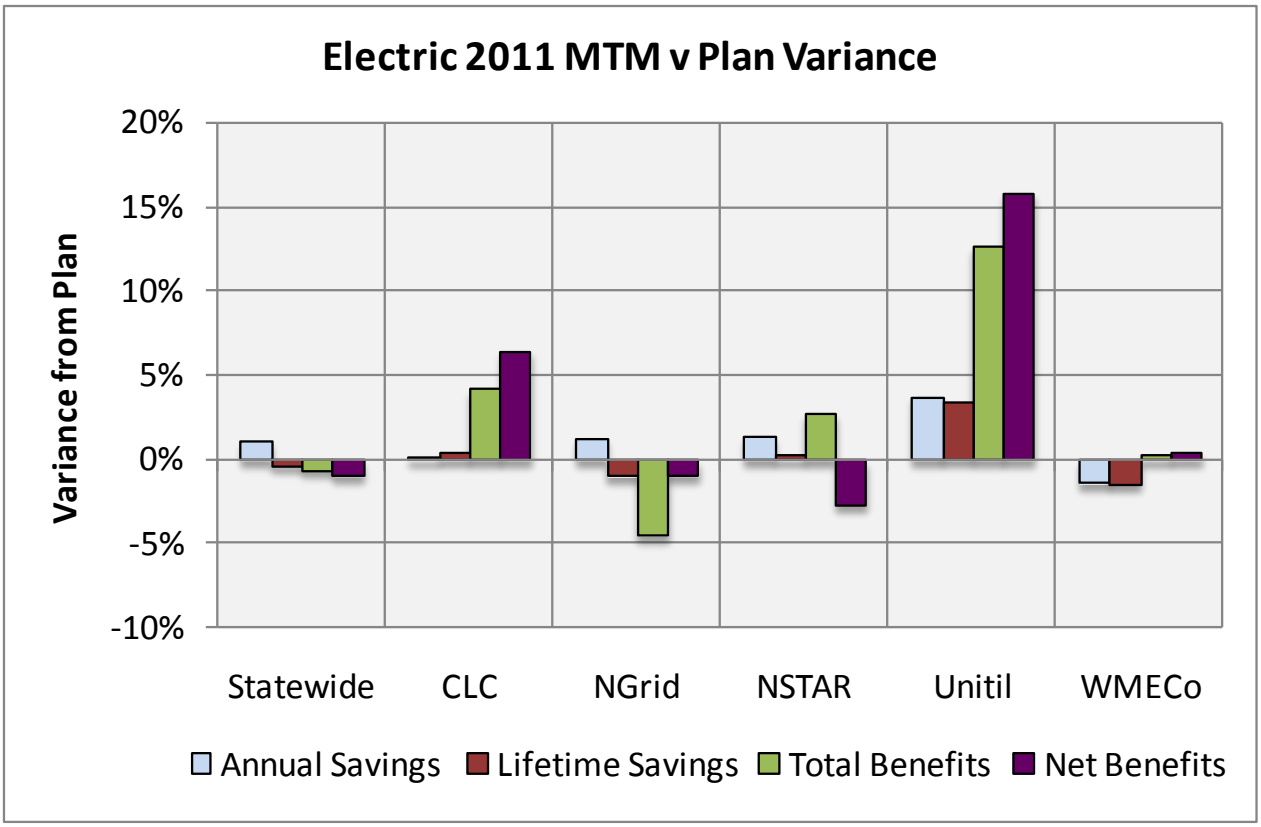
Below are summaries of the savings, benefits, and net benefits for the electric programs, followed by a summary for the gas programs.

Electric 2011 MTMs:
Annual kWh savings = 1.1% higher than the 2011 Plan (and closer to the original EEAC goal for 2011)
Lifetime kWh savings = 0.3% lower than 2011 Plan
Total Benefits = 0.6% lower than 2011 Plan
Net Benefits = 1.0% lower than 2011 Plan

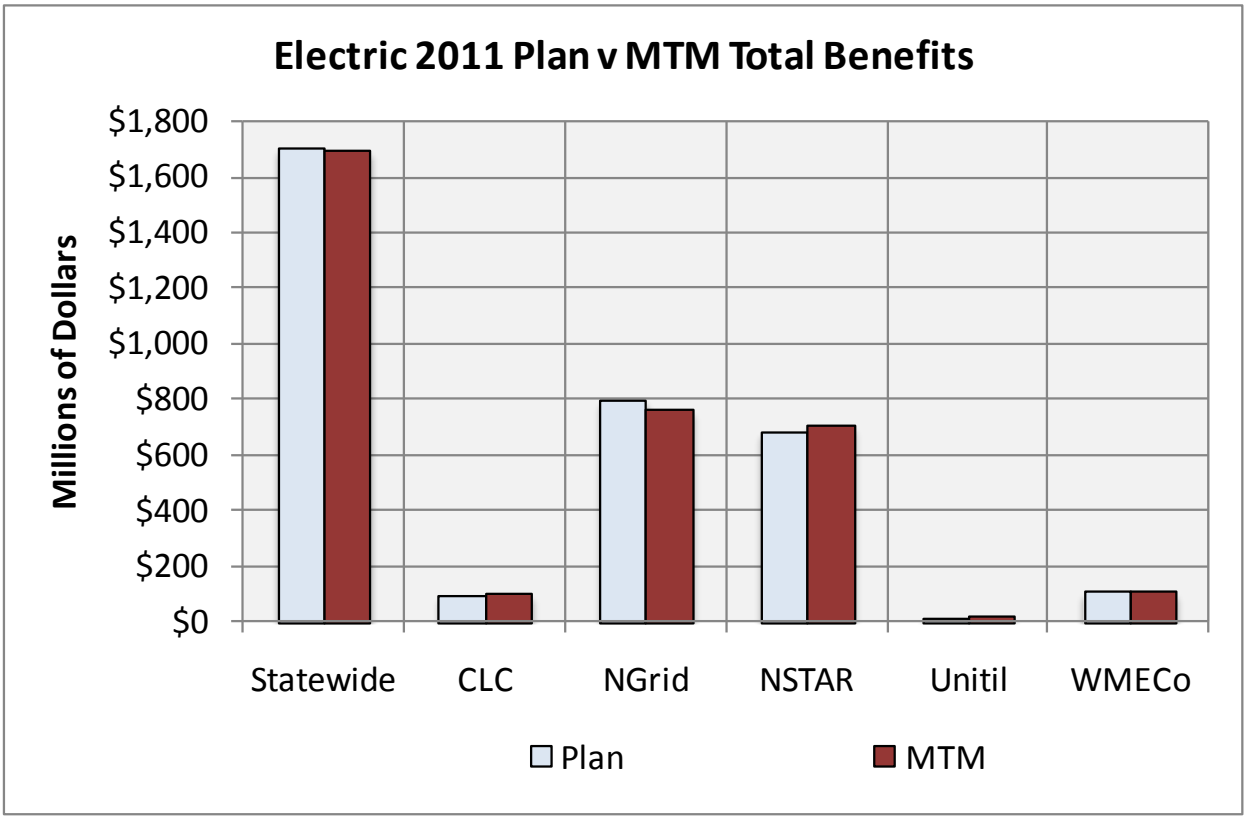
Overall, while there is a 1.1% increase in 2011 electric annual savings compared to the 2011 savings in the Three-Year Plan, the proposed 2011 MTMs also reflect an approximate 1% decrease in electric benefits and net benefits. Generally, the decrease in total electric benefits is in the Residential sector (14% decrease statewide in 2011), and it is largely offset by an increase in benefits in the C&I sector (6% increase in C&I benefits in the 2011 MTMs relative to the Plan), as shown below.



The percent variances are fairly different across the individual electric PAs, as shown in the chart below, meaning that the PAs made different adjustments in their individual 2011 MTMs relative to the values in the original Three-Year Plans. While the MTM vs. Plan variances at the statewide level are small, the variances are larger for most of the individual PAs. The individual PA variances at the level of the full portfolio for 2011 shown in the chart are lower than 20% for all PAs.



These relative variances matter most, in terms of the impact on total statewide results, for the PAs with the largest portfolios of electric programs, i.e., NGrid and NSTAR. The chart below shows the total benefits and the MTM vs. Plan variances in millions of dollars, thereby indicating the absolute magnitude of the effects. Together, the two charts indicate that the 0.6% decrease in 2011 statewide electric total benefits is caused by a decrease in benefits at NGrid (see more discussion of this in section D below; the decrease in NGrid benefits is in the Mass Save program primarily).



Gas 2011 MTMs:
Annual therm savings = 3.8% lower than the 2011 Plan
Lifetime therm savings = 10.6% lower than 2011 Plan
Total Benefits = 10.1% lower than 2011 Plan
Net Benefits = 13.7% lower than 2011 Plan

The substantial declines in 2011 gas benefits and net benefits, when comparing the 2011 gas MTMs to the 2011 values in the DPU-approved Three-Year Plan, are a significant concern. The EEAC Consultants initially raised concerns about the decreases in benefits and net benefits to the PAs in October, prior to the October 29 MTM filings. The PAs should achieve all of the goals of the gas Three-Year Plan, including total benefits and net benefits (with due consideration for potentially higher costs to achieve deeper savings and other objectives, where such increased costs are justified).

The declines in 2011 gas benefits and net benefits relative to the 2011 values in the Three-Year Plan appear to be due to several factors:

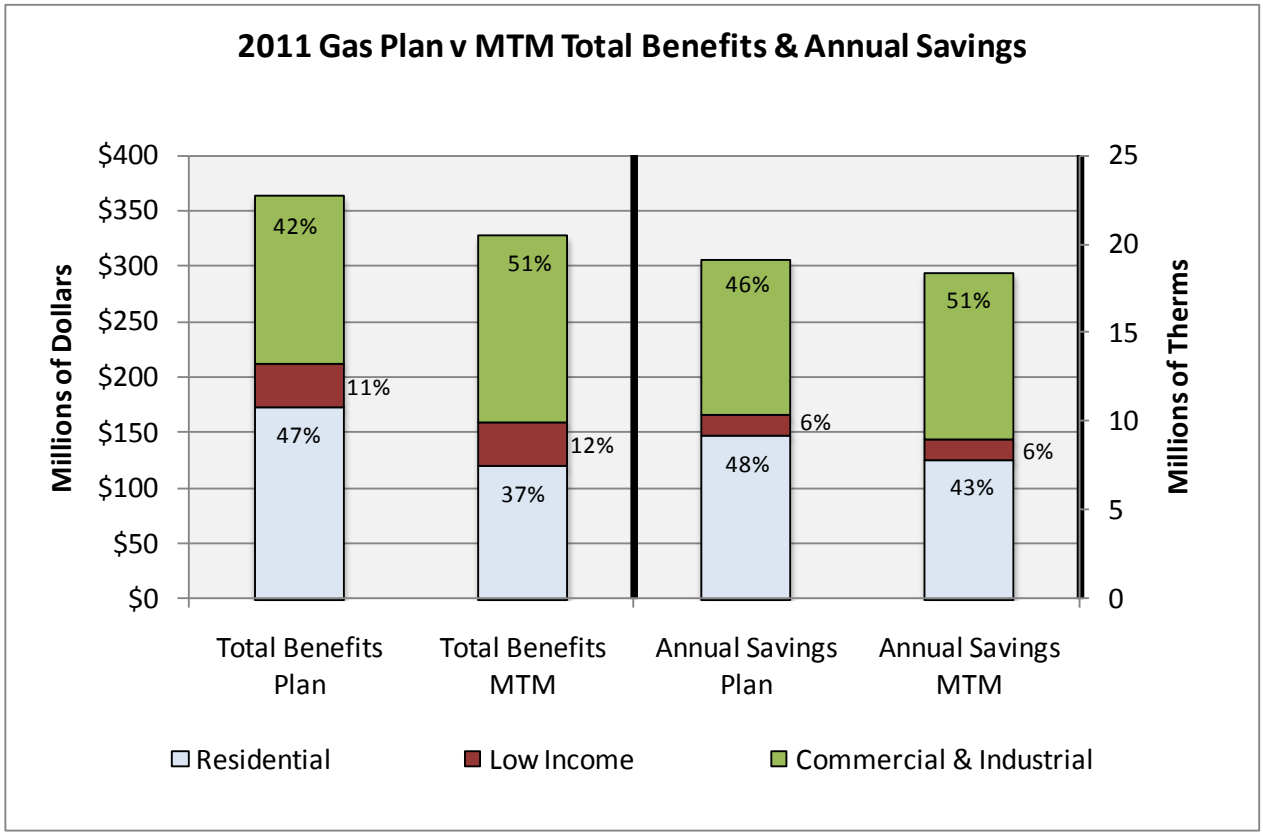
1. Evaluation (EM&V) findings have led to a reduction in savings for some key measures in the gas programs, particularly for the Residential Heating and Water Heating Program (also known as High Efficiency Heating Equipment or HEHE), where annual savings are 48% lower than plan and benefits are 49% lower than plan. These reductions are due primarily to evaluation results, including the higher-than-expected free ridership findings, meaning that some customers report that they would have installed the energy efficiency measures without the program. (It should be noted that the participants are still receiving the expected energy

savings, but the energy efficiency programs cannot claim all of the savings that the customers receive.)

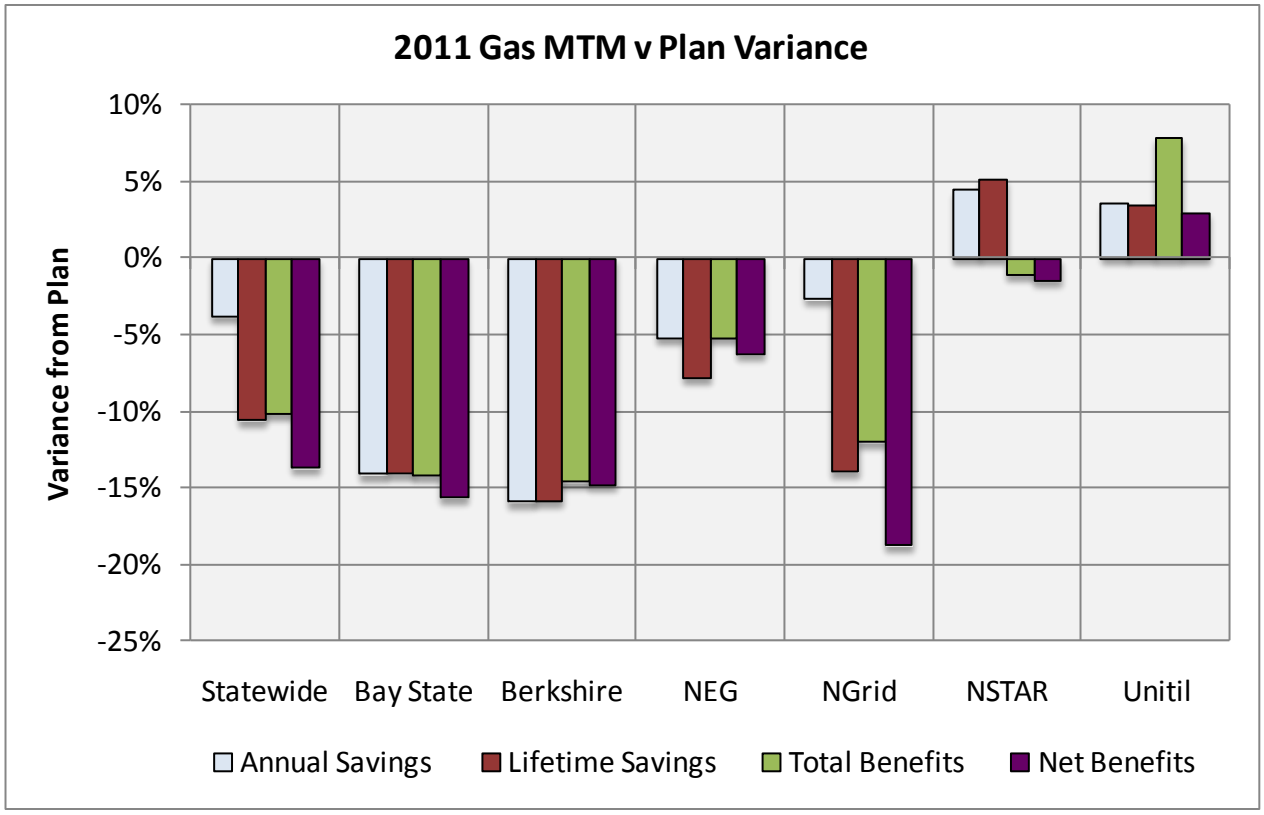
2. In Residential New Construction, where savings and benefits have decreased by 54% and 51% respectively, there are higher baselines due to more efficient building codes and standards, which reduce the levels of savings and benefits able to be claimed by the program.
3. The gas *benefits* are declining at a higher percentage rate than the gas annual *savings* primarily because measures with shorter lifetimes (e.g., behavior/feedback programs) are being employed as substitutes for the longer lifetime measures that were a core part of Residential Heating and Water Heating (HEHE).[5] This is confirmed by comparing the decrease in total benefits (10.1%) to the decrease in gas *lifetime* savings (10.6%), while the decrease in gas *annual* savings is smaller at only 3.8%.
4. The Residential sector benefits decrease by 30% relative to the Plan, driven by the factors above.
5. For some programs, even though the annual savings goals are maintained or even increased, the costs to achieve those savings have increased, which reduces the net benefits (benefits minus costs).

In general, the PAs increased savings and benefits in the gas C&I programs to make up for a portion of the loss of Residential savings and benefits. Statewide 2011 gas C&I annual savings increased 7% and gas C&I benefits increased 9%. Some PAs also increased their efforts in behavior/feedback programs as a way to increase Residential gas savings; while these programs provide annual energy savings, they contribute less to total lifetime benefits because they have a short measure life (generally one year).

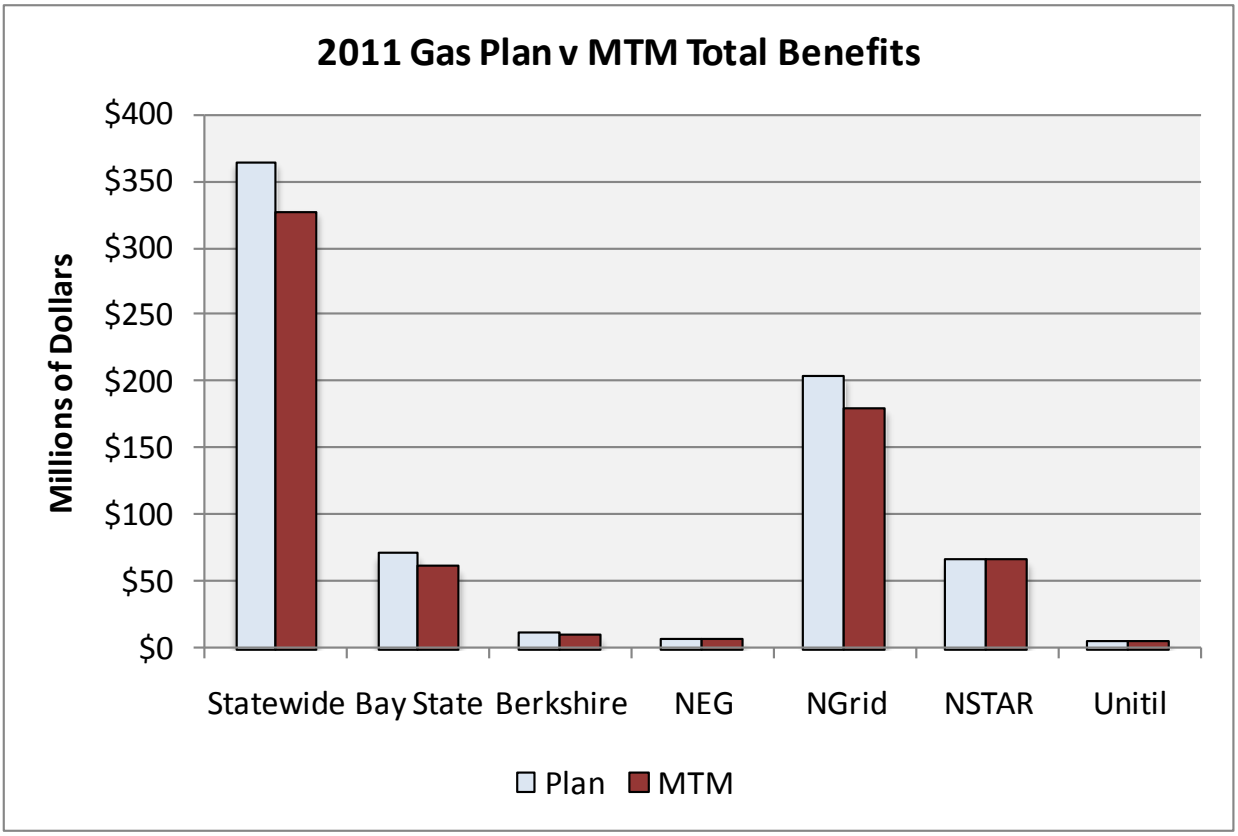
[5] The lack of gas lifetime savings data by program in the DPU 08-50 data tables and in the output of the gas cost-effectiveness screening tools made the analysis of gas savings and benefits more challenging than it should have been. Data on gas lifetime savings by program should be provided in the 08-50 tables and in the output of the gas screening tools.



The percent variances are different across the individual gas PAs, as shown in the chart below, meaning that the gas PAs made somewhat different adjustments through the 2011 MTMs relative to the values in the original Three-Year Plans.



These relative variances matter most, in terms of the impact on total gas statewide results, for the PAs with the largest portfolios of gas programs, i.e., NGrid, NSTAR, and Bay State (Columbia). The chart below shows the total benefits and the variances in millions of dollars, thereby indicating the absolute magnitude of the effects of the MTMs on gas benefits. Reductions in total benefits at NGrid and Bay State (Columbia) drive the decrease in statewide total benefits for gas.


2011 Gas Plan v MTM Total Benefits
Millions of Dollars
$400
$350
$300
$250
$200
$150
$100
$50
$0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Plan
MTM

B. Guidelines for mid-term modifications

The DPU, in its Energy Efficiency Guidelines (DPU 08-50-B, Section 3.8) set forth guidelines for Mid-Term Modifications, to define significant modifications and to identify when such modifications would need to be submitted for DPU review and approval. See Appendix A. Its guidelines are focused primarily on modifications that result in individual program changes greater than +/- 20% for budgets, savings goals, or performance incentives, as well as for new or discontinued programs. As the PAs began to consider its MTM filings they had to determine whether this guideline (Section 3.8.2) applied only to 2011 (one year) or to the three year period. In the end, the PAs interpreted the guideline to apply to the full three-year period of the 2010-2012 Plans rather than to a one-year period.

The Consultants have pointed out that such a three-year interpretation leads to significant risks and exposures for the Council and the DPU. Changes to savings goals could be as much as 19.9% lower than the three-year Plan savings goals, and budget changes could be as much as 19.9% higher than the three-year Plan budget (leading to significant increases in program costs, as well as in EERF or gas customer charges). Under the PAs' application of the DPU's guidelines, none of these types of changes would need to be provided to either the Council for review or to the DPU for review and approval. Because of these and related concerns the EEAC Consultants do not support the PAs' interpretation of the DPU guidelines for mid-term modifications.

The EEAC Consultants and several Councilors had discussed guidelines for mid-term modifications extensively with the PAs, and proposed some alternate approaches to guidelines to address the issues above[6], as well as additional filing criteria to the DPU's +/-20% criterion to enable the Council to receive information about matters of priority to them and to highlight additional issues to the DPU. The PAs agreed to include several additional sets of material in their MTM filings. To address any major concerns about bill impacts, the PAs agreed to include individual PA formal requests to the DPU for approval of any changes at the sector level that lead to a 20 percent increase in the residential or low income budgets or to a 15 percent increase in the C&I budget for 2011. The PAs also agreed to provide, for informational purposes to the Council and DPU, any changes in budget, savings, or performance incentive that was greater than 20 percent at the program level in 2011 (the one year period).

These additions to the formally established DPU Guidelines for MTMs in Order 08-50-B provide useful additional information for the Council's and DPU's review and consideration. We note, however, that these were established to provide some balance to the implications resulting from the Council and the DPU only receiving requests and supporting data for

[6] For example, the Consultants recommended that some guidelines should not be equal for both increases and decreases. i.e., it is more important to guard against and seek approval for increases in budgets than decreases in budgets, and it is more important to guard against decreases in savings goals than increases in savings goals. The Consultants also suggested guidelines based on both percentage changes and absolute numerical amounts (such as $) rather than relying solely on percentages.

program changes that would have a 20% impacts over the three year plan period. The Consultants view this agreement as a mutual accommodation for this year's filings only.

While the PAs agreed to include several sets of information in their filings to accommodate some of these concerns, and the additional information has been helpful as the Consultants review the materials and highlight issues and information for the Council, we believe a more comprehensive re-examination the DPU of its guidelines for mid-term modifications would be a valuable contribution to planning and review before the 2012 planning cycle. ***The Consultants recommend that the Council request that the DPU establish a process to revisit these guidelines to strike an appropriate balance between flexibility and clarity regarding ratepayer/public risk*** – all of which are requirements for PAs to successfully implement the energy efficiency programs and achieve the goals.

C. PA mid-term modification materials to DPU

1. Individual PA requests for formal DPU approval (program budget, savings, or performance incentive change of +/-20% at the program level over the 2010-2012 period; budget increase at sector level 15% C&I or 20% res/low income; adding or subtracting programs)

Many of the electric and gas Program Administrators have proposed one or more mid-term modifications to the DPU within the categories listed above; the majority are in the residential sector, with several in the low income sector. These proposed changes in budget, planned savings, or performance incentive are the result of various factors, including shifting market dynamics, evaluation study results, changing codes and standards, and the evolving design of programs and pilots. For an overview of each PAs' proposal(s), see the summary and individual PA tables in Appendix B.

The PAs' proposals under the criteria noted above are generally based on the need to adapt programs to respond to changing circumstances, while keeping the focus on carrying out the Green Communities Act's mandate of acquiring all cost-effective energy efficiency, through the savings and benefits goals in the PAs' three year Plans that have been approved by the DPU. The Council Consultants have reviewed each PA's specific proposals and the supporting explanations and find these proposed modifications for 2011 from the original three year plan to be reasonable. ***The Consultants recommend that the Council approve the individual PA proposed mid-term modifications with the following caution:***

The Consultant review included a cross-PA comparison of several key indicators (e.g., cost per unit saving) for a number of the programs, focused on the residential and low income sectors. While we have not had sufficient opportunity to explore these in great depth or to discuss them in detail with PA staff, we believe they need either an explanation justifying the differences or adjustments to the data to reduce or eliminate these differences. Data changes to reflect further explanation of these cross-PA differences may lead to changes in savings, budgets, or performance incentives which could alter the totality of the proposed MTMs. For specific

examples (not a complete listing), please refer to Appendix C. Section III J below proposes an approach the PAs could undertake before the next mid-term modification cycle which we believe would both minimize such unexplained differences and enhance the planning inputs beyond those in the TRM.

In contrast to the Residential portfolio, the PAs have not proposed any MTM changes for their Commercial and Industrial programs. With one exception discussed in Section III I. below, the Consultants believe that the PA filings reflect the current status of program evolution. That is, there are no program modifications in budget or savings over the three year period that rise to the level of a significant shift from the approved filings of last year.

2. Informational: program budget, savings, or PI change of +/- 20% at the program level in 2011

Each PA has identified one or more changes in program budget, savings, or performance incentive that do exceed the 20% threshold for 2011 without having a similar effect on 2010-2012. The PAs agreed to identify these for the Council and DPU, while not seeking approval of such changes. These are also included in the 'Summary of Filings' documents in Appendix C. Each such program included in the PAs' filings was affected by decisions made in support of the overall savings targets, and, from an examination of each PAs' filings, the explanation for each is unique and directly pertinent to the program and local circumstance. After reviewing these documents, we find that these shifts in budget, savings, or performance incentives were appropriate at the levels proposed, with the same caveats included in Section II C.1 above.

D. Other MTM threshold related topics – The following sections highlight results based on the program updates that the Consultants believe are important to the Council's priorities, but which are not "triggered" by the 20% threshold on savings, cost, or performance incentive that was established by the DPU guidelines.

1. Savings

Electric

We note that the overall statewide savings planned to be acquired in 2011 are close to those included in the final three year plans, as discussed and presented in charts in Section II above. Highlighted here is one program whose targets are proposed to be noticeably lower than in the Plan. The 2011 statewide lifetime MWh savings in the Electric Low-Income Multifamily program are 27% lower than had been approved in the 2010-2012 Plan in January. This is due primarily to a request by LEAN to reduce program activity funded by program funds, to enable LEAN to take advantage for the time-limited ARRA funding of weatherization projects. The result is a proposed program budget reduction in 2011, with associated reductions in planned program savings. The greatest impact of this program reduction affects the two largest PAs: a 24% MWh reduction at NGRID and a 38% MWh reduction at NSTAR.

C&I sector savings for 2011, which provide a large proportion of the overall portfolio savings, remained close to the previously approved targets – a decline of approximately 1%. The annual MWh savings per participant decreases by 8% across the C&I sector.

While no one program or individual PA is responsible for a significant portion of this reduction, there is a slight reduction in this indicator across all programs and PAs with the exception of Unitil, which sees a slight increase. With the small statewide drop in annual savings for 2011 in the C&I sector, and an anticipated increase in total participants, we would recommend a careful comparison of the PAs program efforts against the C&I metrics designed to promote deeper savings.

Gas

In the Residential sector, a 15% drop in overall therm savings in 2011 is being driven by two programs: Residential New Construction & Major Renovation (-54%) and Residential Heating and Water Heating (-48%). The reduced savings are due to increasing code standards, and the subsequent increased program baseline, and the application of recent EM&V results, which showed reduced program-associated gas savings.

In the C&I Sector, annual therm savings are expected to increase in 2011 by 7% over the currently approved plan. Savings from the New Construction and Major Renovation program are expected to be 24% higher than previously planned for. One third of the sector's savings are from the program. The Direct Install program is expected to increase its savings by 4% over the current plan.

2. Benefits and net benefits

Electric residential net benefits and total benefits for 2011 decline in the PAs' proposed updated plans compared with the 2011 plan approved in January. Net benefits show a 20 percent reduction ($328.M to $263.8M) and total benefits decrease by 14 percent ($473,343,673 to $405,639,285). This is primarily associated with the Mass Save HES program, where total benefits fall 25% statewide, due predominantly to a big drop in NGRID benefits. Overall, NGRID's total benefits for this program in 2011 fall from $194 million to $99 million, a large portion of which is a drop in oil benefits Total C&I benefits increased at the statewide level by nearly 6%, while net benefits are projected to increase 8 percent.

On the gas side, because there are no quantified benefits other than the value of the energy savings, the reduction in total benefits is due to the HEHE program, with the new lower net-to-gross (NTG) ratios.

3. Program-specific comments

Lighting

The PAs do not adjust their lifetime CFL savings or measure life assumptions to account for expected changes in the lighting baseline due to federal standards (that start phasing in during 2012) and the introduction of new technologies such as efficient halogen lamps and LEDs. No baseline shift is assumed over the full seven year measure life for CFLs sold at retail. As a result the PAs may be over-claiming gross lifetime savings from CFLs. ***The Consultants recommend that the Council encourage the PAs to develop and propose a more defensible set of savings and/or measure lifetime assumptions to more accurately estimate the actual lifetime savings of CFLs.*** These adjustments are separate from any net-to-gross ratio adjustments to gross savings.

Appliances

NSTAR's 2011 MTM lifetime savings go down by 20% compared to the original 2011 Plan; such savings also decrease at WMECo by 2%. Lifetime savings are projected to increase at NGrid by 3%, at CLC by 4%, and at Unitil by 11%. Program budgets are projected to decline at NGrid by 11.7% and at CLC by 1.6% and increase at WMECO by 5.7% and at NSTAR by 12.5%. It is not clear why NSTAR's 2011 budget for this increases the most while its savings decrease the most.

High Efficiency Heating Equipment (HEHE)

Statewide 2011 HEHE savings fall 48% relative to the 2011 target in the Three-Year Plan. This is a combination of two factors. Participant goals are lower, dropping 19% from 44,448 to 36,104, possibly due to some measures being dropped as a result of the recent program evaluation and a redirection of some program resources to a newly proposed hard-to-reach customer/contractor segment. In addition, the impact of the HEHE evaluation reduced per unit savings for a number of key program measures, due to high free-ridership rates. The 2011 HEHE combined budgets also fall 28% resulting in a cost per therm that increases by 38%.

Across PAs 2011 program savings fell between 18% to 46% relative to the Three-Year Plan and proposed budget modifications ranged from an increase of 23% to a decrease of 15%. Program yields increased for all PAs and varied from $9.35 to $5.12/therm with a statewide average of $5.87. The change in participants ranged from 3% to -10%.

Mass Save HES

The Mass Save HES program is in the process of undergoing a significant set of program enhancements, driven by the work of the Residential Steering Committee. These changes will be implemented in early 2011. The MTM documents do not specifically address these program changes, which are laying the groundwork for broader and deeper energy savings in 2011 and beyond.

Residential New Construction & Major Renovations

The Residential New Construction and Major Renovations Program will be impacted by the State's implementation of the new building code (based on IECC 2009). This code upgrade will increase the new construction baseline, resulting in a reduction of program-claimed savings. This will have the greatest impact on non-electric (gas, oil, propane) savings. On the other hand, the PAs are projecting an increase in the incidence of efficient heat pumps in new homes, which will drive electric savings up. The overall net effect of these market influences will result in a 2011 gas savings decrease of 54% and an electric savings increase of 27%.

III. Review and Comments on Additional PA Filed Documents

A. Financing

The PAs have made good progress on future attractive and convenient financing for customers with the Massachusetts Bankers Association and with other potential partners and sources of financing capital, building on the successful implementation of the current Heat Loan program

with its low cost of capital to the program. See Exhibit E in each MTM filing. The Consultants see this progress, along with progress that DOER is making on other approaches, as important and very positive steps forward on the crucial issue of financing for customers.

In terms of outside financing capital, the MTMs do not appear to quantify the specific levels of outside financing capital the PAs are proposing to secure for 2011. The proposed sources of the outside capital and the financing offers are described in the PAs' filings, Exhibit E, but the total amounts of outside capital are not included. The PAs appear to be assuming the original Plan $48 million estimate of financing capital for 2011 ($40 M electric and $8 M gas), since the MTMs do not appear to modify the Plan amounts for 2011. With the new approaches described in Exhibit E, the total financing pool does not appear to be capital constrained, and the Consultants recommend and expect that at least $48 million for 2011 should be available.

We understand that NGrid is proposing an additional financing approach using a loan loss reserve. We are not necessarily concerned about multiple approaches to financing and outside financing capital – as these can be good things – as long as customers perceive the program offerings as statewide programs from the view of the customer experience.

There are also some questions regarding potential transitions from current approaches to new financing approaches (e.g., is there a transition planned for small business, from the current approach, with some use of shareholder funds for financing capital, to the approach outlined in the financing exhibit, supported by the Massachusetts Bankers Association?). The nature and timing of such transitions should be clarified by the PAs as part of the implementation of the new financing approaches and capital sources.

B. Outside program funding

The Three-Year Plan included a total of $100 M of electric and $20 M of gas outside funding for 2011, in two categories: outside program funding ($60 M electric, $12 M gas) and outside financing capital ($40 M electric, $8 M gas). The outside program funding has an impact and interrelationship with EERF and gas ratepayer funding; the outside financing capital (discussed above) does not.

From what we have been able to discern from the PA MTMs and the 08-50 data tables, it appears that only CLC is planning for a level of outside program funding equivalent to what was planned for 2011 per the Three-Year Plans, and the other PAs are proposing zero outside program funding for 2011 in the MTMs.[7] The PAs have included statements committing to continue to explore and pursue other program funding for 2011.

It appears that the PAs are not making major adjustments to the 2011 Plan goals (through the MTMs) solely because they have not identified the planned outside program funding (i.e., they are not making major adjustments in savings goals just because they have not identified

[7] There are negative numbers in the "other funding" column for some gas PAs -- but it appears that there are no proposals on the gas side that assume any level of outside program funding for 2011 in the MTMs.

or secured the planned level of outside program funding for 2011). This is a part of the PAs' positive commitment to the savings goals.

However, in the MTMs filed on October 29, the PAs did not describe the impact of lower outside program funding on the budgets, and on the EERF and gas collections from customers. The overall impacts on the 2011 budget and EERF are estimated by the Consultants to be about as much as the outside program funding in the original Plan ($60 M electric, $12 M gas) -- to be confirmed by the PAs in response to the following question we have asked of the PAs:
"What are the increases in EERF and gas collections from ratepayers in the MTMs, compared to the original 2011 Plans, since the PAs (except for CLC) are assuming zero outside program funding in the MTMs?"

The DPU requested similar information, which the PAs filed on Monday, November 15. In the November 15 filings, the PAs estimated the bill impacts for the "worst case" situation in which there would be zero outside program funding secured for 2011. Therefore these PA filings indicate the maximum bill impacts resulting from zero outside program funding, and they should be consistent with the estimate the Consultants provided above – i.e., the statewide bill impacts in the PA analysis will be equivalent to the outside program funding for 2011 in the original Plan (about $60 M electric, $12 M gas) since the PAs (except for CLC) are planning zero outside program funding in their MTM filings. These PA filings represent the worst case situation, and any outside program funding secured for 2011 would reduce the bill impacts and the EERF/gas collection amounts shown in the November 15 filings. ***The Consultants continue to recommend that the PAs should aggressively pursue other program funding in 2011***.

It appears in the filed MTMs that the PAs used, for the purposes of the performance incentive metrics (see the tables in the PA MTM Exhibit D, Attachment 2), the prior levels (DPU approved in January 2010) of outside program funding ($60 M electric, $12 M gas) and outside financing capital ($40 M electric, $8 M gas), for a total of $100 M electric and $20 M gas of outside funding for 2011. The inclusion of the outside program funding levels in the original Plan appears to be done solely for the performance incentive metrics, and there do not appear to be any other PA commitments to these levels elsewhere in the 2011 MTMs (except for CLC).[8]

Further, in the 2011 MTM filings the PAs stated (Exhibit D, Attachment 2, Appendix A, for All Sector Metrics):
"The Program Administrators will revisit and review the appropriate level of targets (threshold, design and exemplary) for the other funding metric with the Council based upon current circumstances, including without limitation reviewing the ability of the Program Administrators to consider ARRA funding of low-income efforts as part of the qualifying funding of this metric, with a goal of presenting updated revised values that better reflect current circumstances after the Council's November meeting."

[8] CLC does not receive performance incentives so the CLC MTM filing does not affect the performance incentive MTM filings of the other PAs.

These discussions between the PAs and the Council and its Consultants are ongoing at this time.

C – F. Introduction

Sections C through F address separate but related topics associated with data that are used to inform the development of the energy efficiency plans and the reported results that are used for public reporting of savings, recovery of performance incentives and LBR, and program planning and benefit/cost screening for the next cycle of program plans. The sections present the Consultants' technical review of the topics and seek also to address practicalities that can facilitate the efficient and appropriate application and use of the various data discussed in these sections.

C. Technical Reference Manual and related data issues including inputs to screening runs

The 2011 Plan Version of the *Massachusetts Technical Reference Manual* (TRM) generally meets the objectives of consistency, reliability, and transparency in the process of calculating the savings of efficiency measures. ***The Consultants recommend that the Council seek specific revisions to the 2011 Plan Version TRM (see Section III.D. below), and the 2011 Report Version TRM (for actual reported savings) and the 2012 Plan Version of the TRM, as detailed in Appendix E***.

The 2011 Plan Version of the *Massachusetts Technical Reference Manual* (TRM) was developed to document how the PAs calculate savings for residential and C&I sector prescriptive measures, covering methods, formulas and default assumptions for estimating energy, peak demand and other impacts from efficiency measures. The TRM is intended to make the process of accounting for efficiency costs and savings consistent, reliable and transparent. In most respects this inaugural version of the TRM successfully meets those objectives, and represents an impressive step forward in aligning all PAs.

The completion date of the final draft version of the TRM by the PAs was close to the filing deadline, and as such, it was not feasible for the Consultants and other stakeholders to provide the PAs with a detailed review and feedback of the final draft. While earlier drafts afforded some opportunity for real-time feedback resulting in some modifications, some issues remain for clarification and/or correction. This initial list of issues (see Appendix E) includes items that don't appear to fully achieve the objectives of consistency, reliability and transparency.

Examples include:

- Consistency: On gross demand impact values and coincidence factors, there appears to be inconsistent presentation and description of gross demand savings values. In some cases the demand values are coincident impacts, in others they are the maximum connected kW reduction.
- Reliability: There are some questionable assumptions for some reference baseline efficiencies, and lifetime savings, e.g., for compact fluorescent lamps and full early-retirement savings for Low Income Refrigerator and Freezer replacement.

- Transparency: Multiple instances of assumptions that are lacking any citation, or which reference dated source materials.

Most of these issues will have relatively minor impacts on the goal of accurately tracking savings from efficiency measures. However, we believe the PAs' assumptions for some of the net-to-gross factors (free ridership and spillover) have a strong potential to significantly overstate the efficiency savings. This issue is important enough that we address it separately in the following section.

As referenced in the 2011 Plan Version TRM, a process to update the document leading up to the 2012 Plan Version will require on-going efforts, with these updates potentially including corrections to the 2011 Plan version, additions/removal of measures, updates to impact factors (e.g., due to new impact evaluation studies), and updates to the glossary and other background material included in the TRM. It is anticipated that the Consultant team will continue to support this process by working with the TRM Coordinating Committee or its equivalent.[9]

D. Net-to-Gross ratios for determining net savings

We recommend that the Council indicate to the PAs that it is a high Council priority that the PAs revise their assumptions in the 2011 Plan Version TRM for Net-To-Gross Ratios (NGTRs) for natural gas prescriptive measures where no directly applicable evaluation study has been done. We recommend adopting values of 90% for C&I prescriptive measures, and 80% for residential prescriptive measures, which we believe constitute a reasonable minimum for adjusting savings downward due to the expected impacts of free ridership and spillover. The revised values should be used for all 2011 planning and screening, in order to avoid having to significantly adjust tracked savings downward for actual reported 2011 savings. That risk is one the PAs may choose to accept, recognizing that timely evaluation results (Net-to-Gross studies) will update those planning values with field-derived and current values. We also recommend that the Council request the DPU to require such modifications. By our analysis, total natural gas savings due to natural gas programs will be reduced by 9.6% if these NTGRs are applied.

Net-to-Gross Ratios incorporate the effects of free ridership and spillover in order to determine the net savings from the installation of efficiency measures. The TRM identifies the NTGRs to be used for each measure within each program. There are a number of issues related to the NTGRs that we believe should be addressed in the 2011 MTM plans, and in future versions of the TRM, as described in this section.

The most significant issue is the PAs' assumption that if no evaluation study has been performed to determine net-to-gross impacts for a particular measure or program, then the NTGRs are presumed to be 100%. We find this to be problematic in several respects. First, our professional experience and judgment leads us to believe that for most measures the NTGR will be significantly lower than 100% when an evaluation is performed. The body of evaluation results both from other types of programs in Massachusetts and from similar types

[9] The 2011 Plan Version TRM proposes establishment of a TRM Coordinating Committee, with representation from the PAs and DOER, to provide the necessary coordination of ongoing updates to the TRM.

of programs in other states suggests that NTGRs this high are relatively rare, even when spillover is included. We do not believe that spillover and free ridership tend to cancel each other out, and do not view them as such in the absence of empirical evidence to that effect (free ridership almost always exists, whereas spillover is a more uncertain effect). For example, the two most recent statewide studies of residential NTGRs have yielded estimates of about 40% for lighting and 35% to 40% for high-efficiency heating equipment.[10]

In the absence of specific impact evaluation data, we recommend use of default NTGRs of 80% for residential measures and 90% for C&I measures. We believe that when evaluation studies are performed for those measures and programs they are likely to reduce overall savings more than these default values. However, use of these default values will serve to better estimate realistic efficiency savings, and will decrease the adjustment of tracked savings to actual savings when evaluation data become available.

Most of the electric efficiency measures have NTGRs that are based on either evaluation data or negotiated values. However, except for the residential high-efficiency heating equipment, all natural gas measures have NTGRs of 100%. For the 2011 Plan Version TRM we therefore recommend that the recommended default NTGRs be applied only to the natural gas measures, as noted in the first paragraph of this section.[11] [12]

Regarding the plan for future impact evaluation studies for determining and updating NTGRs, see the section below on 2011 EM&V Plan and Schedule.

Another issue is that some of the electric NTGR assumptions appear to be based on studies that are so old as to be essentially irrelevant. For example, the assumptions for MassSAVE appear to be based on a study from 2004. For such measures we recommend either performing new impact evaluation studies if feasible (per the EM&V plan and schedule), or consideration of using the default NTGR values recommended above until EM&V results can supplant them.

[10] As EM&V oversight specialists, the members of the EEAC consultants EM&V team have been involved collectively in at least 1,000 NTGR studies over the course of the past 25 years, covering virtually every type of program and spanning a majority of the states that have been active in energy efficiency. Our recommended NTGR assumptions are based in large part on this broad experience. Because there are many factors bearing on the transferability of any one study result, we do not individual studies from other states here. In general, however, our experience has been that: (1) the vast majority of NTGR evaluations produce NTGR results lower than 100%, regardless of how comprehensive they are in including spillover effects; (2) for the types of residential programs for which the PAs are currently proposing 100% NTGRs, study results in other states have generally tended to yield somewhat lower NTGRs than for C&I programs.

[11] We applied a NTGR of 100% for the behavioral measures since our understanding is that OPOWER's tracking methodology estimates net savings directly. We believe the NTGR is not actually 100%, but that is an appropriate factor given OPOWER's tracking methodology. For behavioral programs with different tracking and impact evaluation methodologies, a lower NTGR would be expected.

[12] We acknowledge that the PAs have authority from the DPU to use gas NTGR assumptions of 100% for 2010 for purposes of incentives and lost base revenues (LBRs). However we do not believe this extends to using NTGR assumptions of 100% for purposes of other applications such as program planning. This is further discussed in the section below on application of EM&V results to claimed results.

Many of the NTGRs differ between PAs for the same measure, due to having separate impact evaluations. This is understandable, but in some cases we believe one PA's evaluation results are more comprehensive and/or up-to-date, and would recommend adoption of the more reliable NTGRs in such cases. However, these differences will be eliminated over time as statewide evaluations are performed.

Some additional, more specific issues related to NTGRs are identified in the detailed TRM review comments in Appendix E.

E. 2011 EM&V plan and schedule

We recommend that the Council accept most of the EM&V plan in its current form and indicate that it is a high Council priority that specific deadlines be set for the completion and application of research on net-to-gross ratios, specifying that in each major customer sector (residential and non-residential) net-to-gross assumptions used in the 2011 Plans that account for at least 80% of total statewide claimed savings be updated based on timely, defensible empirical research no later than mid-June for both electric and gas, in time to inform the 2010 annual reports[13], the 2012 MTM planning process, and the 2012 TRM Plan version.[14]. The Consultants also recommend that the Council request the DPU to require such modifications to the EM&V plan and the application of results, and that the schedule for both be strictly adhered to.

The EEAC Consultants have worked closely with the PAs both in developing the EM&V plan and in developing and overseeing the numerous studies discussed in the EM&V plan. In many respects, the EM&V plan is a consensus document. However, midway through the EM&V plan development process, it became clear that there were significant differences between the views and intentions of the PAs and the EEAC Consultants regarding one major issue addressed in the plan: the scope and pace of future research intended to confirm or revise assumptions regarding net-to-gross ratios (NTGRs). We attempted to resolve this issue prior to the PAs filed their plans with the DPU, but were unable to do so. As a result, we believe the EM&V plan fails to commit to an acceptable schedule for studying and updating NTGRs.

Under the terms of the EM&V resolution adopted by the Council in September 2009 and subsequently accepted by the DPU, the Council agreed to assume an oversight role for EM&V activities, with the EEAC Consultants serving as its agents. The EM&V resolution specified that

[13] We recommend that gas NTGR research be completed along with electric in time to inform the 2010 annual reports because, although the gas performance incentives are to be based on deemed savings values for 2010, we believe it is important that public reporting of gas savings be based on EM&V-adjusted results, with performance incentive calculations being presented secondarily. This issue is discussed in more detail in the next section of this report.

[14] Given the process for revision of savings assumptions laid out in the proposed 2011 Plan Version TRM, the 2012 plan version of the TRM is chronologically the first milestone at which EM&V results can be applied to post-2010 program years. The first milestone at which EM&V results can be applied to program year 2011will be the 2011 annual report version of the TRM, which comes after the 2012 plan version of the TRM chronologically despite the fact that it bears on an earlier program year.

"While 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 PA evaluation staff, authority for decision-making will reside with the EEAC or its Designee."

Given this agreed-upon shift in the decision-making process – and therefore accountability – for EM&V, we view the fact that the EM&V plan fails to commit to an appropriate schedule for NTGR studies with some concern.

1. The Issue

The standard practice for electric programs in Massachusetts for some time has been to have a distinct NTGR assumption for each measure or measure group. This assumption is then either confirmed or updated through EM&V.[15]

Until recently, in large part because until 2010 the gas programs were infrequently if ever evaluated, gas programs have generally assumed a NTGR of 100%. However, the DPU order regarding the three-year gas plans required gas PAs to begin studying NTGRs. What other actions the DPU required the gas PAs to take regarding NTGRs is an issue over which there are some important differences in interpretation, which are discussed in the section of this report on application of gas EM&V results.

Our concern regarding the handling of NTGRs in the EM&V plan is that the PAs have been too slow to research and update the NTGRs for certain key categories of programs, and the EM&V plan reflects an intention to continue this pattern. At the same time, as discussed elsewhere in our comments, the PAs have proposed NTGR values for inclusion in the Technical Reference Manual (TRM) that we believe are in many cases both poorly supported and much too optimistic. The combined effect of these two issues is that the PAs are making aggressive (optimistic) planning assumptions regarding the percentage of observed gross savings that will be attributable to their programs, yet are refusing to accept a suitable degree of accountability for confirming or disconfirming these assumptions in a timely manner. *If these issues are not dealt with effectively, as we propose, we believe the credibility and reliability of the PAs' savings claims for 2010 and planned savings for 2011 are in serious jeopardy* At least as important, inadequate or too-slow attention to evaluating NTGRs, coupled with optimistic NTGR planning assumptions, may have the following programming and policy consequences:

- The PAs may have limited near-term incentive to generate the program innovations, and find the new sources of savings, that ultimately prove necessary to offset lower-than-expected NTGRs. Such program improvements generally take time to accomplish, and the later the PAs begin seeking them, the longer it will take for them to yield results.

[15] A variety of methods can be used to determine NTGRs, including participant self-reports, vendor self-reports, analysis of sales data, and quasi-experimental comparisons of the program area with one or more non-program areas.

- Achieving long-term savings goals may thus become difficult, as evidence of low NTGRs becomes available too late to make the program changes needed to redress the resulting savings shortfall.
- Programs may get out of tune with the markets they are targeting and/or to misallocation of resources, as happens when PAs continue heavily promoting measures that have reached a high and stable market share, causing the NTGR to decrease to an unacceptably low level.

While the PAs have argued that they ultimately bear the risk for any savings shortfalls due to disappointing NTGR results, we believe this is not really true. First, the programming- and policy-related risks discussed above generally affect a wide range of parties, including ratepayers. Second, from a savings reporting perspective, while it is correct that there are true-up mechanisms in place, in some cases overly slow progress towards the updating of NTGR assumptions has the potential to prevent these mechanisms from being brought to bear. For example, if the bulk of electric NTGRs are not updated in time for the 2010 annual reports, as we are recommending, the 2010 electric savings for which the PAs are ultimately credited for purposes of performance incentives will end up being based largely on outdated and/or untested assumptions, exposing ratepayers to unnecessary risks for those programs for which the NTGR has not been updated.

2. The History

Estimation of NTGRs has long been a core EM&V activity for electric C&I programs, as well as for residential lighting. However, on the gas side the PAs have historically assumed NTGRs of 100% for most measures. On the residential electric side, the bulk of the effort to evaluate NTGRs has been dedicated to lighting, which until recently accounted for the great majority of total claimed savings.

The first set of 2010-2011 EM&V studies, now in progress, has largely continued this historic pattern, once again focusing the bulk of NTGR analysis on C&I programs and on residential lighting. One significant change is that a C&I NTGR study has been planned for early 2011 that is intended to cover both electric and gas measures using a new standardized methodology, which is being developed in a 2010-2011 study. However, the 2010-2011 studies once again include few efforts to update NTGR assumptions for residential non-lighting measures. The EEAC Consultants accepted this because we believed most of the relevant programs were in a state of flux in the first half of 2010, making it more critical to perform timely process evaluations intended to provide feedback on how program changes were faring. However, we always intended to introduce more NTGR studies as part of the second round of studies to be initiated in early 2011.

Recent events, however, have made clear that there are significant differences of opinion between the PAs and the EEAC Consultants regarding the urgency of addressing NTGRs for residential non-lighting measures. Attempts on our part to introduce systemic commitments regarding the timing of such studies into the 2011-2012 EM&V plan have met with resistance, as have some attempts we have made to work NTGR research where

appropriate into the first round of studies in 2010-2011. Meanwhile, the PAs have rebuffed our proposals to introduce more caution into the NTGR assumptions proposed for the TRM.

Our concern over the PAs' reluctance to perform timely research into NTGRs for residential non-lighting measures is heightened by the results of those few NTGR studies that have been done in the residential sector in recent years. Two major residential NTGR studies have been completed recently, involving residential lighting and the gas High Efficiency Heating and Water Heating Equipment (HEHE) program. Both studies yielded estimated NTGRs much lower than had previously been assumed, leading to significant changes in program design in order to maintain forecasted savings levels and/or cost-effectiveness. We are concerned that these results may be suggestive of the kind of results that may lie in wait for some of the residential non-lighting measures that have not yet been studied, and that with every month that goes by needed changes to program design may be going unmade.

Late in the process of developing the 2011-2012 EM&V plan, we proposed to resolve the issue of the pace of NTGR research for non-lighting residential measures by adding language to the plan that would commit to updating NTGR assumptions accounting for the bulk of residential claimed savings in time for the 2010 annual reports for electric and the 2012 TRM plan version for gas. Our intention in making this proposal was to ensure that needed NTGR research proceeds in a timely manner, while still leaving flexibility to prioritize those measures accounting for the largest share of savings. We proposed the specific deadlines we did because our understanding is that these are the first milestones at this point at which NTGR research results can influence the savings to be ultimately claimed by the PAs.[16] However, the PAs declined to adopt such language. Instead the PAs chose to add the following language:

"… Future evaluation will include assessments of net savings from both electric and gas residential retrofit measures, addressing both free ridership and spillover effects. Additionally, pursuant to the directives at pages 124-125 of the Gas Order, the PAs will conduct EM&V studies to account for free ridership and spillover in gas programs so that the results can be applied consistently across Program Administrators and that the information obtained from the studies will be included in their next three-year plans as directed by the Department. The Program Administrators and consulting team will prioritize areas for study based upon the level of savings contributed by various programs and provide updates on these studies in their 2010 and 2011 Annual Reports." (EM&V plan, page 10)

We believe this language is too vague and non-committal, promising only that *some* of the needed research will be done in time for the *2011* annual reports, that the gas PAs will at *some* point do what the three-year gas plan order has clearly directed them to do, and that whatever research is done will be prioritized based on savings. If this language is approved, we anticipate that the PAs will continue to perform needed NTGR much too slowly and infrequently for some key programs, threatening both the reliability of their

[16] Our reasoning in reaching this conclusion is discussed in an earlier section of this report.

savings claims and the effectiveness of their programs in moving the market. We therefore recommend that the Council affirm its interests to the PAs and ask the DPU to institute the more specific requirements, as described in this section and embodied in the recommendations at the beginning of the section. [17]

In discussions with the EEAC Consultants, the PAs have made a number of arguments as to why they should not be held to language such as the above. We briefly note these arguments here (in italics), along with our responses to them.

There are already 55 EM&V studies under way in 2010-2011. We believe that what matters is not the number of studies, but the specific issues being studied and how good a job is being done at studying them. We also note that we have repeatedly suggested that if the EM&V workload is a key concern there are other studies tentatively planned for 2011 that could probably be dropped to make way for needed NTGR research. We have received no response to these suggestions. Lastly, we note that despite their expressed concerns over the amount of research under way, late in the process of developing the plan, the PAs unilaterally added two more studies addressing net savings issues[18] – yet both of these studies represent attempts to find new sources of hitherto unclaimed net savings without any corresponding attention to supporting the many poorly documented and/or optimistic net savings assumptions that already exist.

It is premature to update NTGR assumptions for MassSAVE, which is expected to account for a substantial proportion of residential electric savings, because the program is scheduled to be restructured in late 2011. However and whenever the program is redesigned, there will remain at all times a need for some set of assumptions regarding NTGRs. Our understanding is that the current assumptions are based on a 2004 study – old enough to be essentially irrelevant. Given this fact, we believe that pretty much any legitimate NTGR analysis of the current program configuration would provide more defensible results than the existing assumptions. Another NTGR study could be done in 2012 once the new program configuration is in place. But to do nothing and wait until 2012 to update NTGR assumptions for the first time could well lead to the new program design being out of alignment with current market conditions, not to mention threatening the reliability of PA savings claims for 2010 and 2011.

It is important that NTGR studies address spillover as well as free riding. There is full consensus between the PAs and the EEAC Consultants on this issue, so it does not seem particularly germane to the issue at hand.

June 2010 is too soon to perform the needed research to update residential electric NTGRs. We believe there is time to perform the needed research, if efforts toward this

[17] While our main concern has been progress toward updating residential NTGRs, addressing the non-residential sector as well will ensure that problems do not also emerge there.

[18] Studies of spillover from the gas HEHE program and of savings from gas training events. While we are not fundamentally opposed to these proposed studies, we believe they need to be considered as part of a systematic prioritization of work to update NTGRs. It is not clear to us whether these two studies will rise to the top of such a prioritization.

end begin promptly. The evaluation industry has much experience with residential electric NTGRs, and at this point Massachusetts has substantial technical resources available in the form of standing teams of evaluation contractors covering each research area. However, the longer the delay before the needed research begins, the more difficult it will be to complete it in time.

Should the resolution of this issue be delayed to the point where it is no longer possible to perform the needed research in time, we believe it would become that much more important to revise the gas net-to-gross assumptions proposed by the PAs in the 2011 TRM Plan version. It could also become advisable under such circumstances to revise some of the proposed electric net-to-gross assumptions in that same document.

Alternatively, if specification of the studies and establishment of study completion dates to inform the 2010 annual reports are agreed to by the PAs (which also presumes that the studies would be initiated promptly),the Consultants would be able to recommend that the Council support the PAs use of the NtG values that are now included in their 2011 MTM plans for 2011 planning purposes only. The risk of including what the Consultants believe to be over optimistic savings estimates would rest with the PAs but the backstop would be that the delivered 2011 savings would be adjusted by evaluation results completed with the active support of the PAs.

F. Timing of application of EM&V results to claimed results

The Consultants recommend that the Council indicate to the PAs that it is a high Council priority that program EM&V studies must be conducted as soon as possible and results of all kinds must be applied as soon as available to inform the 2010 annual report filings; for purposes of program planning and benefit/cost screening to inform the 2012 MTM planning process; and to inform the 2012 TRM Plan version to establish, along with other planning inputs, 2012 savings, benefits, and incentive targets, and from which LBR will be calculated. We also recommend that the Council request the DPU to require such modifications to the EM&V plan and the application of results, and that the schedule for both be strictly adhered to.

1. Summary

Our discussions with the PAs in the course of trying to resolve some of the other issues highlighted in this report have made clear that the PAs and the EEAC Consultants have differing understandings of what the DPU required regarding application of gas program EM&V results going forward. There appear to be differences in our understanding of both what the DPU order says and what the implications of the order are. Specifically, we believe the PAs are in error in their apparent interpretation that the Order authorizes the use of deemed savings for planning purposes for any period during the three year plan period.[19]

[19] In early discussions with the PAs it appeared that they interpreted the DPU Order approving the gas three year Plan as authorizing the use of deemed Net-to-Gross values for the entire 2010-2012 Plan period. In more recent discussions we have been persuaded that this is not the PAs' position.

2. Discussion

In their three-year plans, the gas PAs proposed that:

"For the purpose of the incentive calculation, for 2010, savings and benefits will be based on a deemed savings approach, consistent with the October 13th Resolution, which flow from the savings planning assumptions reflected in this Plan. For 2011 and 2012, savings and benefits will be based on EM&V results, as reported in each Program Administrator's Energy Efficiency Annual Report submitted to the Department each summer. However, the impact of any resulting change as a result of the application of EM&V findings that either increases or decreases preliminary year-end results (*i.e.*, results that are based on the planning assumptions used to derive goals for the year) at the individual Program Administrator sector level will be limited to +/- 25%." 2010 – 2012 Massachusetts Joint Statewide Three-Year Gas Energy Efficiency Plan, pp. 267-268.

The PAs infer from the fact that the DPU approved the three-year gas plans without objecting to this language that the DPU approved the above proposal. We agree with this interpretation. However, the PAs appear to go well beyond applying the content of this section only to performance incentives (which introduces the paragraph and bounds its application), and conclude that the DPU more broadly authorized the use of deemed savings values for *all applications of the data* (not just determination of performance incentives). Further, in the case of net-to-gross assumptions, the PAs appear to conclude that the DPU authorized the use of deemed savings values for the *entire three-year period*, not just 2010. It is these interpretations with which we disagree. As the PAs' interpretation of the order appears to underlie their positions on some of the other issues discussed in this report, we believe it is important to clarify these issues.

The PAs' apparent assumption that there is no need to update any gas savings assumptions until program year 2011 appears to be based solely on the fact that the DPU approved the gas three-year plans without commenting on the language above. However, we note that the proposal regarding application of EM&V results in the three-year plans (and in a closely related EEAC resolution) was specifically limited to the application of EM&V results to shareholder incentives and goal attainment. *The language did not address other applications of EM&V results, such as public reporting of savings, program planning, and benefit/cost screening.* We believe it is critical to recognize this distinction.

Program Planning and Benefit/Cost Screening

To continue to shape program planning activities around the savings assumptions contained in their initial three-year gas plans, even as EM&V evidence may be accumulating that these assumptions were inaccurate, would have the potential to severely distort programming efforts and lead to unnecessary misallocation of resources. This threat is particularly immediate in the case of assumed net-to-gross ratios, as illustrated by the aftermath of the recently completed evaluation of the High Efficiency Home Equipment (HEHE) program, which found much lower net-to-gross ratios than had hitherto been assumed. To their credit, the PAs immediately recognized that this implied that key components of the program were not actually cost-effective, and they quickly revised the program accordingly. We believe it is important that the PAs both undertake EM&V studies in a timely way and quickly incorporate EM&V results into their program

planning efforts, as soon as those results are available, regardless of when EM&V results are applied for purposes of performance incentives.

Public Reporting of Savings

While the DPU gas order endorsed basing gas performance incentives on deemed savings values, it does not follow that deemed savings values should form the basis for the core public reporting of savings accomplishments contained in the annual reports' primary savings tables. All that is necessary is that the annual reports include the information necessary for the DPU to verify the savings being claimed for performance incentive purposes. A key downside of treating the unadjusted results based on deemed savings as the basis for public reporting of savings accomplishments is that this could result in a steadily increasing gap between what is being reported to the public and what the EM&V studies are actually finding, leading to public credibility issues.[20] For this reason, we recommend that the primary savings tables in the 2010-2012 annual reports be based on EM&V-adjusted results, with the savings associated with performance incentives being reported in a new, secondary set of tables.

G. Performance incentive model and components

The EEAC Consultants discussed 2011 performance incentives and metrics extensively with the PAs, and proposed some improvements and alternatives. The PAs and the EEAC Consultants were not able to reach full agreement on a performance incentive package to recommend to the Council. ***The Consultants recommend that the Council reserve judgment on the performance incentives for 2011 until several issues and concerns regarding performance incentives, discussed below, are addressed.***

Throughout the discussions with the PAs, the three components of the performance incentives were supported by all – i.e., savings (the level of benefits from the programs), net benefits (a measure of cost-efficiency calculated as benefits minus total costs), and the specific performance metrics.

One important area of agreement, and a key improvement, is the basis for the "savings" component of the performance incentive. For 2010, the statewide savings component had been planned based on kWh or therm savings – the only data available at the time the statewide goals were determined by the Council – yet the associated performance incentive for the savings component was allocated to individual PAs and earned based on the dollar value of benefits. This led to several problems in terms of allocating the statewide savings component of the performance incentive to the PAs and related mismatches. The DPU order on the Three-Year Plans required that this problem be addressed. For 2011, the savings component will be planned, allocated to the individual PAs, and earned based on benefits, thereby ensuring internal consistency and resolving the issue.

[20] This issue applies most acutely to the 2010 gas annual reports, given the agreement to base performance incentives on deemed savings for 2010. However, given the 25% performance deadband agreed upon for 2011 and 2012, the issue also applies to the annual reports for those years. Therefore, if deemed savings are made the basis for public reporting of savings, this could lead to steadily increasing discrepancies between the savings that are reported publicly and the savings that are documented by EM&V results, which are also publicly available.

While the Consultants were able to reach agreement (for recommendation to the Council) with the PAs on some aspects of the 2011 performance incentives, and while we can recommend much of the performance incentive package that the PAs proposed for 2011, we raise several important concerns and provide alternative recommendations below.

One overarching disagreement impacts several of the performance incentive issues. The Council in its December 15, 2009 resolution recommended several principles for performance incentives be applied for 2010-2012. However, in the same resolution the Council stated:
"…the specific mechanical application of these principles to 2011 and 2012 (including, without limitation, the development of the allocation of dollar amounts to low-income metrics) be addressed, first with the Council and then with the DPU, either in any mid-course adjustment process in 2010 (and any associated EEAC and DPU filings) or in stand-alone performance incentive filings (which would include applicable performance metrics) in October of 2010 (for 2011 performance incentives) and October 2011 (for 2012 performance incentives). It is important to consider the application of the performance incentive mechanism for 2011 and 2012 only when any updated information on savings, benefits, and costs is available."
The Council clearly recommended the specific 2010 performance incentives and the detailed application of the principles for 2010 only, and not for the other two years of the Three-Year Plans.

The PAs appear to believe that the DPU adopted the performance incentives and more details of the performance incentive mechanism for all three years. The Consultants do not agree with the PAs' views on this subject. The Consultants provide comments and recommendations on all relevant performance incentives issues for 2011 below, consistent with the Council's resolution and its direction.

The following table summarizes the 2010 performance incentives, the EEAC Consultant recommendation for 2011, and the PAs' proposal for 2011. The three main components of the performance incentives are maintained.

Below are the performance incentive concerns and issues that we have not resolved with the PAs to date.

1. In order to achieve the Commonwealth's energy, economic, and environmental objectives, we recommend that the PAs should be focused on achieving annual energy savings (kWh and therms), lifetime energy savings, total benefits (i.e., the dollar value of total economic benefits, which include the electric and gas energy savings as well as oil, water, and other benefits), and net benefits. Currently the total performance incentive level for 2011 is determined and based solely on the annual savings targets (one of the four important expected achievements above),[21] which could result in less

[21] Note that it was not possible to use total benefits to set the total performance incentive levels in early October 2009 for the Three-Year Plans when the Council was considering goals/targets and performance incentive levels, because the benefits numbers were not adequately available to the Council and its Consultants at that time. To determine

focus on the other important expected achievements of lifetime savings, total benefits, and net benefits.[22] While some of the performance incentive components are based on total benefits (savings) and net benefits (value), these apply only to the *implementation* of the incentive mechanism and the actual earnings, and not to the *determination* of the total performance incentive level.

To address this situation, we recommend that:

- The PAs should be expected to achieve all of the goals of the Three-Year Plans, especially the total benefits, because benefits represent lifetime savings (and not just first year savings) and capture the economic benefits from other fuel savings and non-energy benefits.
- In the future, the Council and DPU should consider whether the planned level of the total performance incentive should be based on total benefits rather than or in addition to annual energy savings. If total benefits were used to determine the total performance incentive level in the plan, then if the benefits planned by the PAs were lower than the EEAC targets or the DPU-approved levels, the total performance incentive would also be lower commensurately.

2. The weights of the three components of the performance incentives (savings, value, and performance metrics) should be revised as shown in the middle/Consultant columns of the table, to ensure adequate funding for the performance metrics, and in particular to ensure adequate funding for the new metric on cost-efficiency of program expenditures.

   In order to focus adequate attention on program and ratepayer expenditures, the Consultants proposed and the PAs agreed to a new performance metric on cost-efficiency of program expenditures. This metric is based on program costs rather than total costs (program costs plus the contributions from participating customers). [23]

   While we were able to reach agreement on the metric, the Consultants recommend that the new cost-efficiency of program expenditures metric should have an adequate (higher) incentive level, at or close to 10% of the total performance incentive amount.

goals and performance incentive levels, annual savings (kWh and therms) numbers were used as the best-available proxy for lifetime savings and total benefits at that time.

[22] The PAs propose in the 2011 MTMs that the PAs should be able to earn the full total performance incentive levels, adjusted by MTM-revised kWh and therm annual savings only, for what appear to be MTM-planned total benefits that are lower than the Council-approved and DPU-approved benefits for 2011.

[23] The "value" or net benefits performance incentive component is calculated based on total costs.

2011 Performance Incentives – Electric and Gas

Target Incentive Levels	2010 EEAC		2011 EEAC with Consultant Recommendation		2011 PA Proposals	
Electric	$17.5 million		$22.0 million (PAs should commit to achieve savings and benefits goals)		$21.850 million (based on kWh savings only)	
Gas	$4.0 million		$4.5 million (PAs should commit to achieve savings and benefits goals)		$4.332 million (based on therm savings only)	
Components and Weights	**2010**		**2011 Consultant Recommendations**		**2011 PA Proposals**	
	Weights	**Notes**	**Weights**	**Notes**	**Weights**	**Notes**
Savings	45% Recommended	Based on kWh and therm savings	45%	Based on $ benefits	48.0% Elec 45.8% Gas	Based on $ benefits
Value	35% Recommended		25%	Essentially 35% still on "value" – 25% based on total costs and 10% focused on ratepayer costs through the cost-efficiency metric	33.4% Elec 26.6% Gas	
Performance Metrics	20% Recommended	14 Total approved for electric	30% (20% metrics plus 10% cost-efficiency metric)	12 Total: 1 Cost-efficiency of program/ratepayer $ 2 Outside Funding - Program funding - Financing capital 2 Residential - Deeper savings - HTR mkt segments 3 Low Income 4 C&I - 3 deeper savings - CHP	18.6% Elec 27.6% Gas	12 Total: 3 All Sector - Cost-efficiency of program expenditures - Program funding - Financing capital 2 Residential - Deeper savings - Community outreach 3 Low Income - HTR landlords - New measures - MF inventory 4 C&I - 3 deeper savings - CHP

NSTAR Exhibit D would need to be revised and re-filed as it is not consistent or fully up-to-date with the filings of the other PAs.

While we were able to reduce the total number of performance metrics slightly, down from 14 (electric) to 12, with the intent to proportionally increase the incentive amount per metric, the incentive pool for performance metrics is still too low (and this concern is exacerbated for some sectors by the issue in #4 below). Additional funding for metrics would increase the PA focus on achieving the metrics. The Consultants recommend the component weights shown in the table.

(Note: as part of the process of adjusting the weights of the incentive components, it may be more appropriate to calculate "payout rates" for the savings and value components based on the current and best-available data for 2011, as set forth in the revised 08-50 data tables for 2011, rather than on the 2011 data in the Three-Year Plan, which were used to calculate the 2011 payout rates in the DPU proceeding last winter.)

3. Work remains on the specifications and numerical targets for the performance metrics.

   The PAs and Consultants were able to improve the specification of several performance metrics, including putting greater emphasis on achieving deeper savings. The detailed specification and numerical targets for the performance incentive metrics (particularly for the residential and low income programs) are under discussion. The Consultants do not recommend the PA-proposed metric specifications and targets for all metrics proposed in the PAs' October 29 MTM filings. Also, the PAs and Consultants are continuing discussions on the other program funding electric and gas amounts for 2011, which relate to the other program funding metric (see earlier discussion).

4. The PA method of allocating the metrics incentive pool to sectors results in too little metric funding for some sectors.

   The Consultants raised concerns about the PA approach, in the October 29 MTM filings, of allocating the total metrics pool to the sectors using TRC net benefits. As the Consultants have said previously, we think it is fine and preferred to allocate the metrics to the individual PAs using net benefits -- this is a reasonable approach for allocation to the individual PAs. But we do not believe it is appropriate to allocate the metrics pool of incentive monies to the sectors by net benefits. As the PA filings reveal, allocating the metrics pool to the sectors by net benefits results in much higher incentive amounts for C&I metrics, and much lower incentive amounts for the residential and low income metrics, relative to the allocations of the metrics to the sectors in 2010. The available amounts for low income metrics are particularly low. Since the MTM filings the PAs, LEAN, and the Consultants have discussed this issue and appear to have agreed in concept to an approach that would resolve the concerns, with a revised approach for allocating the metric amounts to sectors and programs (the PAs recently forwarded a draft revised performance incentive package for review, and discussions are ongoing).

H. Performance metrics

The detailed specification and numerical targets for the performance incentive metrics (particularly for the residential and low income programs) are under discussion between the PAs and the Consultants

1. Residential

The residential metrics are not complete, though under active and productive negotiation between the Consultants and the PAs. The five metrics included in the PAs' 2010 plans have been reduced to two, one focusing on deeper savings in the MassSAVE/Weatherization program and the other on Community Outreach. The first metric has been drafted for Mass Save/Weatherization using the deeper savings metric template approved by the DPU for the comparable 2010 metric. Discussions continue on establishing challenging yet attainable savings targets

2. Low-Income

The three low-income metrics that have been proposed by the PAs and LEAN are carry-overs from 2010, with some very minor modification, 1. Hard to Reach Landlord; 2. Best Practices Technical Review of Potential New Measures; and 3. Multi-family Building Inventory. The Consultants and LEAN are working to refine the metrics to make them more challenging and meaningful..

3. C&I

The Consultants worked with the PAs to negotiate a set of four C&I performance metrics for 2011. As in 2010, their focus is to stress the importance of learning how to get deep savings in C&I projects; a depth of savings metric was thus established for each of the three C&I programs. Typically, C&I customers tend to implement only one or two measures at a time. As a result, the PAs have struggled to convince customers to do all cost-effective efficiency measures at once. Because the annual savings goals continue to increase dramatically, the Consultants believe that capturing deep, whole-building savings will be critical to capture high savings goals and sustain these levels of savings long term.

Currently, the PAs have data issues that prevent them from easily merging customer billing data with customer project data. As a result, the PAs were neither able to provide the Consultants with accurate data on the depth of savings they are currently capturing nor the frequency distribution of depth over the participant population. The Consultants have stressed to the PAs the critical nature of this information, their need to be able to track this data on a regular basis, and their need to develop a system as soon as possible to assess performance toward 2010 metrics. That said, given that no current baseline data for 2010 were available, metric targets were developed based on improvements over 2010 verified results, to be determined no later than when the PAs file their 2010 Annual Reports. Targets for Threshold, Design, and Exemplary performance were established as percent improvements over actual 2010 results. Given that the PAs had similar metrics in 2010, the Consultants believe they have focused strongly on meeting these metrics and have done the best they can to capture deep C&I savings. We therefore believe improvements over the PAs' current "best efforts" of 10%-20% would represent a significant and challenging increase.

In addition to the three depth-of-savings metrics, the PAs have agreed to continue a metric targeted at CHP projects. CHP offers significant opportunity for cost-effective savings and capturing deep savings within buildings. Promotion of CHP by electric utilities is a new strategy starting in 2010 and has been encouraged by DOER in its expressed interest in continuing a CHP metric.

I. Pilots

2011 Pilot budgets for NGrid Electric and CLC represent 1.07% and 2.32% respectively of total annual costs without PI. All other PAs 2011 pilot budgets appear to be under the 1.0% cap. NGrid and CLC's pilot proposals and budgets appear to be reasonable and appropriate, and they support the Council's stated priority of encouraging PAs to "develop new creative pilots and build on existing pilots." After review, ***the Consultants recommend to the Council the approval of these pilots and their related budgets.***

Behavioral
There are still no behavioral programs or pilot for the gas-only PAs, NSTAR Electric, or Unitil. Of the electric PAs, only National Grid is claiming savings for non-pilot efforts; CLC's and WMECO's behavioral efforts remain pilots. Neither Unitil nor NSTAR (electric) have any proposed activity in this area. Among the gas PAs, only NSTAR and National Grid have programs.

Deep Energy Retrofit
Berkshire Gas is proposing to eliminate funding for their Deep Energy Retrofit pilots in 2011 and 2012 due to lack of available participants. The funding for the Residential and C&I pilots does not represent a large dollar amount; however such funding does represent a commitment to the exploration of a comprehensive deep energy strategy. It is recognized that there currently is limited interest from customers in deep energy retrofits, which is to be expected with any leading edge energy efficiency approach. ***The Consultants recommend that the Council endorse Berkshire Gas' proposal with the stipulation that, should a viable pilot project appear in their territory, they will consider co-funding it with the applicable electric company.***

HPWH
There are no NSTAR or WMECo funds for 2011 or for 2010-2012 assigned to this pilot. We understand that NSTAR is currently (2010) participating in pilot, but not WMECo. NGrid has 2010 funding for this pilot, but none for 2011, though the majority of the field monitoring will occur in 2011. It is not clear if this cost is included in their proposed RD&D Demonstration Pilot (see below). CLC has three years of funding for the HPWH pilot.

RD&D Demonstration Pilot
We believe that National Grid should have filed a description of what we believe to be a significant new pilot (or program) that deserves serious Council review. We also believe that the nature of the relationship of the parties in the pilot/program, and the manner by which the pilot/program was developed raises policy questions that, if unresolved, could have program impacts that extend beyond the instant case.

This only appears in NGrid's tables and text, although CLC does have a "Technical Development Pilot." We would like to see similar commitment from other PAs to what NGrid has in their filing regarding the exploration of emerging technologies.

In general, the PAs are proceeding with the C&I pilots described in the approved Three Year Plans. In terms of progress, these pilots are found along a continuum towards completion, but we have no reason to believe that any will not completed on schedule or will be abandoned. With the exception below, no PA has proposed or is engaged in any non-approved pilot. PAs are experimenting with minor modifications to existing programs – incentive levels, measure mix, etc . – to improve uptake and/or to lower costs, but none of these rise to the level of pilots or MTMs.

Recently the Consultants and other PA C&I managers become aware that National Grid has developed a "Sustainable Campus Initiative" (SCI). After inquiry, the Consultants were provided with a general two-page description of this effort, which did not contain a budget or timeframe for the SCI. The SCI is described as "a multi-year strategy and implementation program", implying that it is a new program effort. But it also appears to be initially limited to agreements with three private universities in the National Grid service territory. This initial focus is described as "a good way to build momentum for the Initiative and undertake the critical early thinking and practices that could lead to breakthroughs or advances in energy efficiency and sustainability implementation." Later the SCI is described as "…being conceived as a 3 – 4 year, college-based EE innovation demonstration program"; and later still: "National Grid is committed to significantly accelerating energy efficiency on college campuses and the company hopes to develop a model through the Sustainable Campus Initiative that can be utilized by many other schools…" These later three descriptors all give the effort clear attributes of a pilot.

It is our opinion that under either scenario – a new program initiative or as a pilot – a full description of this effort should have been included in the National Grid Mid-Term Modification.

The Consultants are further concerned that National Grid has selected an "organizing partner" – GreenerU – for this effort without competitive solution. Many firms purport to offer efficiency services to the college and university sector, and a review of material provided and an examination of the GreenerU website does not reveal that this firm has any notable experience or unique skills in this market that would qualify it for a noncompetitive arrangement with any PA.

In the case of National Grid, our concern is heightened because we are aware that National Grid has an ownership share in GreenerU. We are of the opinion that when a Program Administrator assigns ratepayer funds to a pilot or program where a partner firm in that effort has a financial relationship with that Program Administrator, particularly when the partnership has been formed and the pilot developed without open and public competition, the Council should be provided with some notification and justification for such unique circumstances.

J. Variation of key indicators across PAs and between the Three-Year Plan and the MTMs

Through review and analysis of the PAs' MTM filing data, the Consultants have noted numerous instances of numbers/data which would be expected to be reasonably consistent across PAs, but which instead are found within large ranges across PAs. Three primary themes appear to underlie these differences:

1. Inconsistencies in planning numbers and methodologies across the PAs

While there may be valid reasons for some or many of the number differences, they are generally not apparent in the MTM supporting materials. The Consultants have requested clarifying information from the PAs on many of the variances. It is recommended that significant data differences be explored, explained, and addressed, as appropriate.

2. Lack of coordinated planning across the PAs

The PAs are generally working well together to implement consistent programs across the state. However many PA-specific variations do exist, particularly with regard to program planning. These variations in planning assumptions and data have resulted in the inconsistencies noted above. Addressing these has the potential both to impact overall savings in a positive way and to offer opportunities to identify further ways to increase program efficiencies.

3. Need to more accurately account for shifting baselines and future impacts

It is important for PA planning to account for upcoming changes in baselines (e.g. codes) and future impacts (e.g. Federal standards, evolving technology). Anticipating and accounting for known future factors that will impact program savings is important for developing the most accurate program savings assumptions. An example of this was presented in Section II D3, related to assumed CFL lifetime savings from the residential Lighting program.

Examples of planning data variances across PAs that have significant potential to impact program savings include the following. See Appendix D for more program-specific data, information, and analysis.

- Lighting: CFL per household numbers vary from 1.24 to 2.54 among the PAs. Bringing all PAs up to the statewide average would result in increased program savings.
- Appliances: There are very different measure mixes being used across the PAs, as evidenced by the relative weights of refrigerator & freezer recycling (between 20% and 60% of individual PA program savings goals).
- Residential New Construction: Projected gas MMBTU savings vary among PAs by a factor of 3.
- Multifamily electric: The percentage of program savings from lighting varies by PA from 17% to 84%, and CFLs installed per participant vary from 5 to 12.

The Consultants believe that it is important to minimize such apparent anomalies in the future and improve program planning across the PAs in support of common statewide planning, program design, implementation, and reporting. ***We thus recommend that the Council advise the PAs to undertake a greater amount of common program planning, using consistent assumptions, methods, and data, to support enhanced statewide planning and delivery of programs to customers, and meet, at the appropriate time in the MTM development process, to examine and address differences that are known from prior filings (such as this one) or observed as the MTMs are developed.***

IV. Appendices

Appendix A **DPU 08-50 Guidelines on MTMs**
Appendix B **Analysis of 2011 Mid-Term Modification Data Provided by the PAs**
Appendix C-1 **Electric PA MTM summary**
Appendix C-2 **Gas PA MTM Summary**
Appendix D **Program Specific Variance Data**
Appendix E **Review of the PAs' Draft 2011 Plan Version TRM**

Appendix A

DPU 08-50 Guidelines on MTMs

DPU Guidelines on MTMs

In Docket 08-50-B the DPU issued *Guidelines for the Methods and Procedures for the Evaluation and Approval of Energy Efficiency Plans and Energy Efficiency Reports*. A section of those guidelines address Mid-Term Modifications:

3.8 Mid-Term Modifications
3.8.1 A Program Administrator that seeks to make significant modifications to its Energy Efficiency Plan, as defined below, shall submit its proposed modifications for review and approval by the Department as part of its Energy Efficiency Annual Report filing.

3.8.2 A modification is deemed to be significant if it would result in: (a) the addition of a new Energy Efficiency Program or the termination of an existing Energy Efficiency Program; (b) a change in an Energy Efficiency Program budget of greater than 20 percent; (c) an Energy Efficiency Program modification that leads to an adjustment in savings goals that is greater than 20 percent; or (d) an Energy Efficiency Program modification that leads to a change in performance incentives of greater than 20 percent.

3.8.3 A Program Administrator that seeks to make significant modifications to its Energy Efficiency Plan must submit the proposed modifications to the Council for its review prior to submitting such proposed modifications to the Department.

3.8.4 Any request by a Program Administrator for approval of significant modifications to its Energy Efficiency Plan must be accompanied by: (a) sufficient justification for why the proposed modification is appropriate; and (b) the results of the Council's review of the proposed modification.

3.8.5 During the term of its Energy Efficiency Plan, a Program Administrator may propose changes to its Energy Efficiency Program planning assumptions or the types of costs and benefits to be included in its cost-effectiveness analysis when evaluating its Energy Efficiency Programs. Any such proposal shall first be presented to the Council for approval. The Department will then consider such proposals as part of its review of the Energy Efficiency Annual Reports. Any such proposals that are accepted by the Department can be applied to future plan years.

Appendix B

Analysis of 2011 Mid-Term Modification Data Provided by the PAs

Analysis of 2011 Mid-Term Modification Data Provided by the PAs

EEAC Consultants; December 10, 2010

Savings, Benefits, Costs, and Net Benefits

As part of the analysis of the PA-proposed 2011 Mid-Term Modifications (MTMs), the Consultants reviewed the MTM data on savings, benefits, costs, and net benefits, and we compared the MTM values to the DPU-approved 2011 values in the original Three-Year Plans. Below are the charts with data for statewide and individual PAs.

These charts are intended as visual summaries of key data, analysis, and comparisons related to the PA-proposed 2011 MTMs, for easy reference. The Consultants did not provide written commentary on each of the charts as the charts are intended to be visual summaries of the factual data provided by the PAs.

The first set of attached charts summarize the 2011 benefits, costs, and net benefits, for the 2011 program year and also for the 2010-2012 Three-Year Plan period. (Other charts later in this Appendix summarize annual and lifetime savings.)

After the initial electric and gas summary charts, the next section includes of charts for the electric programs, followed by a section for gas programs.

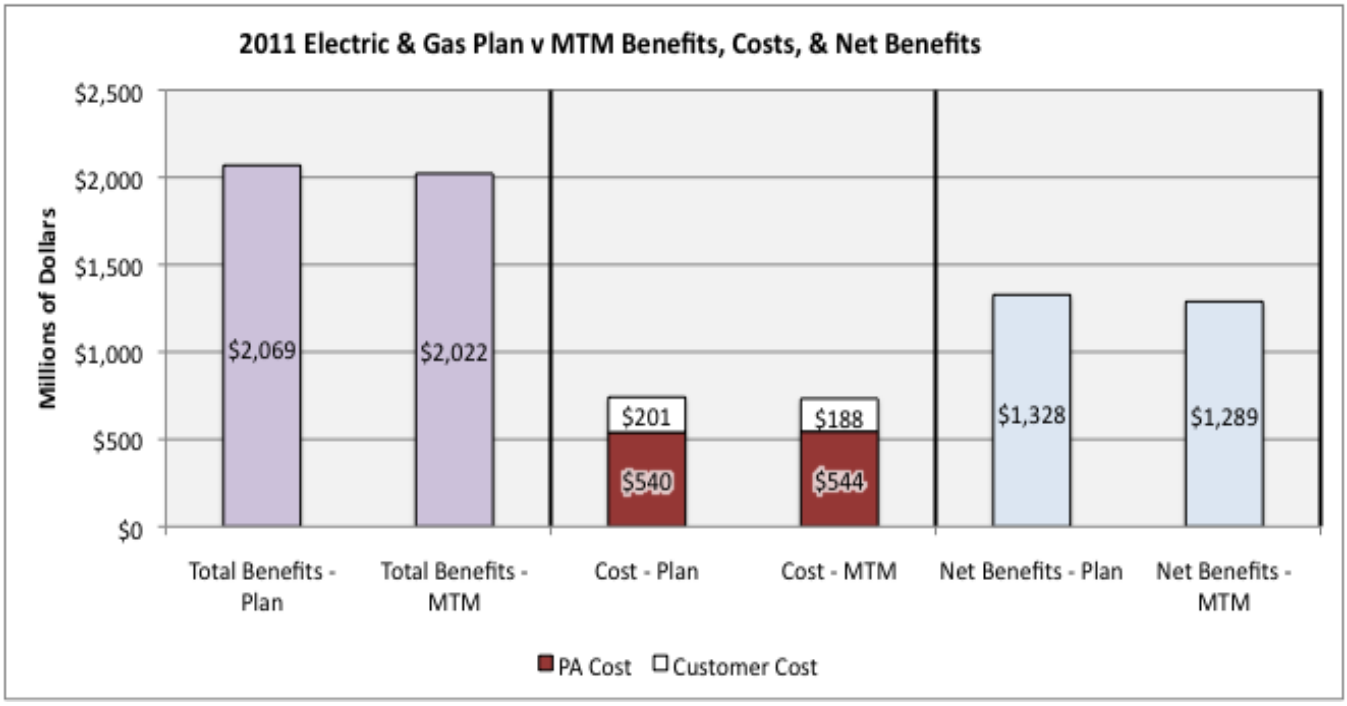
There are some significant variations in the revisions the individual PAs proposed for 2011 and the effects of those revisions on the MTM data that represent the 2011 programs, for both electric and gas programs. See the variance charts that show the statewide variance values as well as variance values for individual PAs.

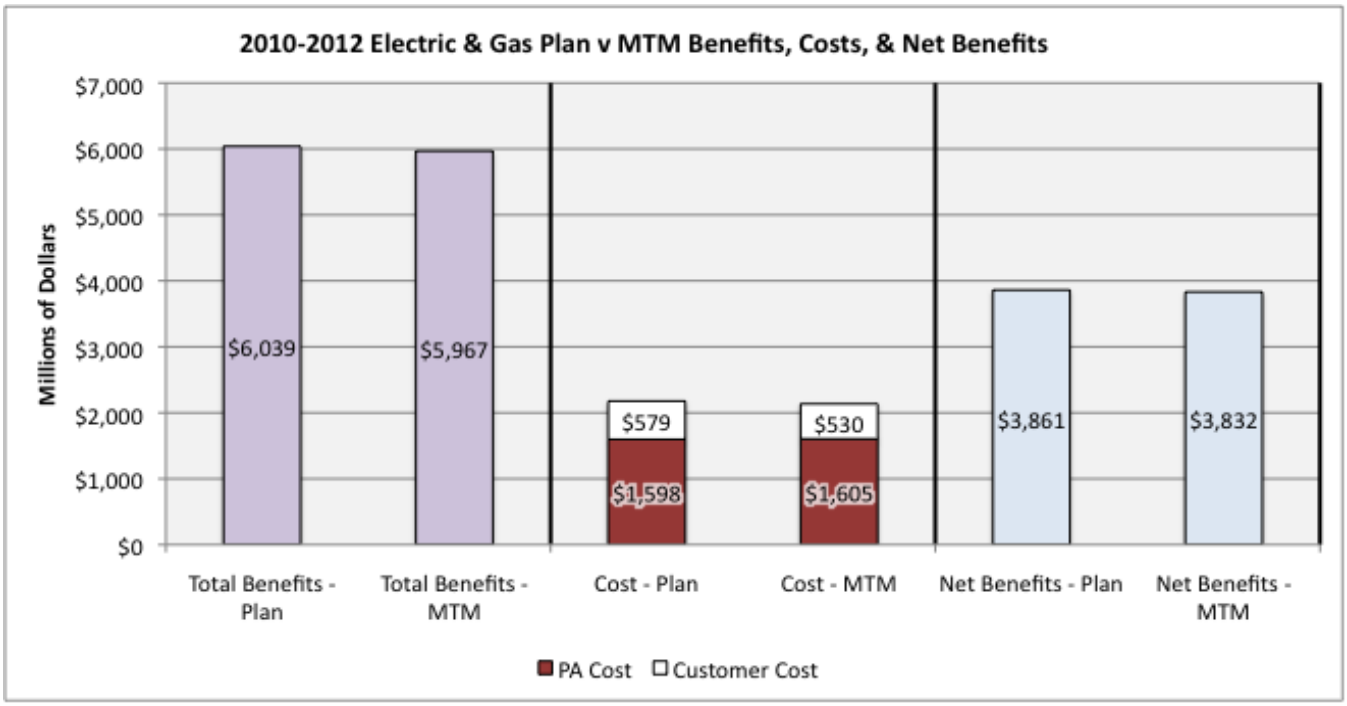
Other charts summarize annual savings, lifetime savings, total benefits, and net benefits, for the original Plan vs. the MTMs, for the electric and gas programs.

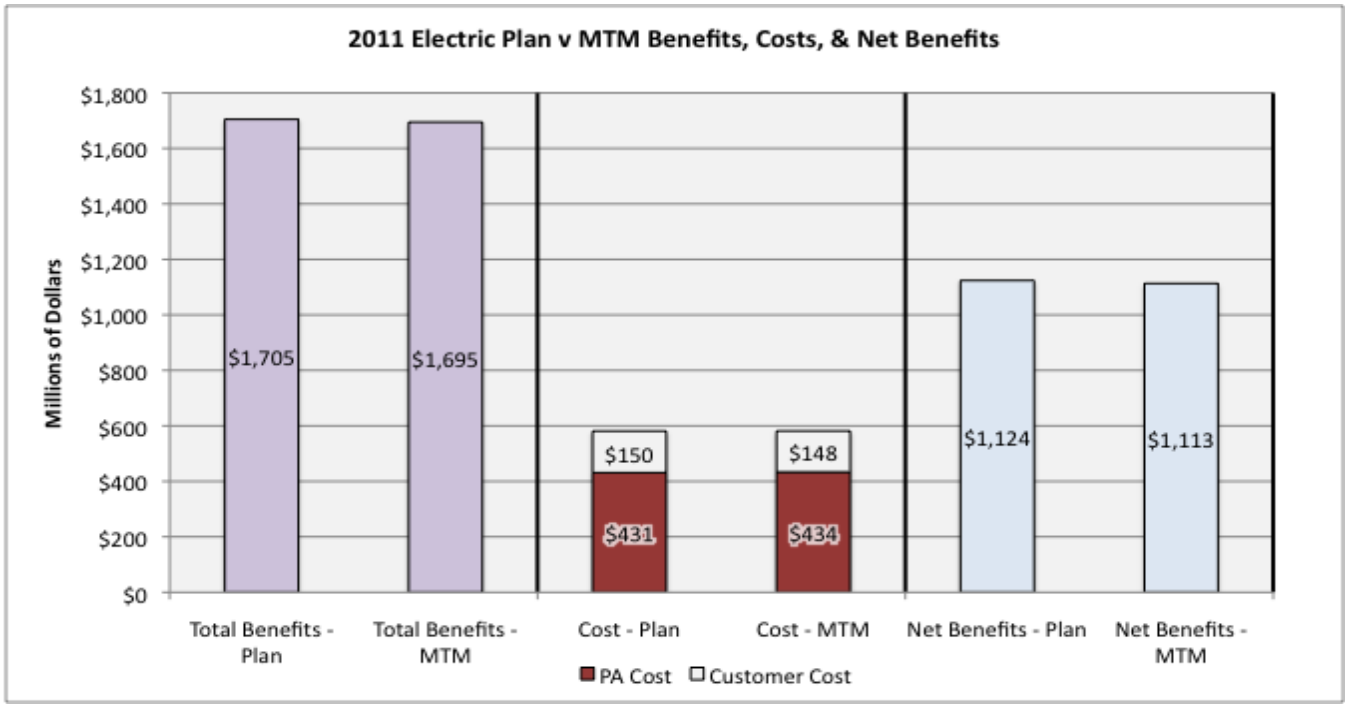
In addition, there is a large amount of variability across the PAs that is not currently explained; see the last group of attached charts in each section (electric vs. gas) for some analysis of key indicators such as PA costs per unit of savings, annual savings per participant, $ benefits per unit of savings, etc. Some of this variability is likely explainable by the PAs due to variations in the sizes/characteristics of customers and the measure mix across the service territories, though it does not appear given the data, explanations, and understandings available at this time that all of the variability necessarily would be explained by these factors.

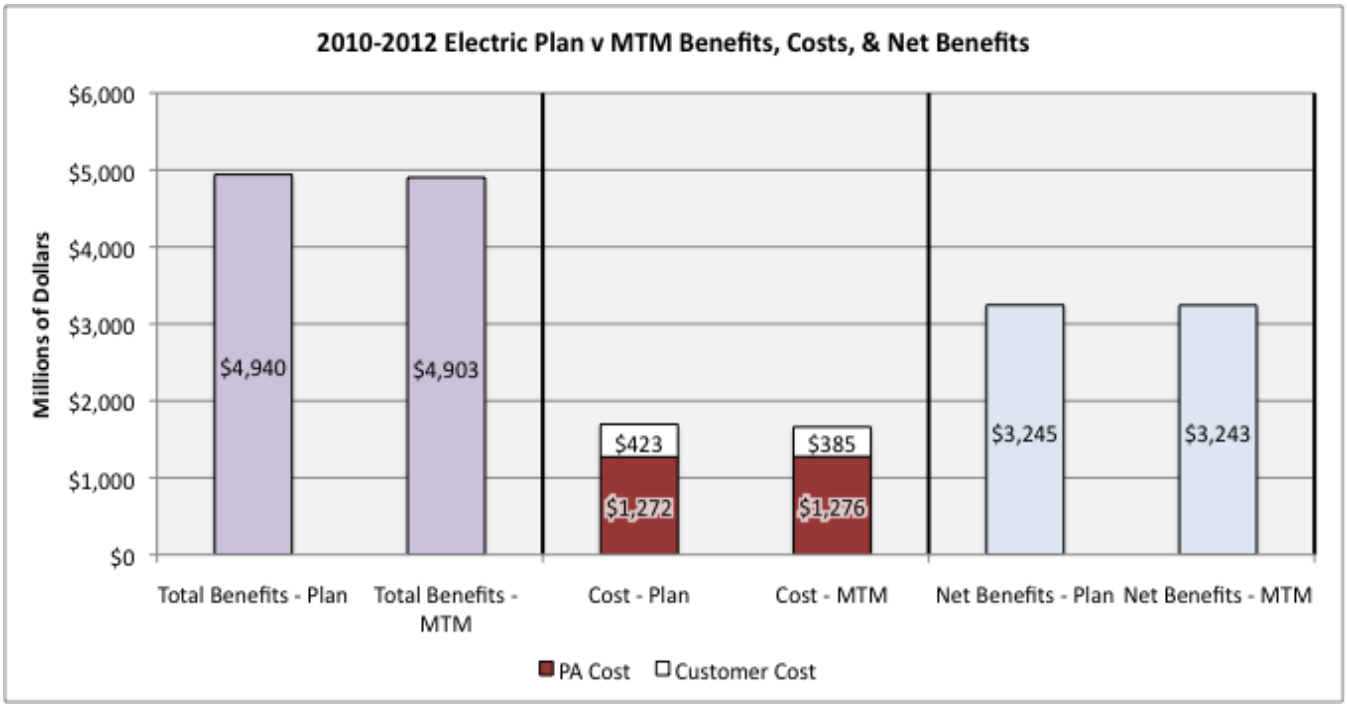
The charts in the last section review savings and benefits per participant for several programs, statewide and for individual PAs.

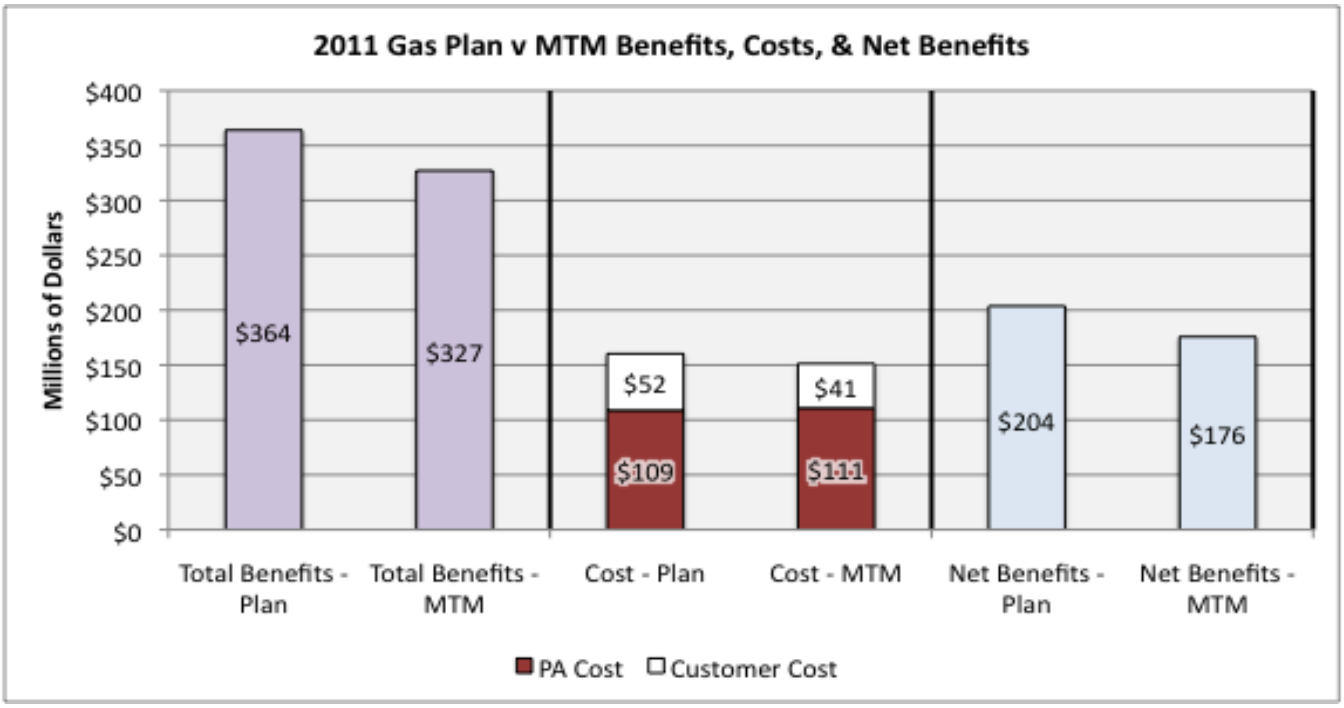
Massachusetts Electric and Gas Plan v MTM Summary Charts

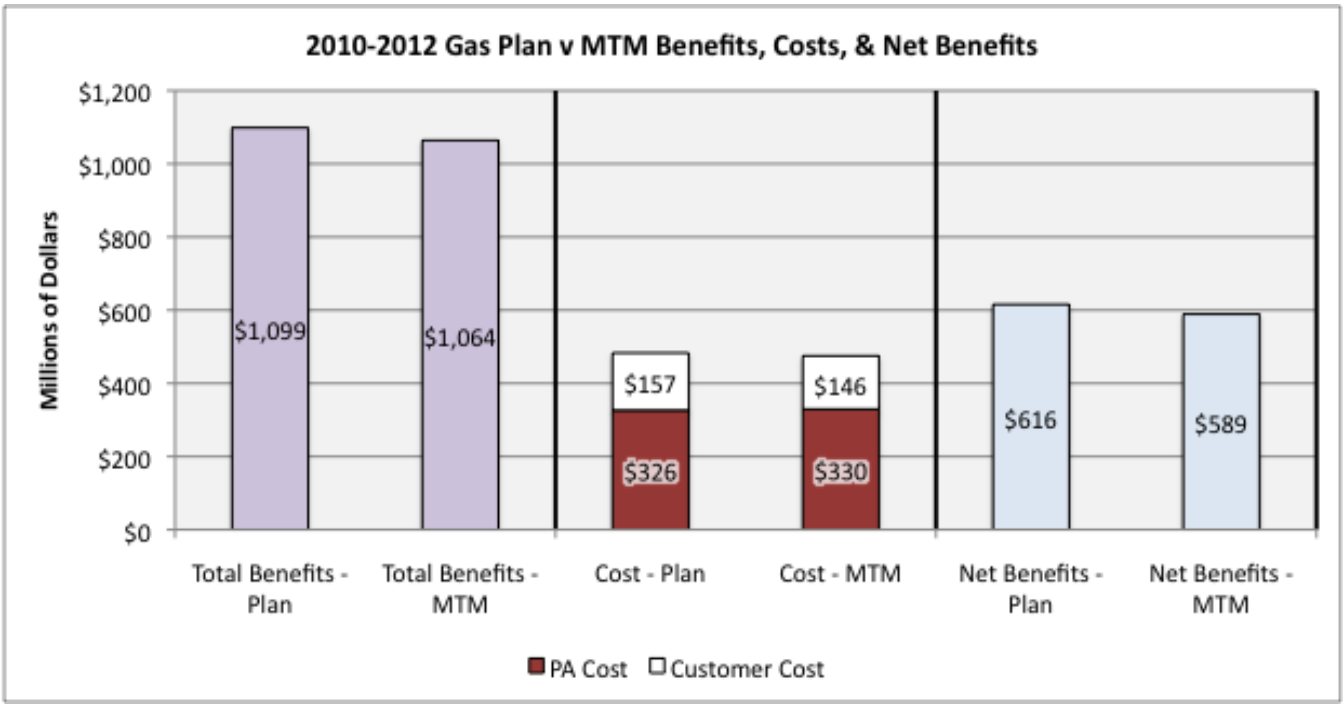




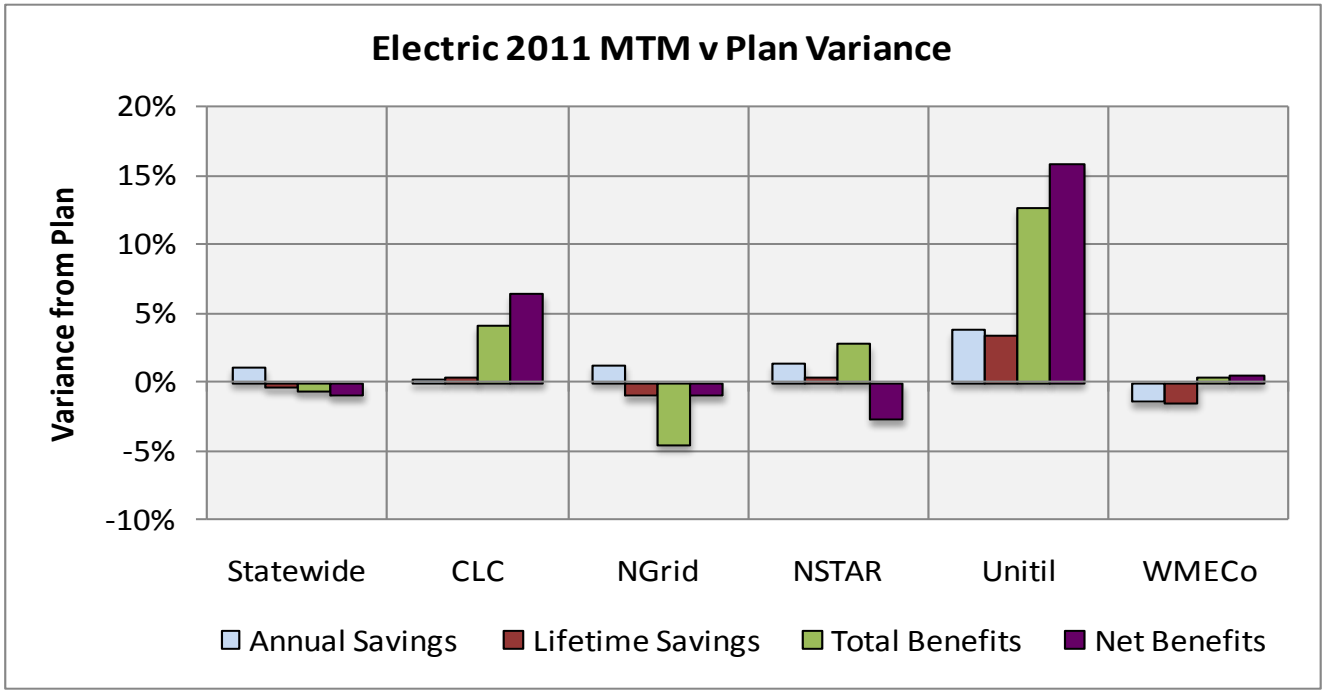

2011 Electric Plan v MTM Benefits, Costs, & Net Benefits
Millions of Dollars
$1,800
$1,600
$1,400
$1,200
$1,000
$800
$600
$400
$200
$0
$1,705
$1,695
$150
$431
$148
$434
$1,124
$1,113
Total Benefits - Plan
Total Benefits - MTM
Cost - Plan
Cost - MTM
Net Benefits - Plan
Net Benefits - MTM
PA Cost
Customer Cost

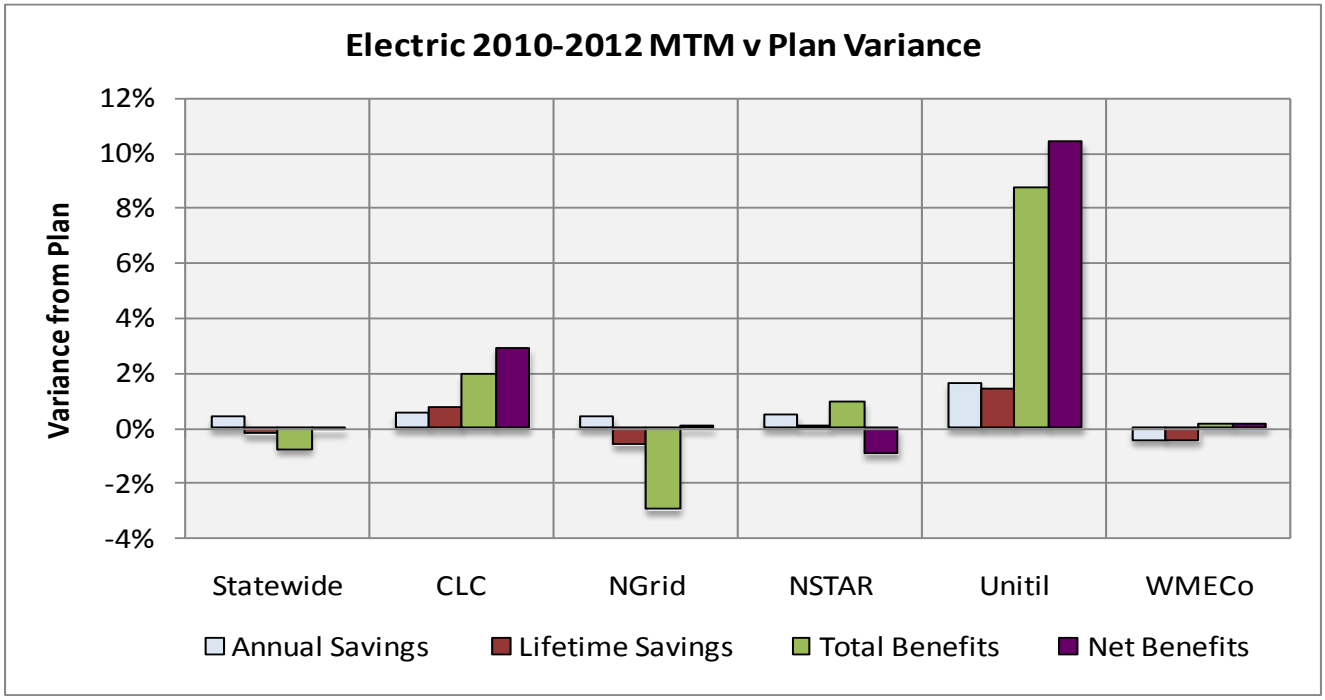

2010-2012 Electric Plan v MTM Benefits, Costs, & Net Benefits
Millions of Dollars
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
$4,940
$4,903
$423
$1,272
$385
$1,276
$3,245
$3,243
Total Benefits - Plan
Total Benefits - MTM
Cost - Plan
Cost - MTM
Net Benefits - Plan
Net Benefits - MTM
PA Cost
Customer Cost

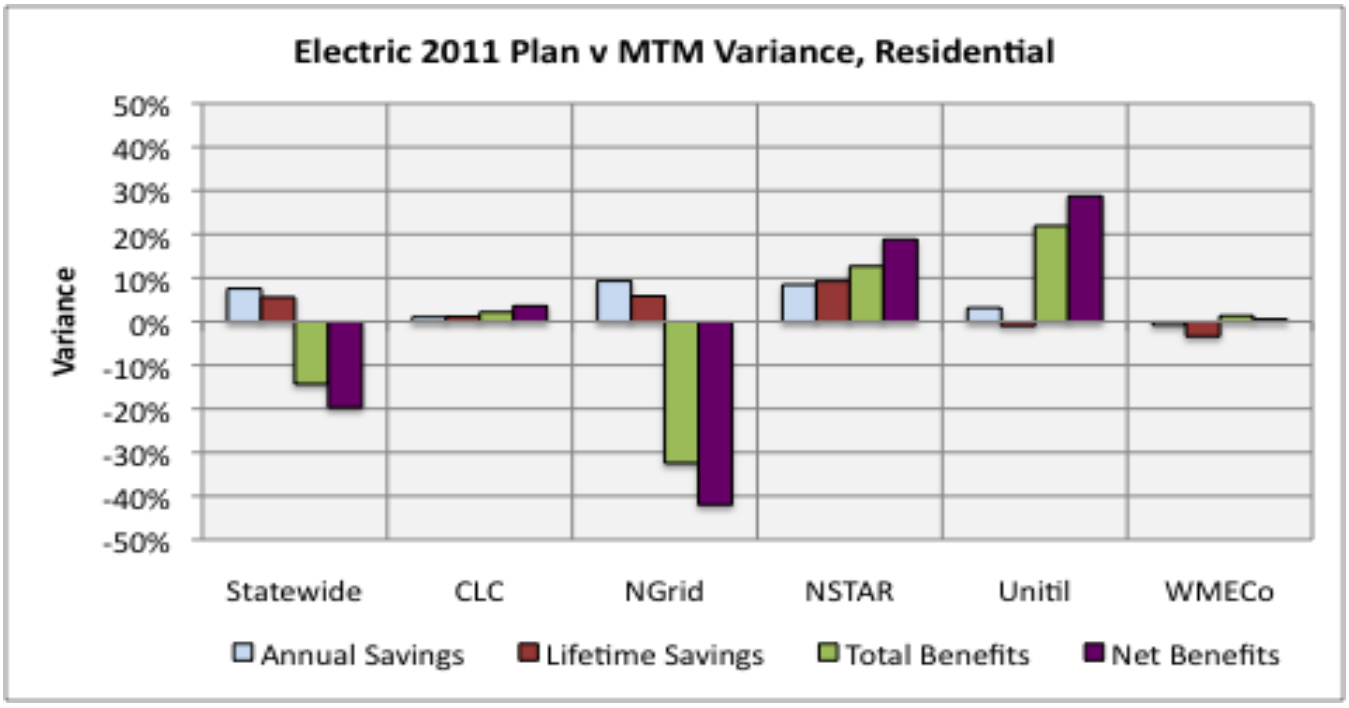

2011 Gas Plan v MTM Benefits, Costs, & Net Benefits
Millions of Dollars
$400
$350
$300
$250
$200
$150
$100
$50
$0
$364
$327
$52
$109
$41
$111
$204
$176
Total Benefits - Plan
Total Benefits - MTM
Cost - Plan
Cost - MTM
Net Benefits - Plan
Net Benefits - MTM
PA Cost
Customer Cost

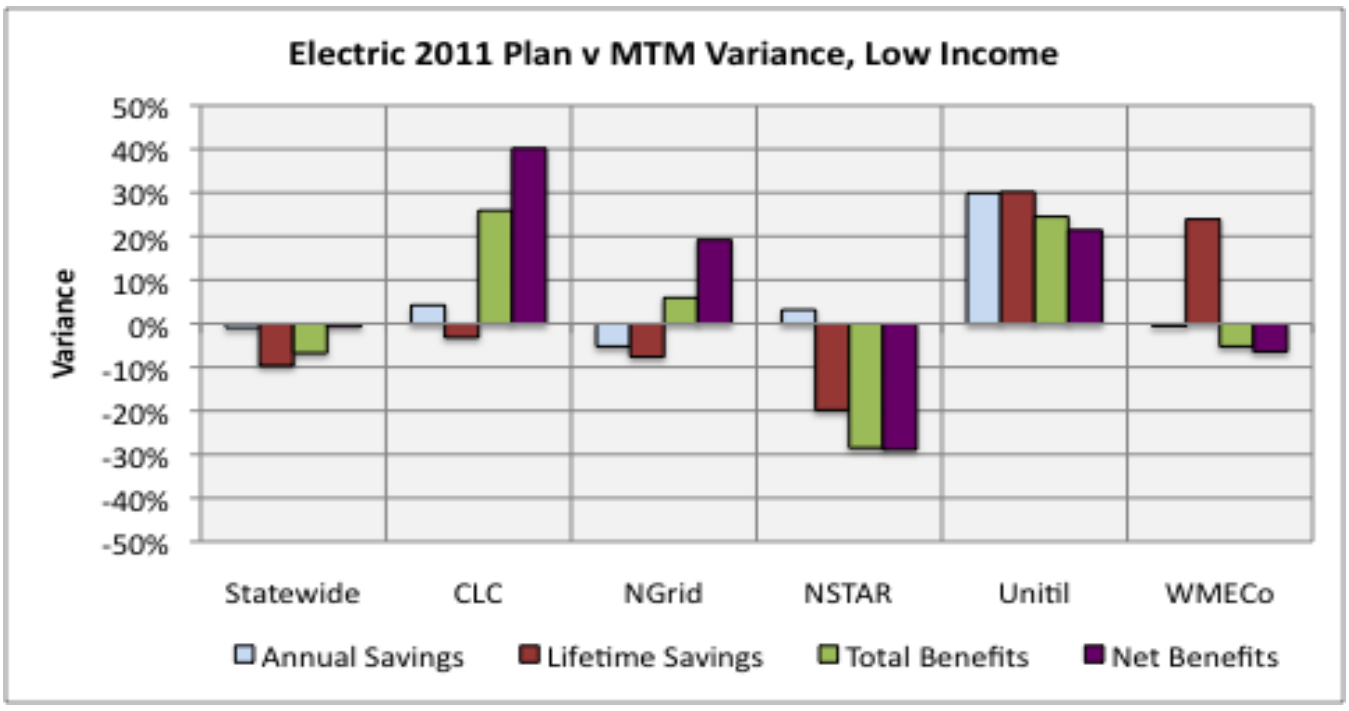

2010-2012 Gas Plan v MTM Benefits, Costs, & Net Benefits
Millions of Dollars
$1,200
$1,000
$800
$600
$400
$200
$0
$1,099
$1,064
$157
$326
$146
$330
$616
$589
Total Benefits - Plan
Total Benefits - MTM
Cost - Plan
Cost - MTM
Net Benefits - Plan
Net Benefits - MTM
PA Cost
Customer Cost

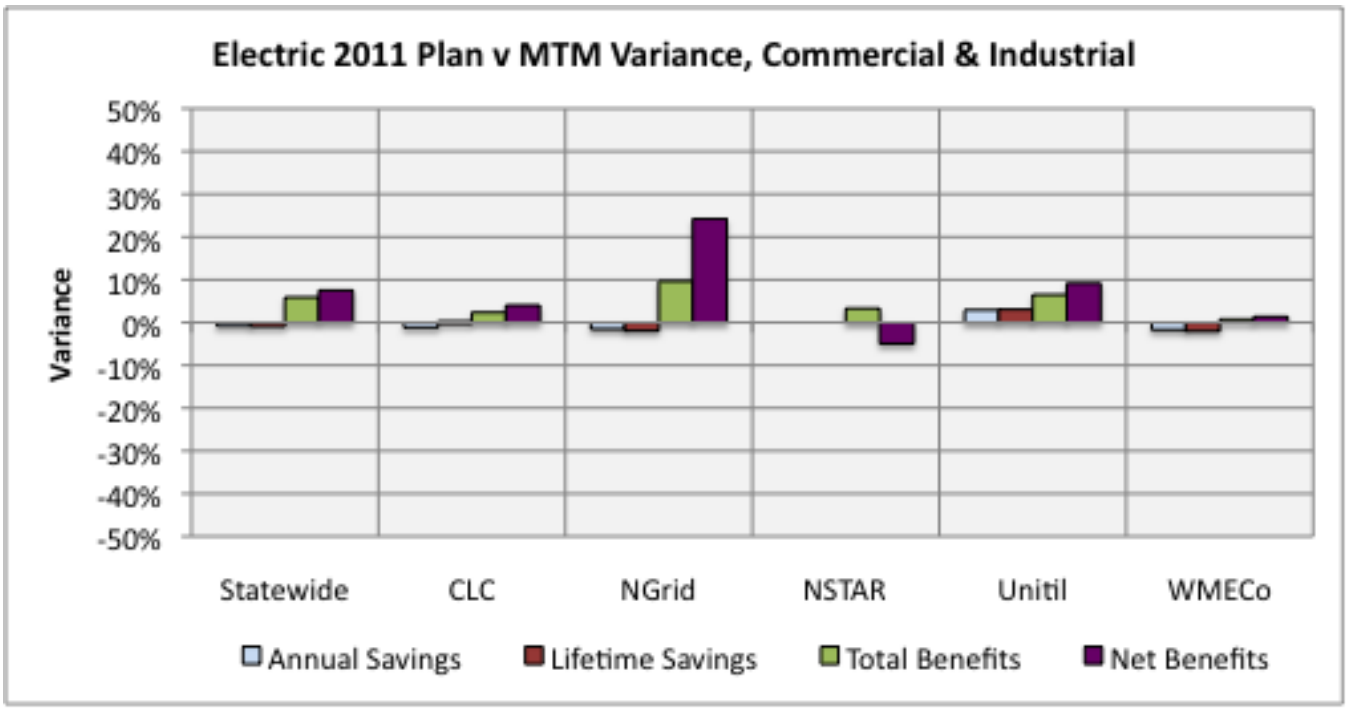
Electric Charts

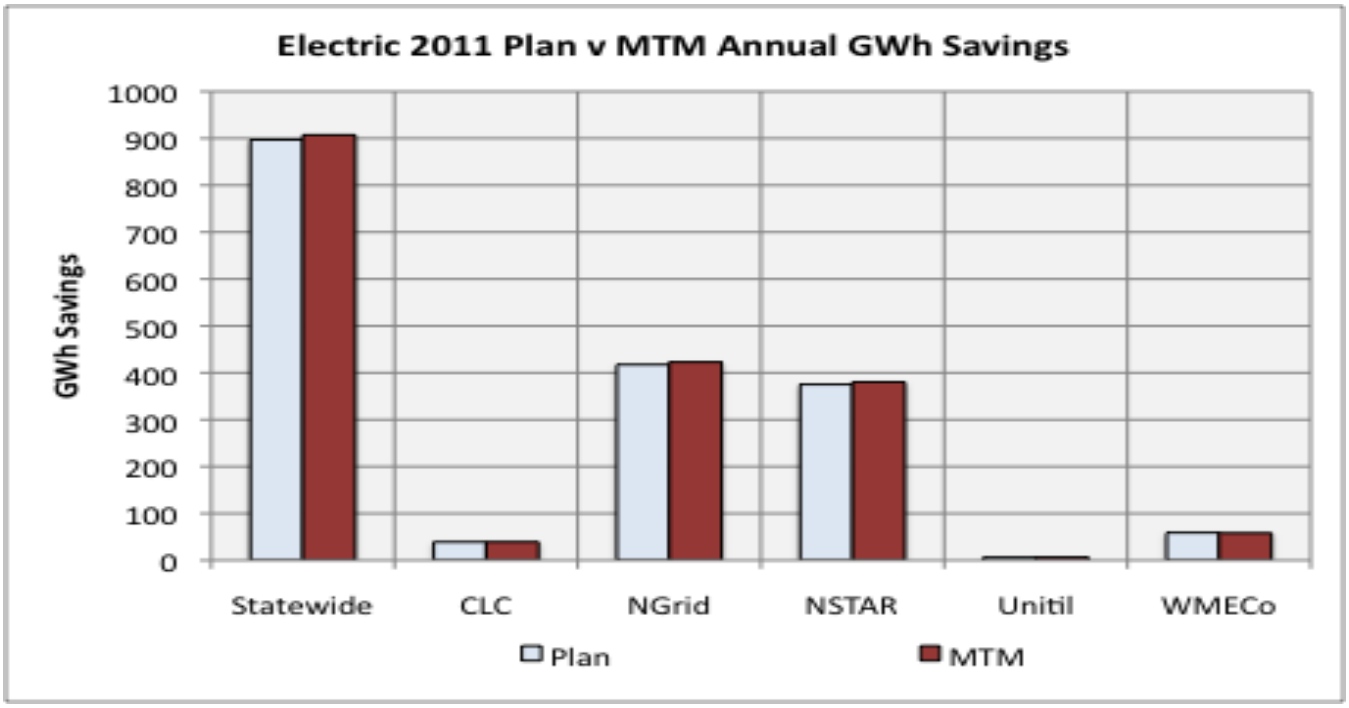


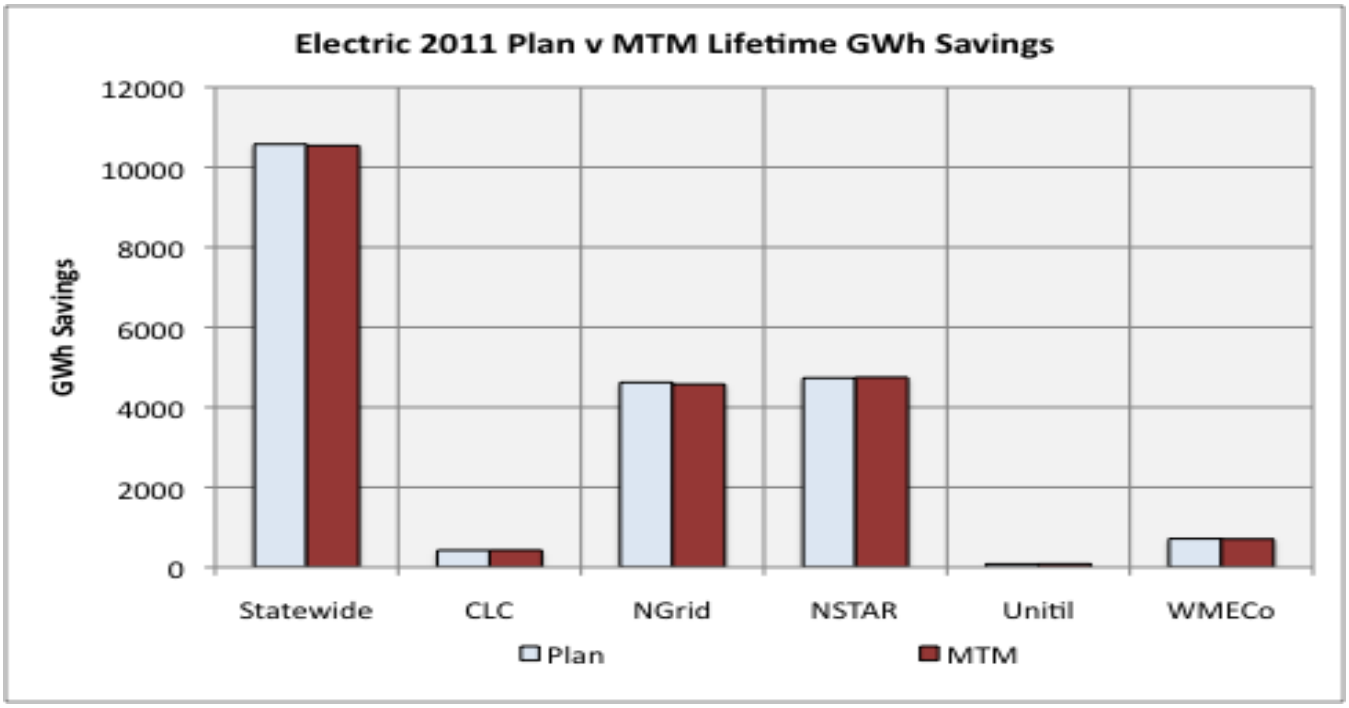


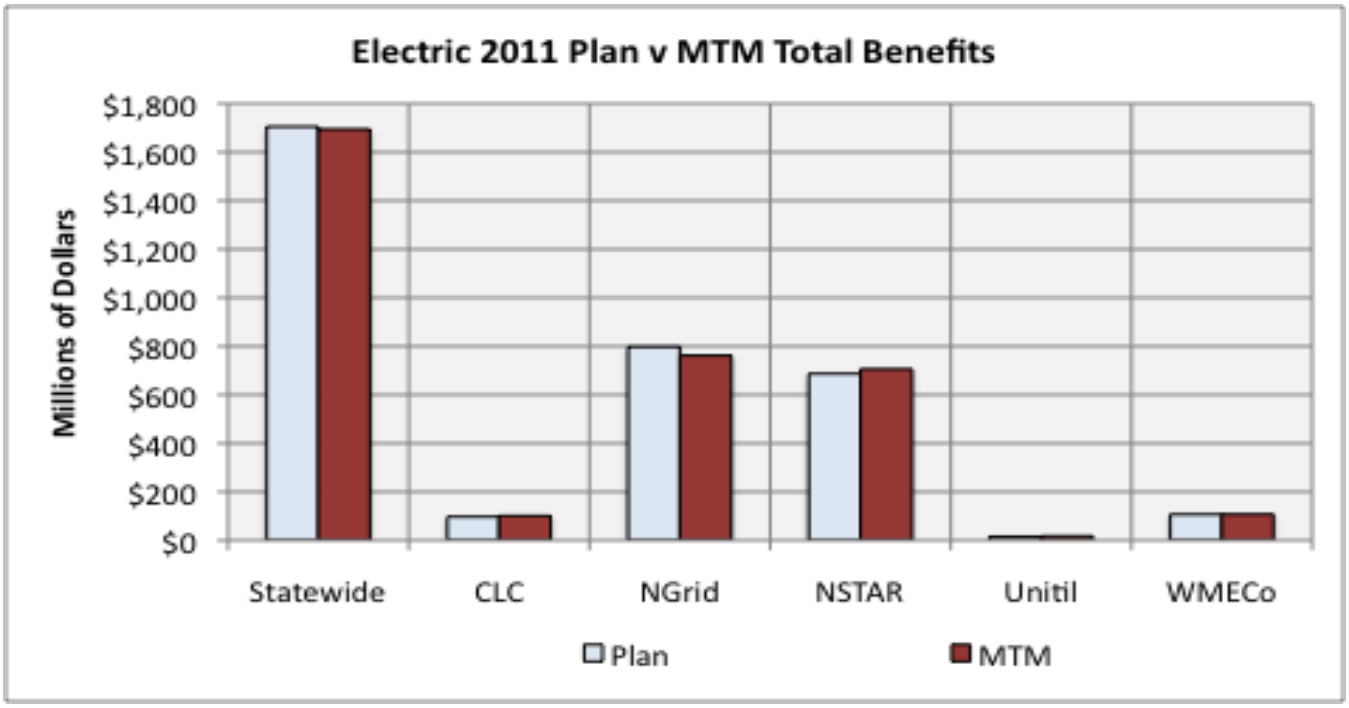

Electric 2011 Plan v MTM Variance, Residential
Variance
50%
40%
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo
Annual Savings
Lifetime Savings
Total Benefits
Net Benefits

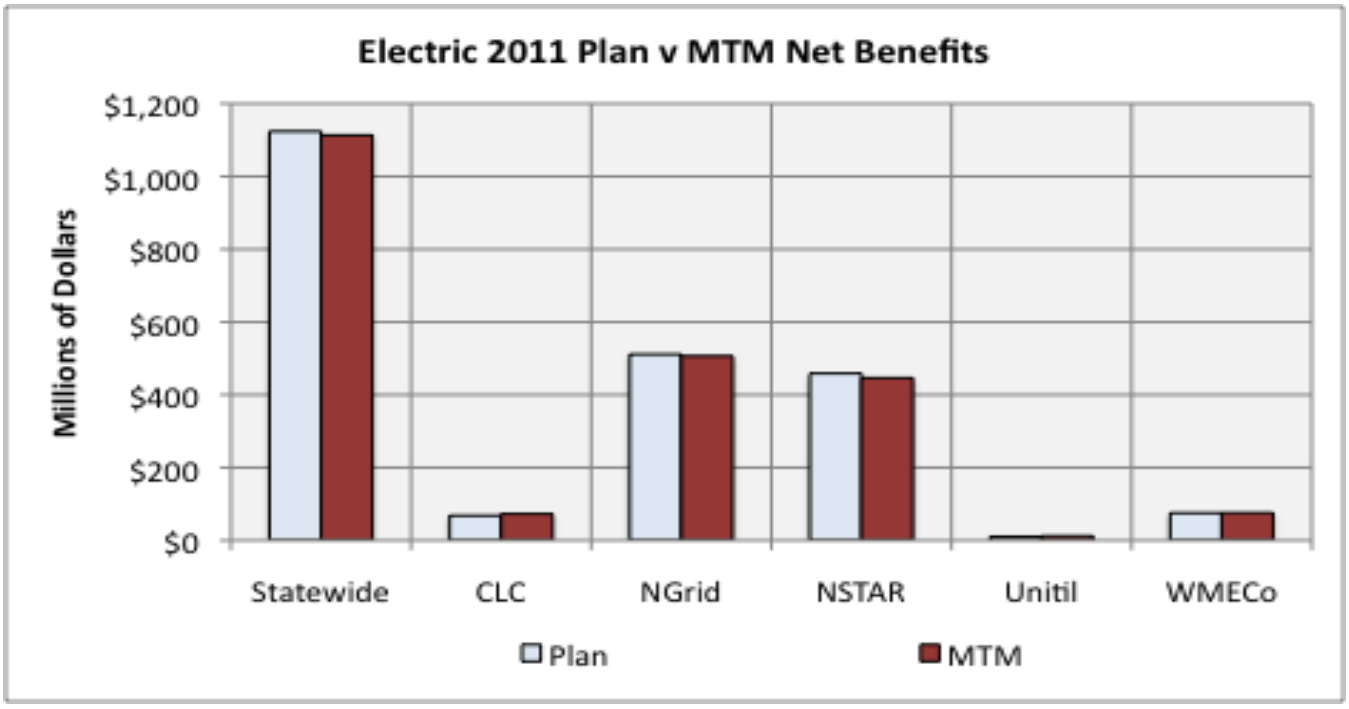

Electric 2011 Plan v MTM Variance, Low Income
Variance
50%
40%
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo
Annual Savings
Lifetime Savings
Total Benefits
Net Benefits

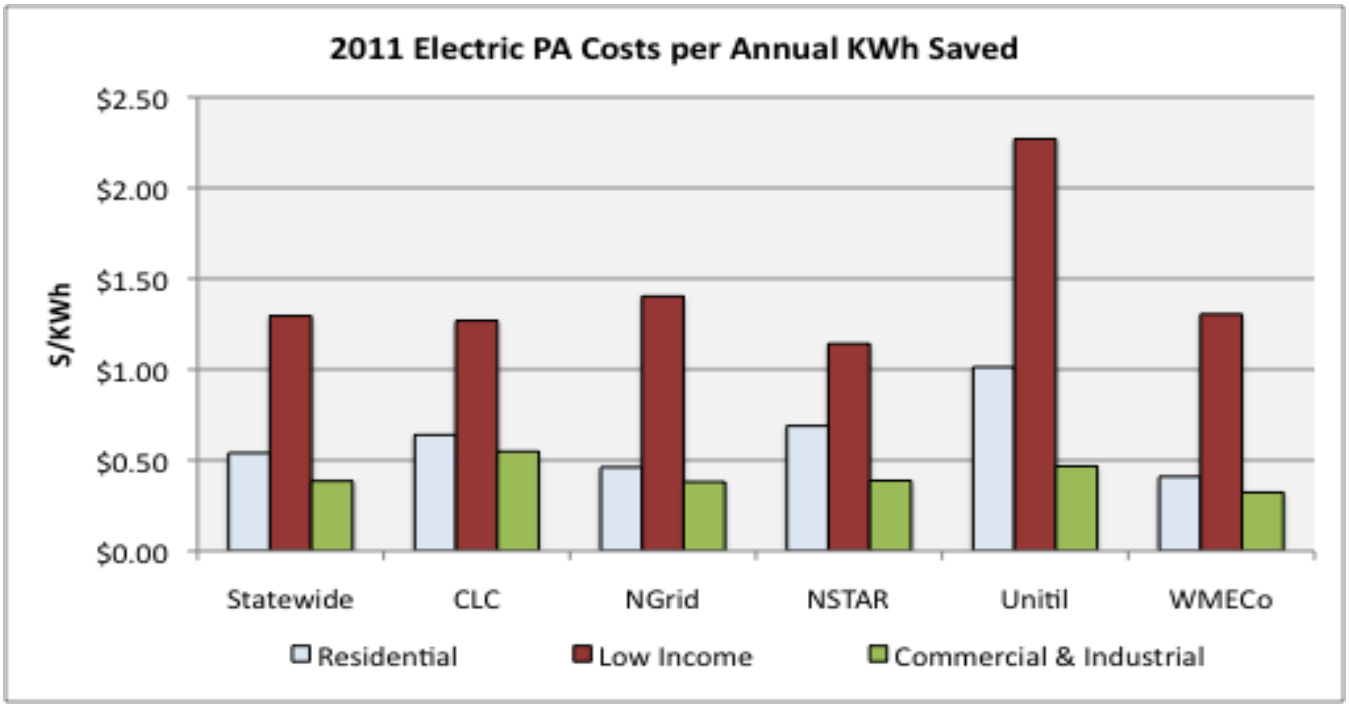

Electric 2011 Plan v MTM Variance, Commercial & Industrial
Variance
50%
40%
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo
Annual Savings
Lifetime Savings
Total Benefits
Net Benefits

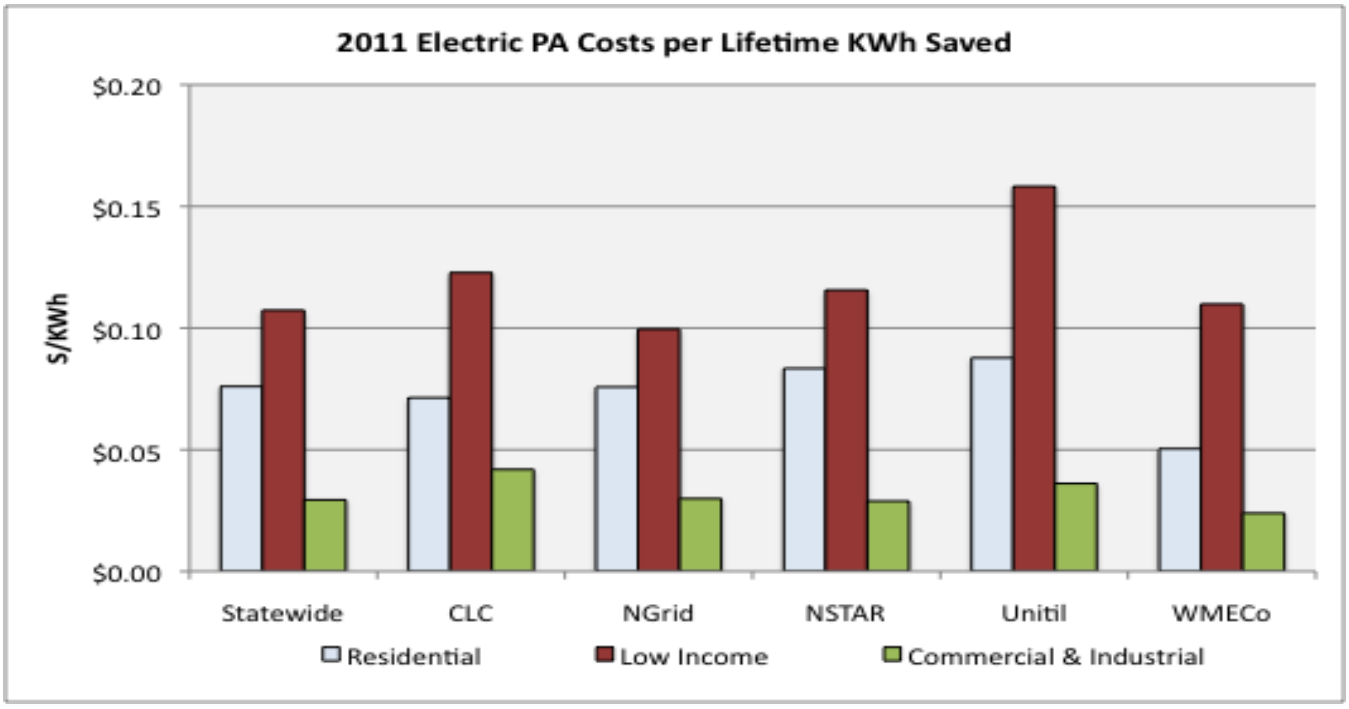

Electric 2011 Plan v MTM Annual GWh Savings
GWh Savings
1000
900
800
700
600
500
400
300
200
100
0
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo
Plan
MTM

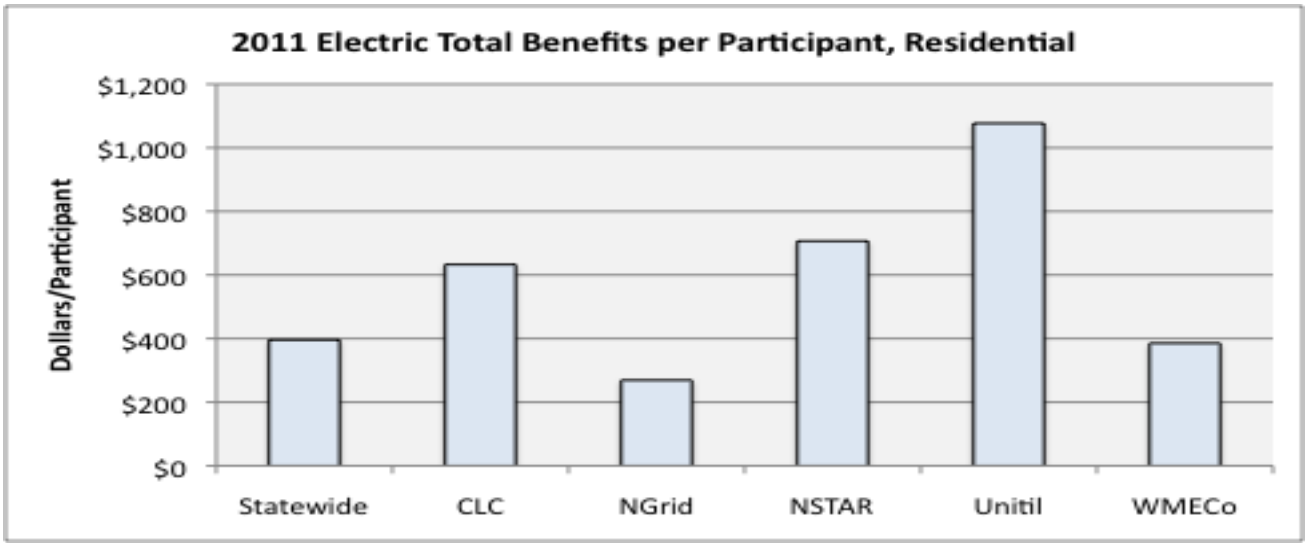

Electric 2011 Plan v MTM Lifetime GWh Savings
GWh Savings
12000
10000
8000
6000
4000
2000
0
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo
Plan
MTM

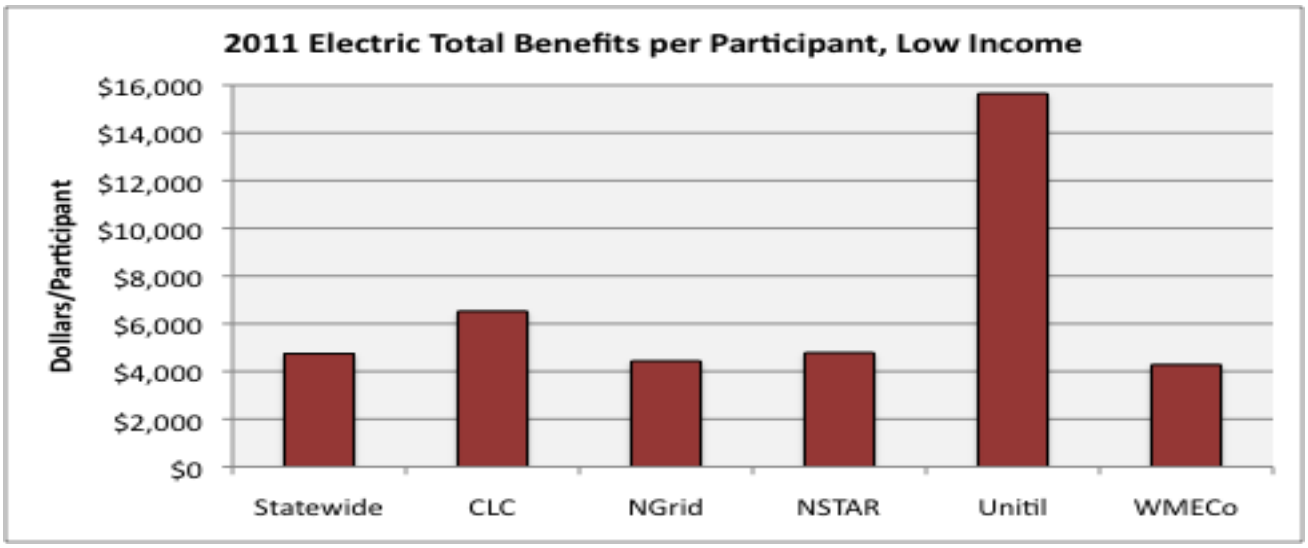

Electric 2011 Plan v MTM Total Benefits
Millions of Dollars
$1,800
$1,600
$1,400
$1,200
$1,000
$800
$600
$400
$200
$0
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo
Plan
MTM

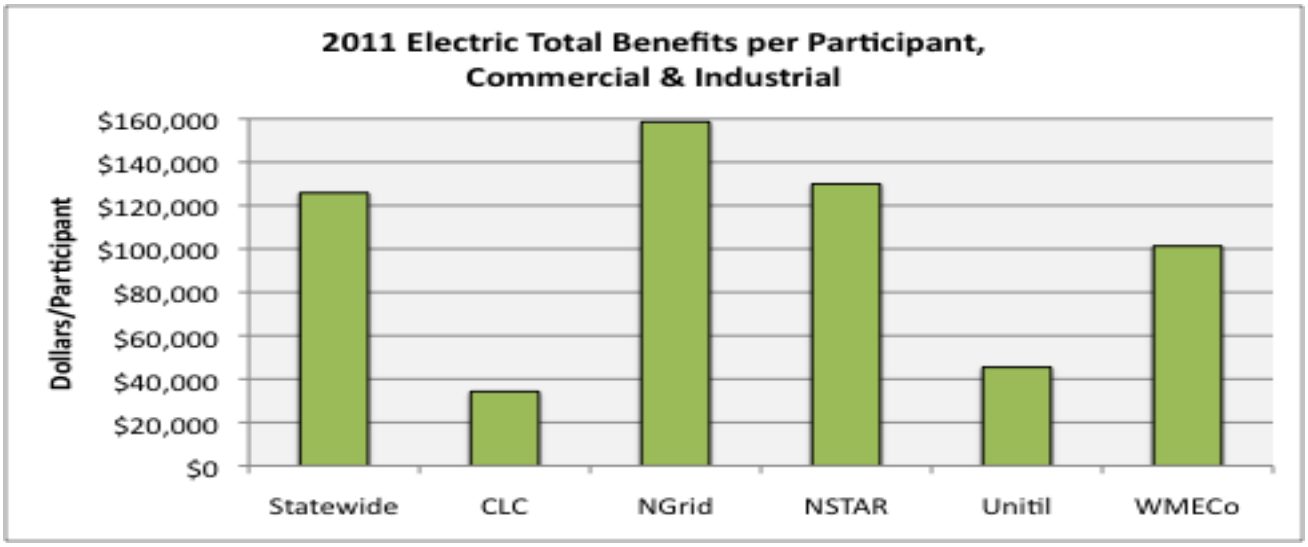

Electric 2011 Plan v MTM Net Benefits
Millions of Dollars
$1,200
$1,000
$800
$600
$400
$200
$0
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo
Plan
MTM

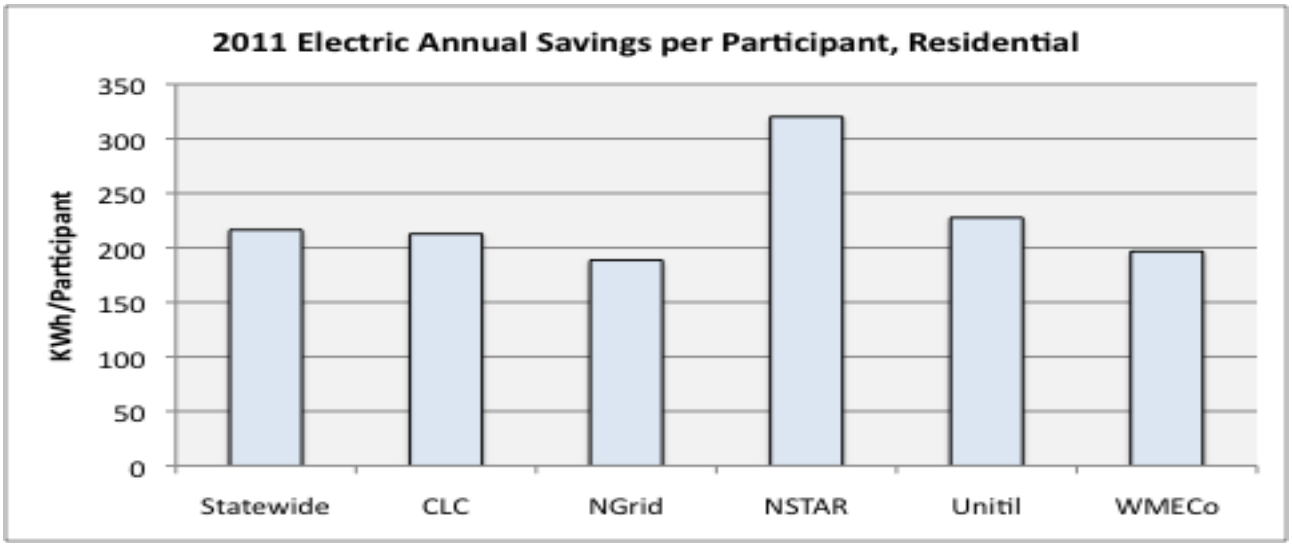

2011 Electric PA Costs per Annual KWh Saved
$2.50
$2.00
$1.50
$1.00
$0.50
$0.00
$/KWh
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo
Residential
Low Income
Commercial & Industrial

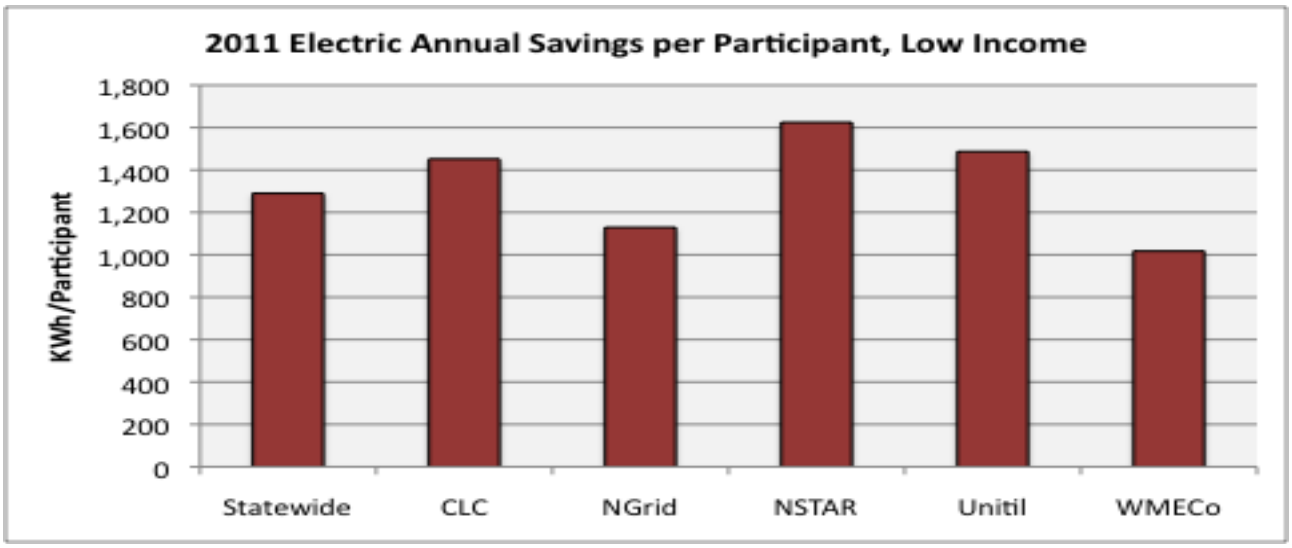

2011 Electric PA Costs per Lifetime KWh Saved
$0.20
$0.15
$0.10
$0.05
$0.00
$/KWh
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo
Residential
Low Income
Commercial & Industrial

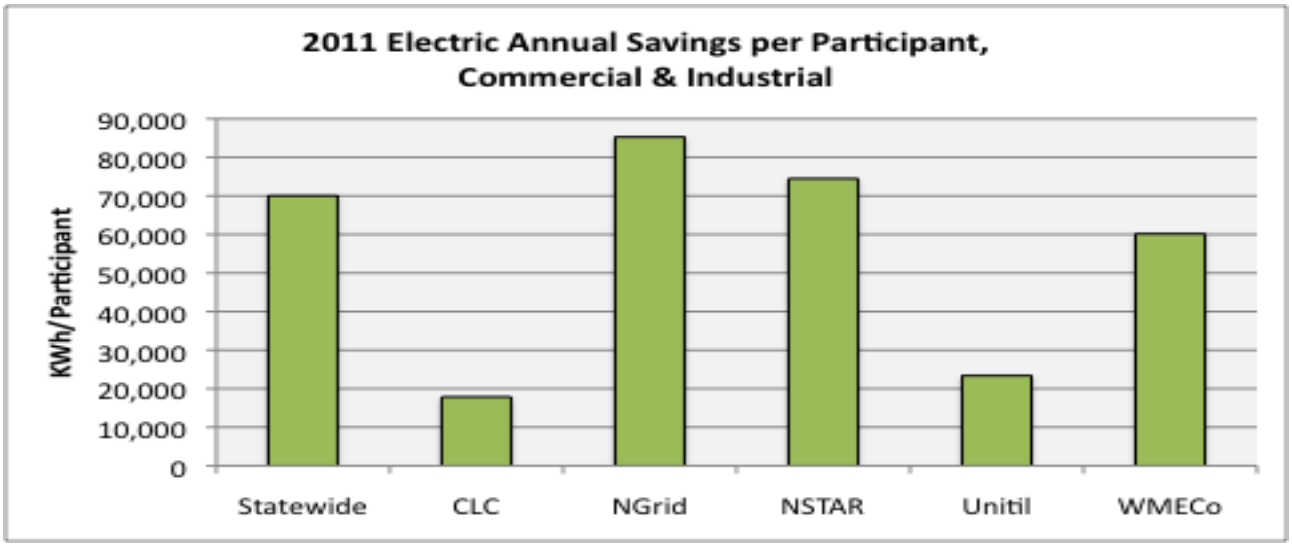

2011 Electric Total Benefits per Participant, Residential
Dollars/Participant
$1,200
$1,000
$800
$600
$400
$200
$0
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo

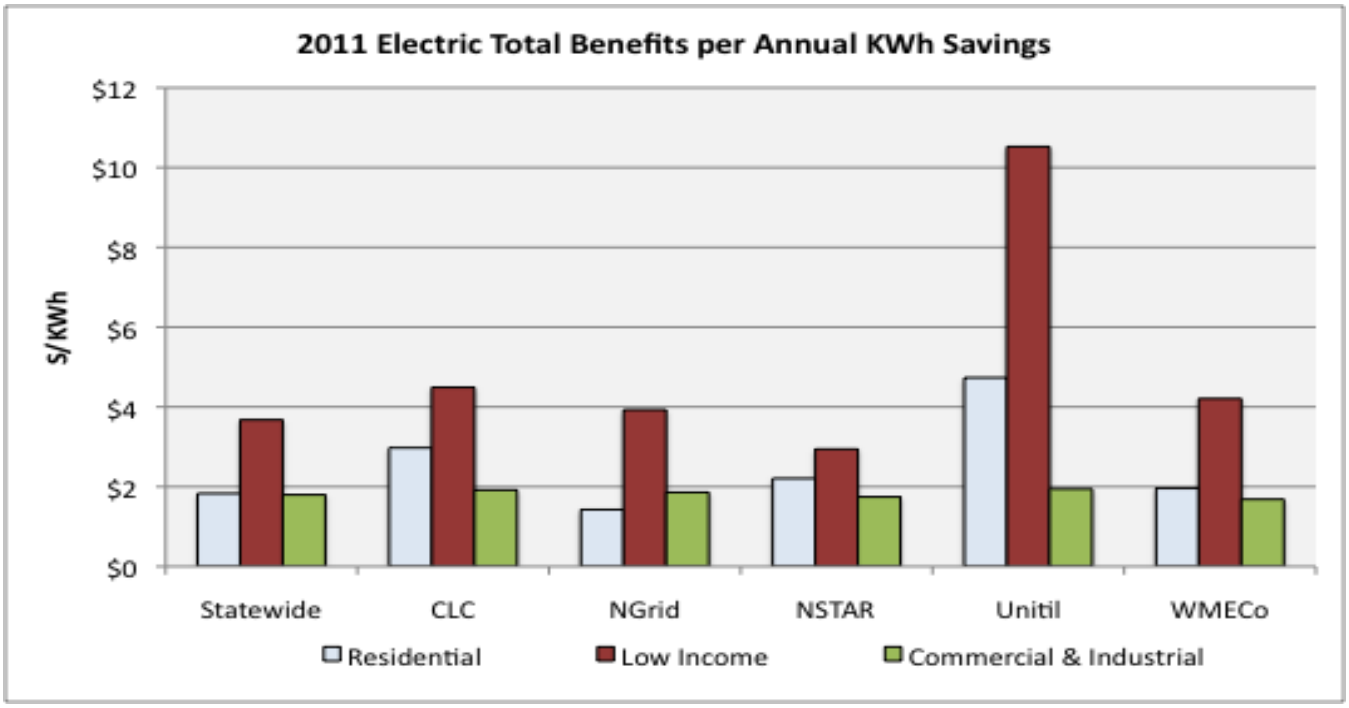

2011 Electric Total Benefits per Participant, Low Income
Dollars/Participant
$16,000
$14,000
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$0
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo


2011 Electric Total Benefits per Participant,
Commercial & Industrial
Dollars/Participant
$160,000
$140,000
$120,000
$100,000
$80,000
$60,000
$40,000
$20,000
$0
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo

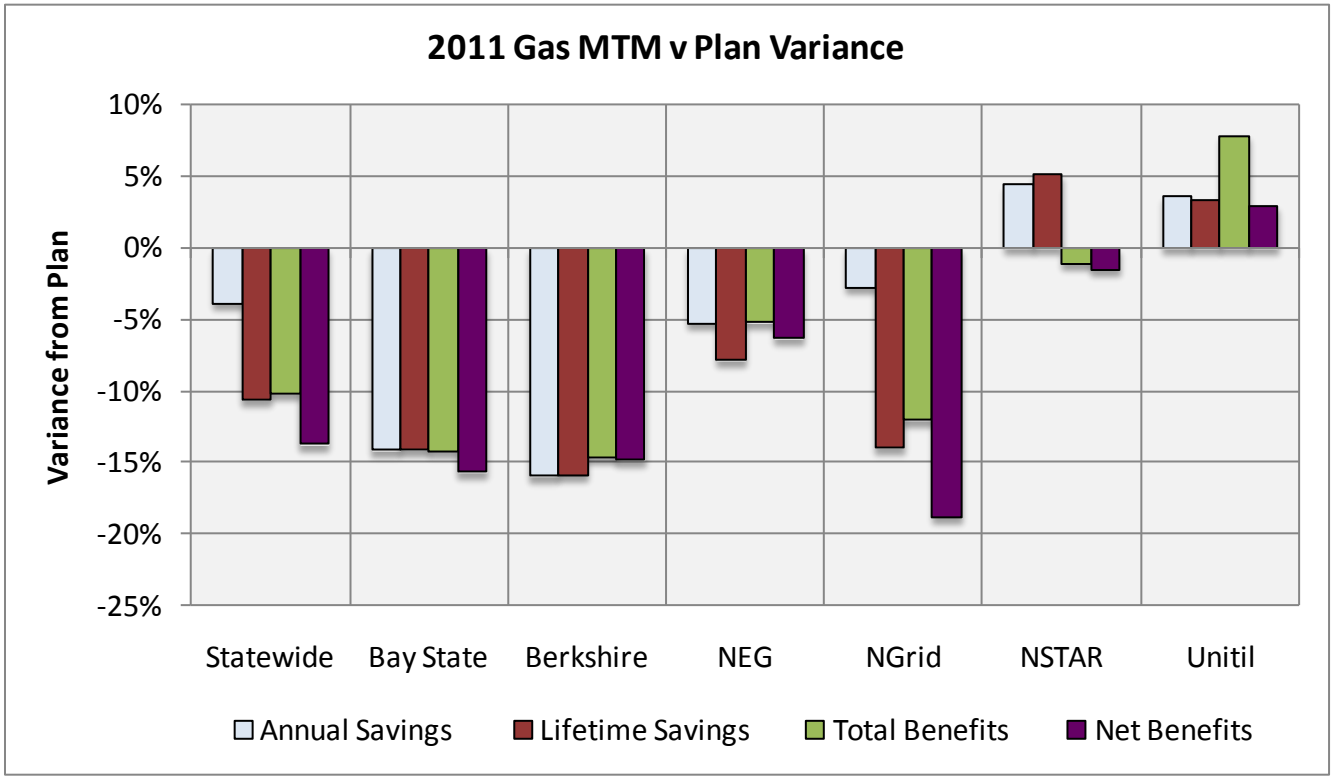

2011 Electric Annual Savings per Participant, Residential
KWh/Participant
350
300
250
200
150
100
50
0
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo

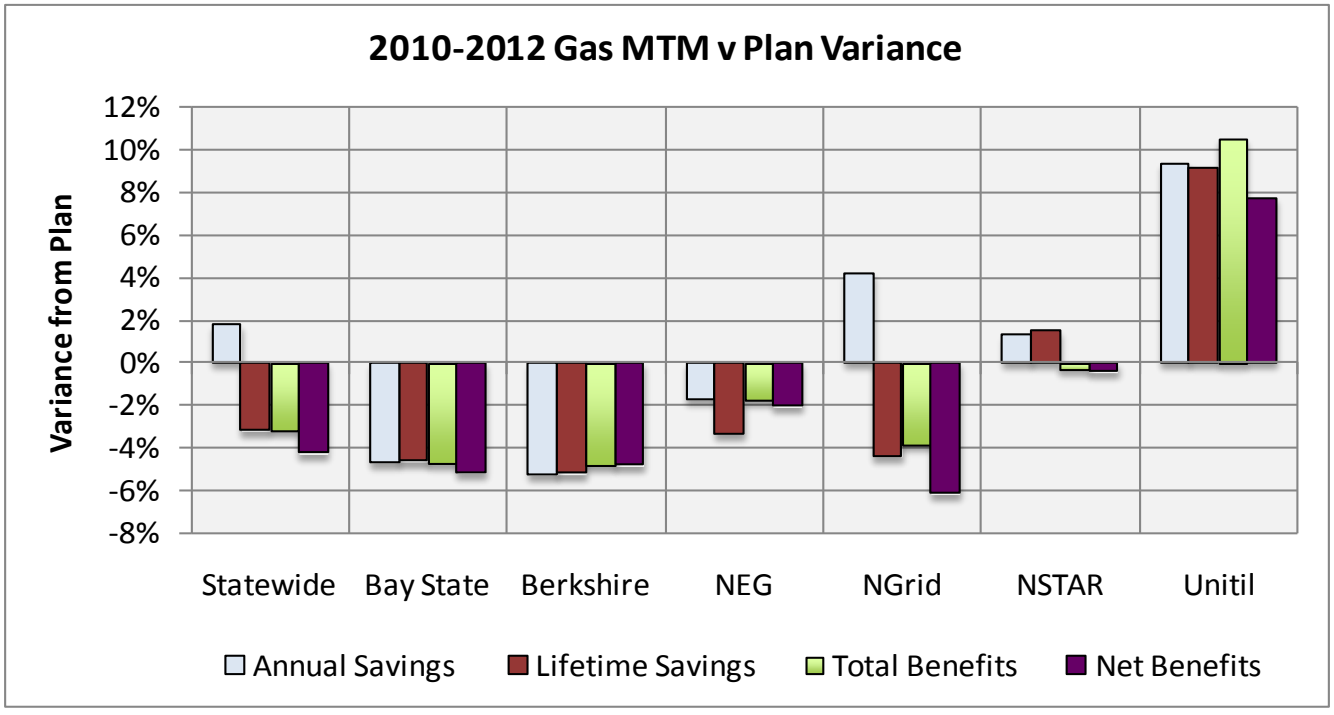

2011 Electric Annual Savings per Participant, Low Income
KWh/Participant
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo

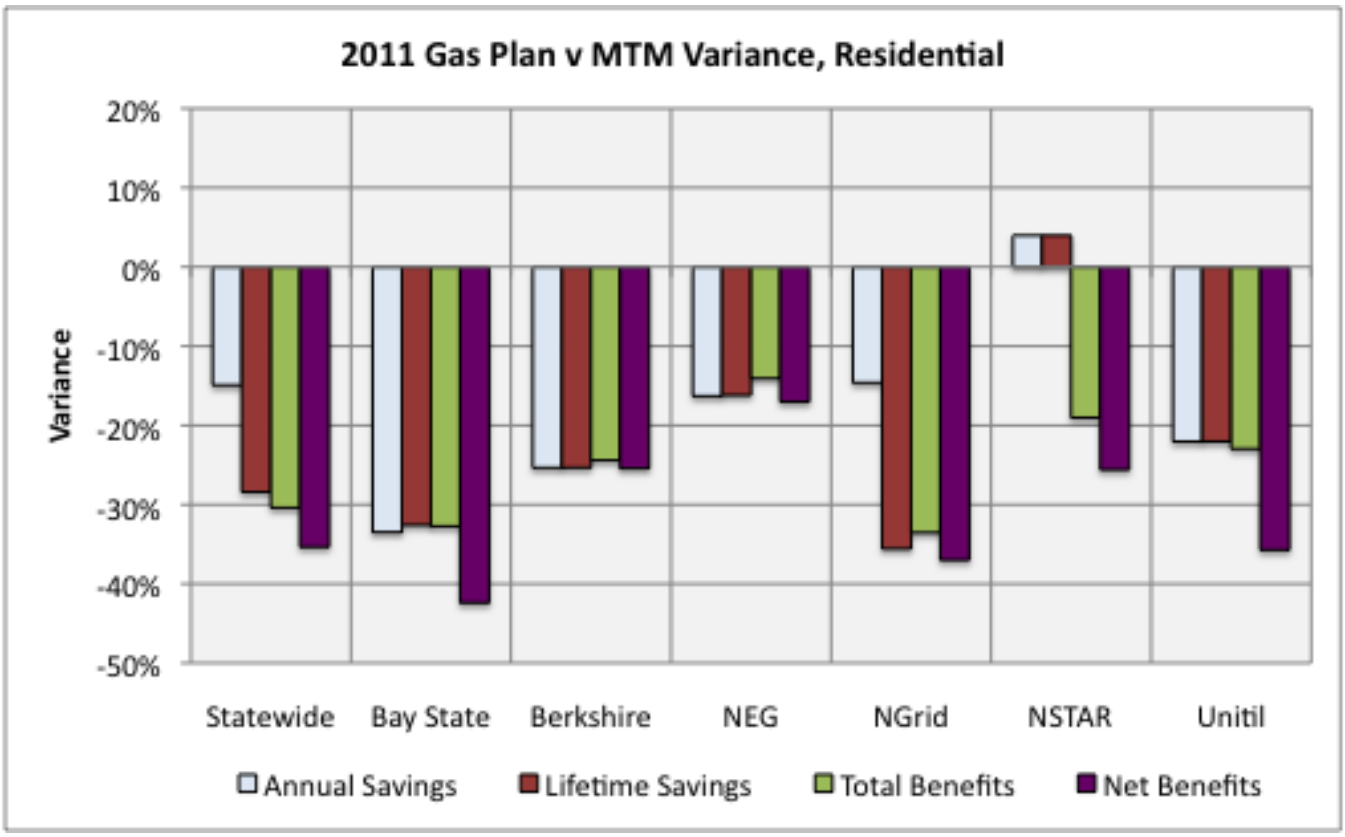

2011 Electric Annual Savings per Participant,
Commercial & Industrial
KWh/Participant
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo

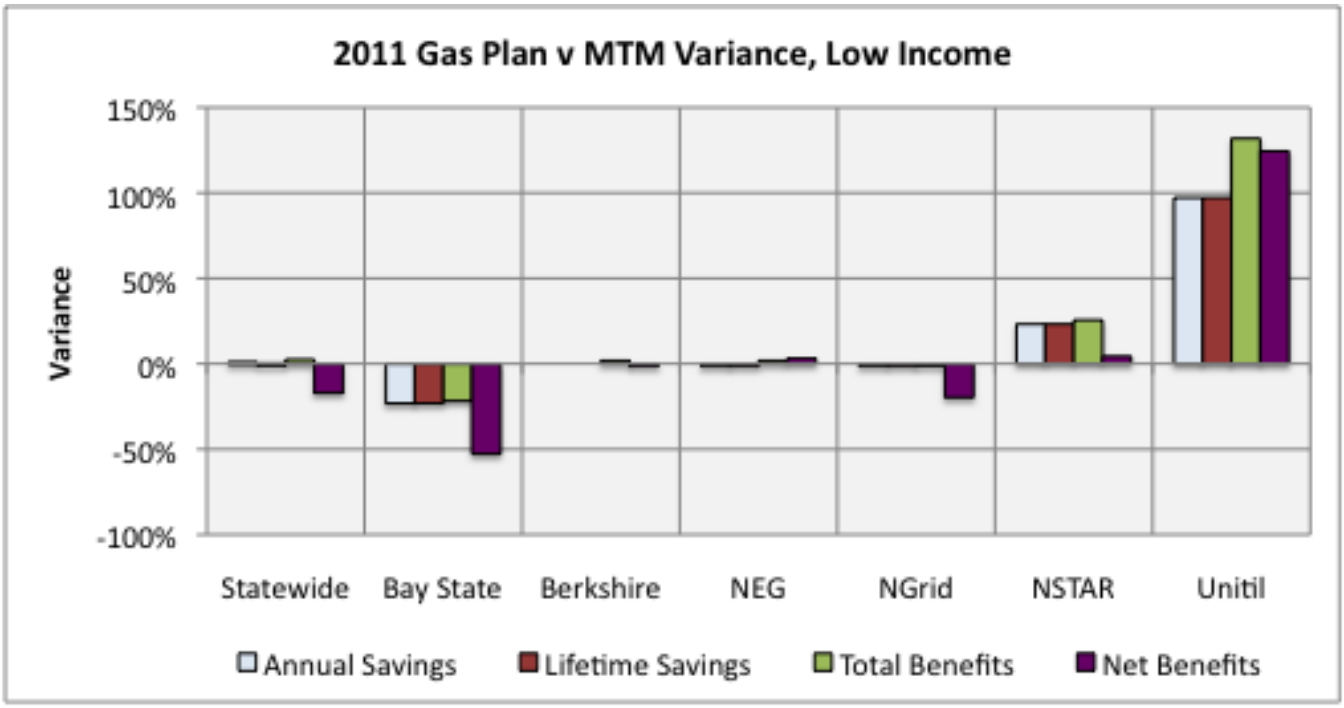

2011 Electric Total Benefits per Annual KWh Savings
$/KWh
$12
$10
$8
$6
$4
$2
$0
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo
Residential
Low Income
Commercial & Industrial

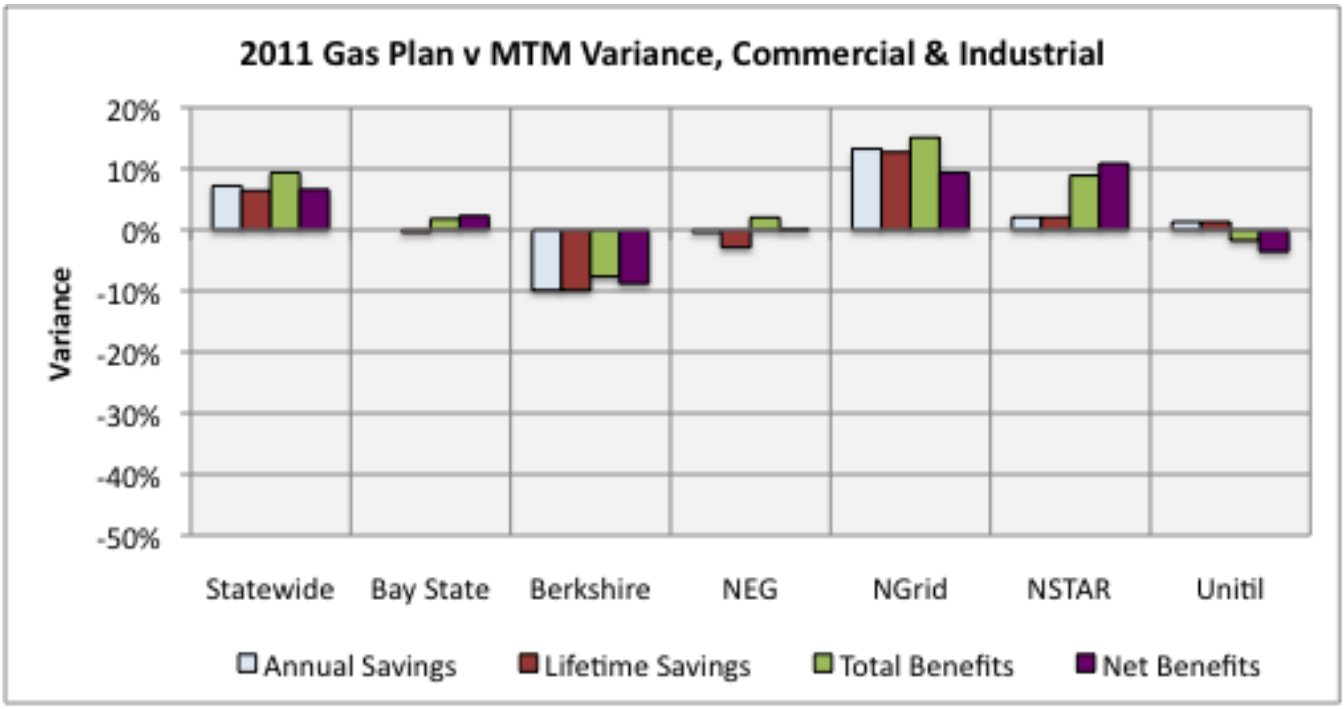
Gas Charts

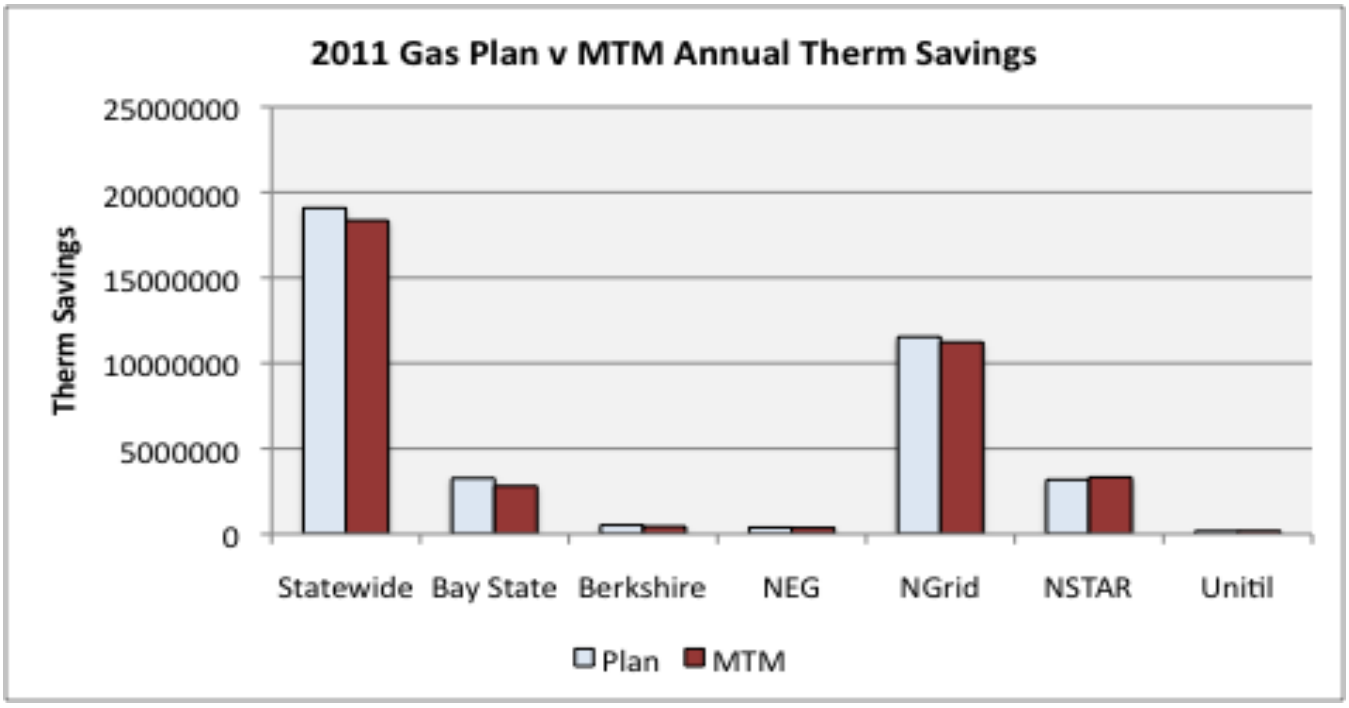

2011 Gas MTM v Plan Variance
Variance from Plan
10%
5%
0%
-5%
-10%
-15%
-20%
-25%
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Annual Savings
Lifetime Savings
Total Benefits
Net Benefits

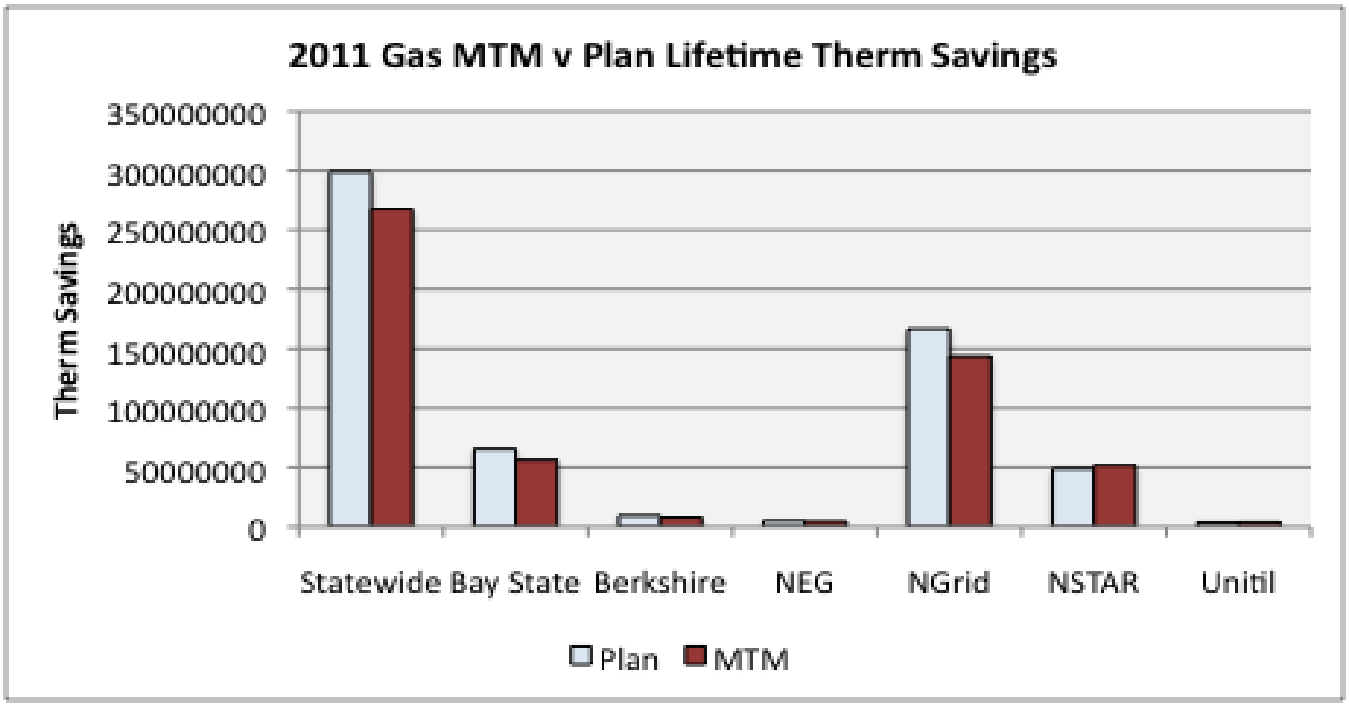

2010-2012 Gas MTM v Plan Variance
Variance from Plan
12%
10%
8%
6%
4%
2%
0%
-2%
-4%
-6%
-8%
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Annual Savings
Lifetime Savings
Total Benefits
Net Benefits

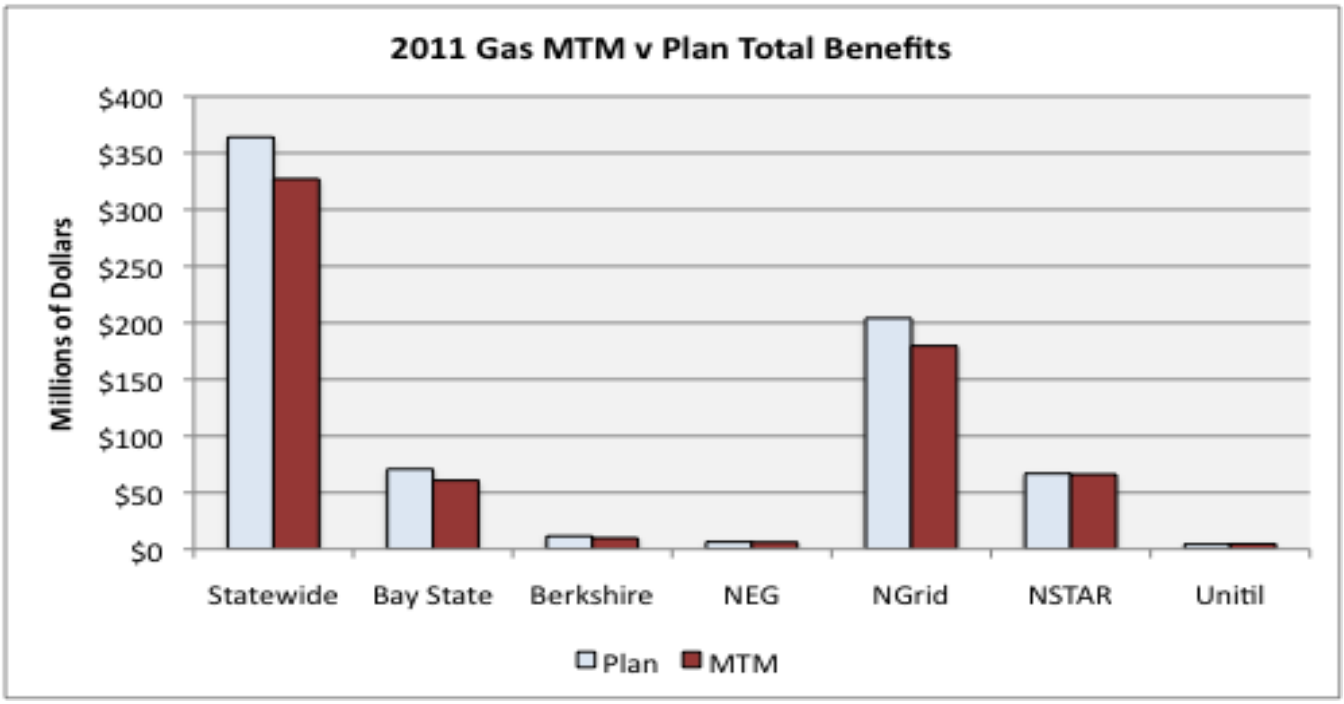

2011 Gas Plan v MTM Variance, Residential
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
Variance
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Annual Savings
Lifetime Savings
Total Benefits
Net Benefits

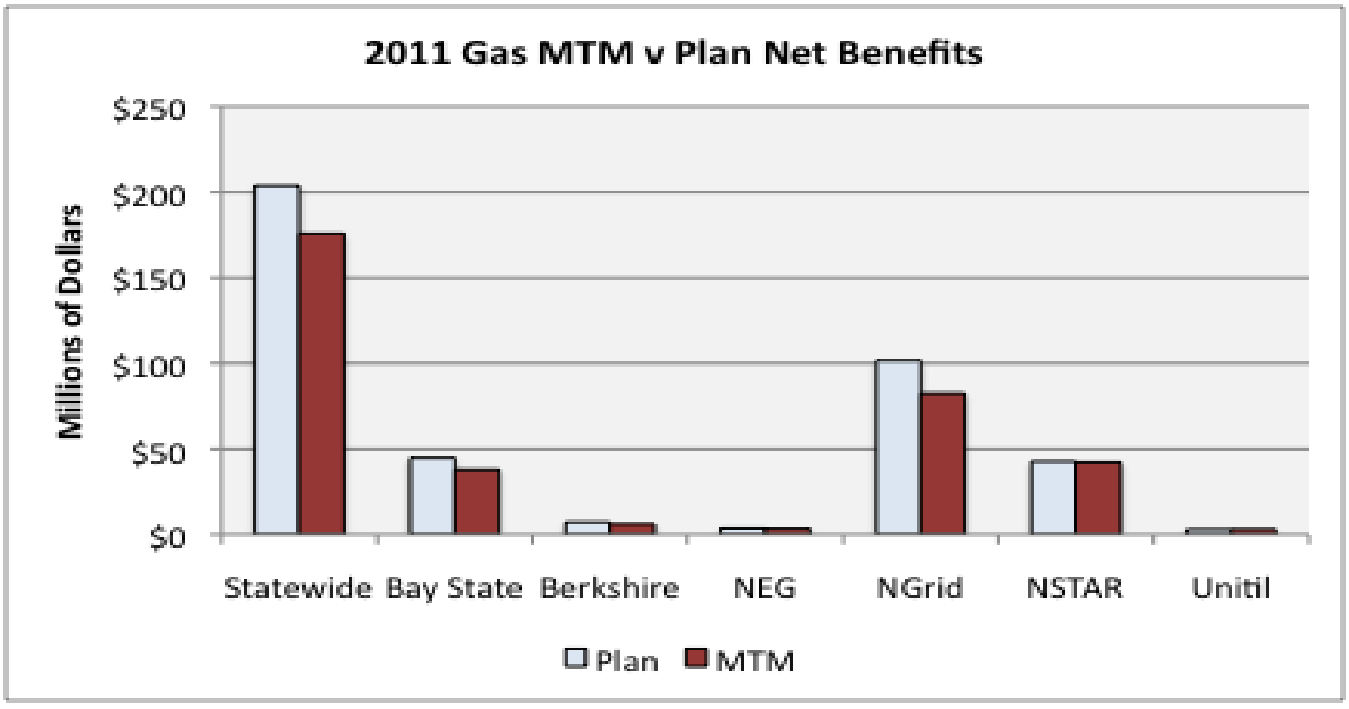

2011 Gas Plan v MTM Variance, Low Income
150%
100%
50%
0%
-50%
-100%
Variance
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Annual Savings
Lifetime Savings
Total Benefits
Net Benefits

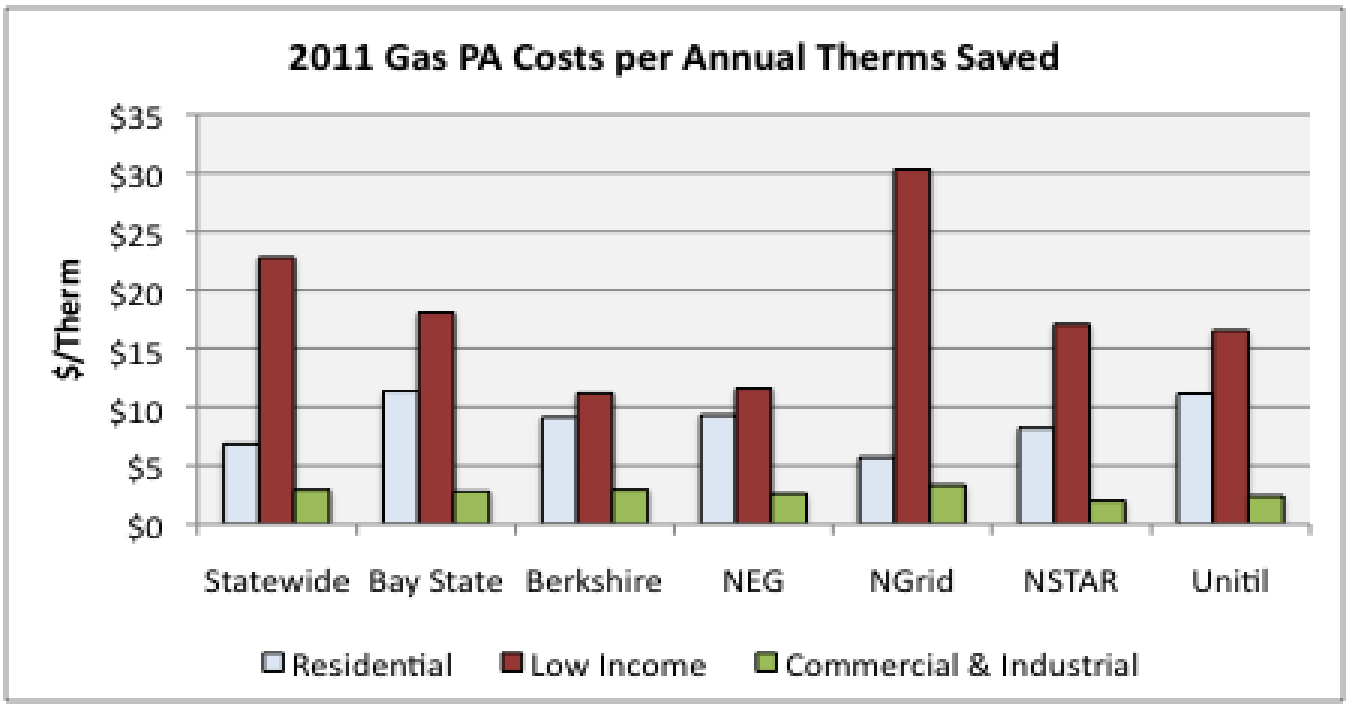

2011 Gas Plan v MTM Variance, Commercial & Industrial
Variance
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Annual Savings
Lifetime Savings
Total Benefits
Net Benefits

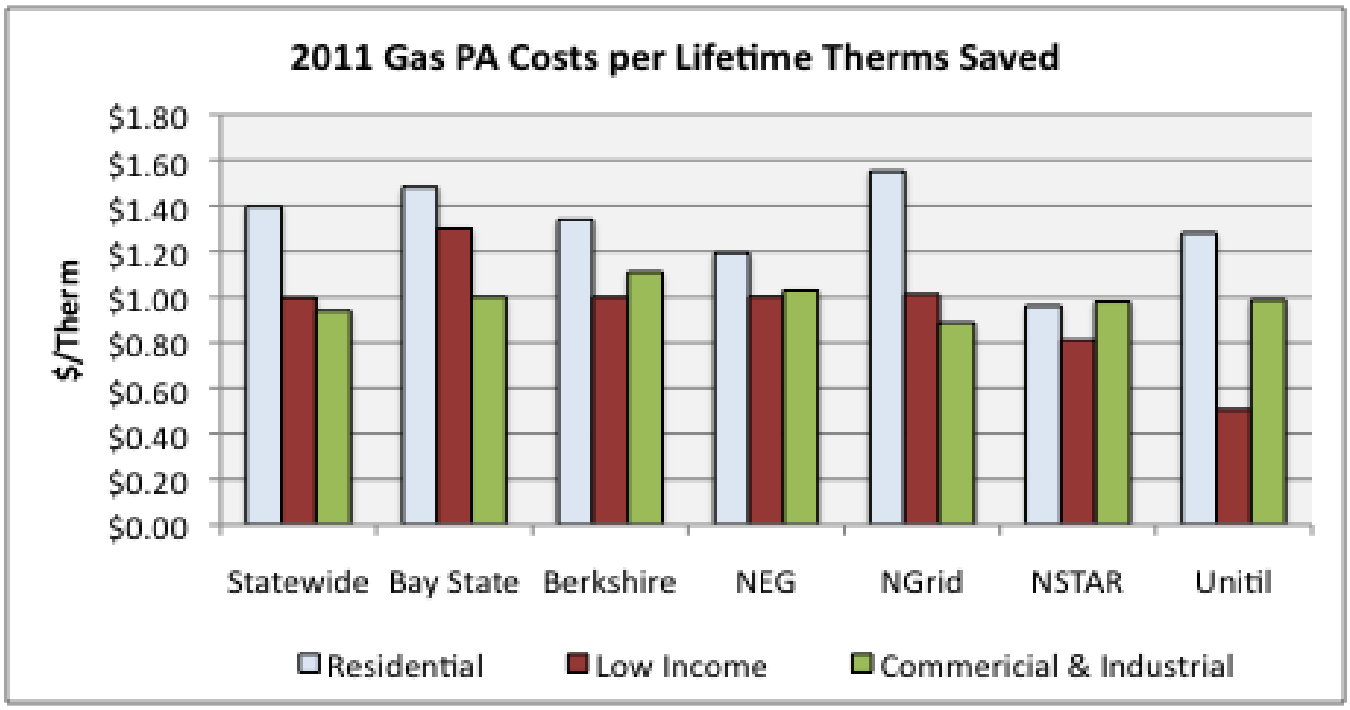

2011 Gas Plan v MTM Annual Therm Savings
Therm Savings
25000000
20000000
15000000
10000000
5000000
0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Plan
MTM

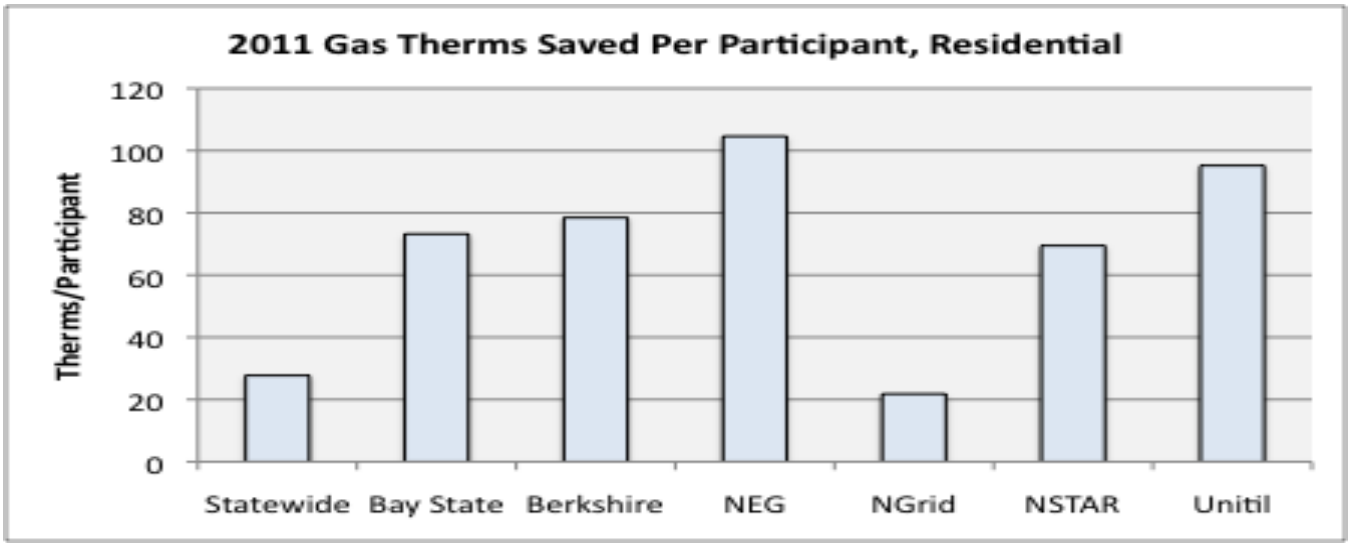

2011 Gas MTM v Plan Lifetime Therm Savings
Therm Savings
350000000
300000000
250000000
200000000
150000000
100000000
50000000
0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Plan
MTM

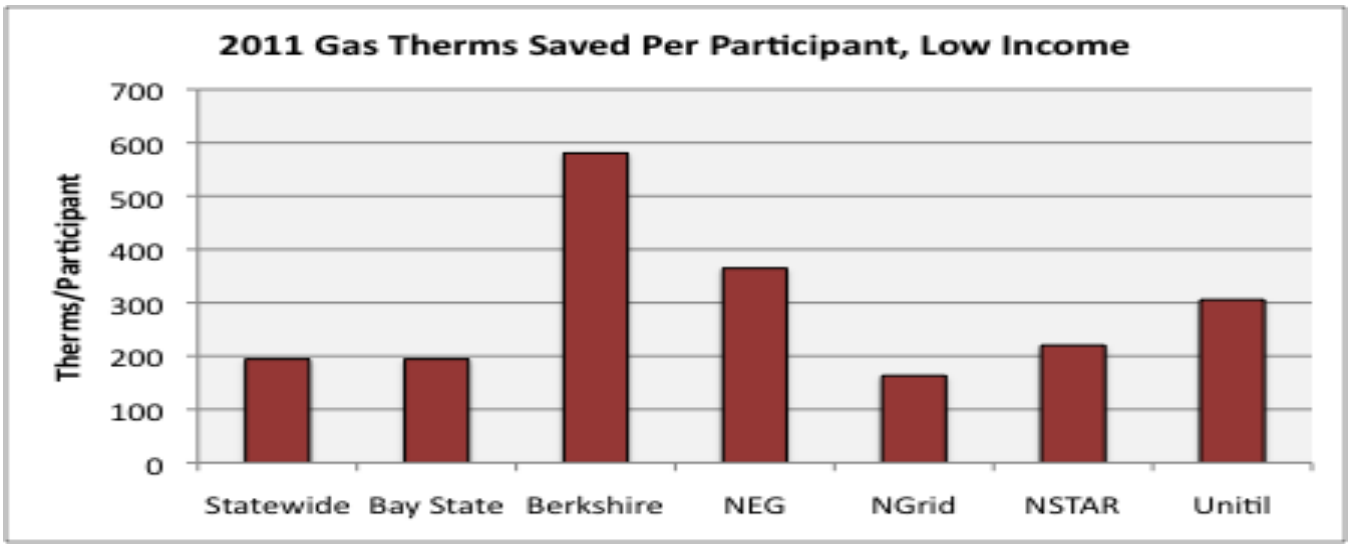

2011 Gas MTM v Plan Total Benefits
Millions of Dollars
$400
$350
$300
$250
$200
$150
$100
$50
$0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Plan
MTM

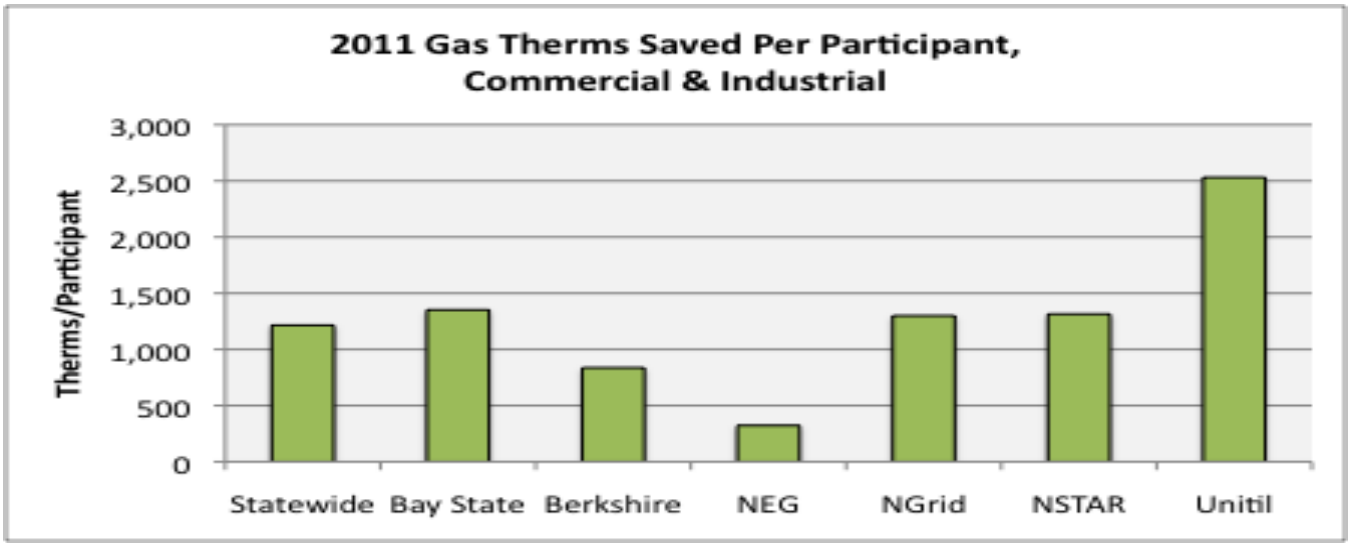

2011 Gas MTM v Plan Net Benefits
Millions of Dollars
$250
$200
$150
$100
$50
$0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Plan
MTM

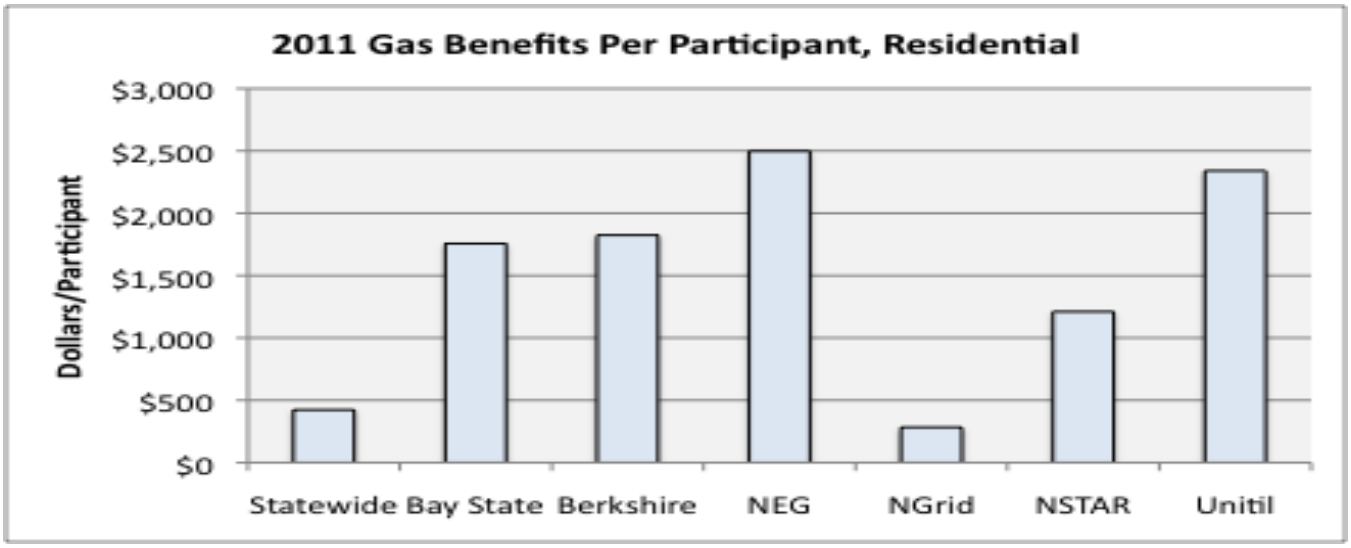

2011 Gas PA Costs per Annual Therms Saved
$/Therm
$35
$30
$25
$20
$15
$10
$5
$0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Residential
Low Income
Commercial & Industrial

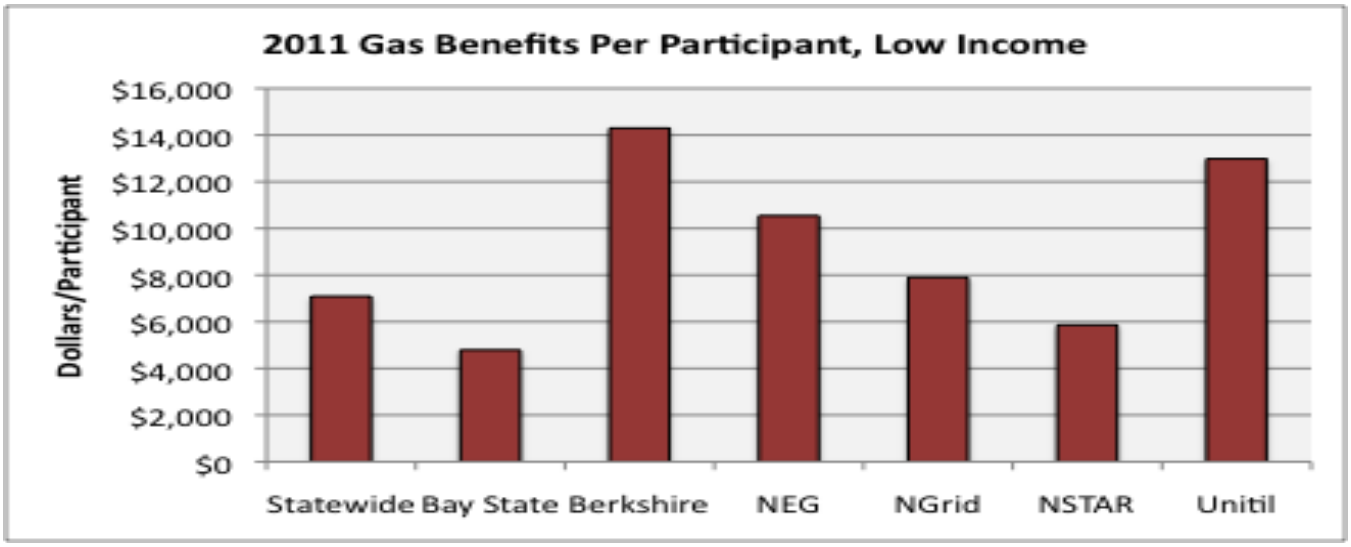

2011 Gas PA Costs per Lifetime Therms Saved
$/Therm
$1.80
$1.60
$1.40
$1.20
$1.00
$0.80
$0.60
$0.40
$0.20
$0.00
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Residential
Low Income
Commericial & Industrial

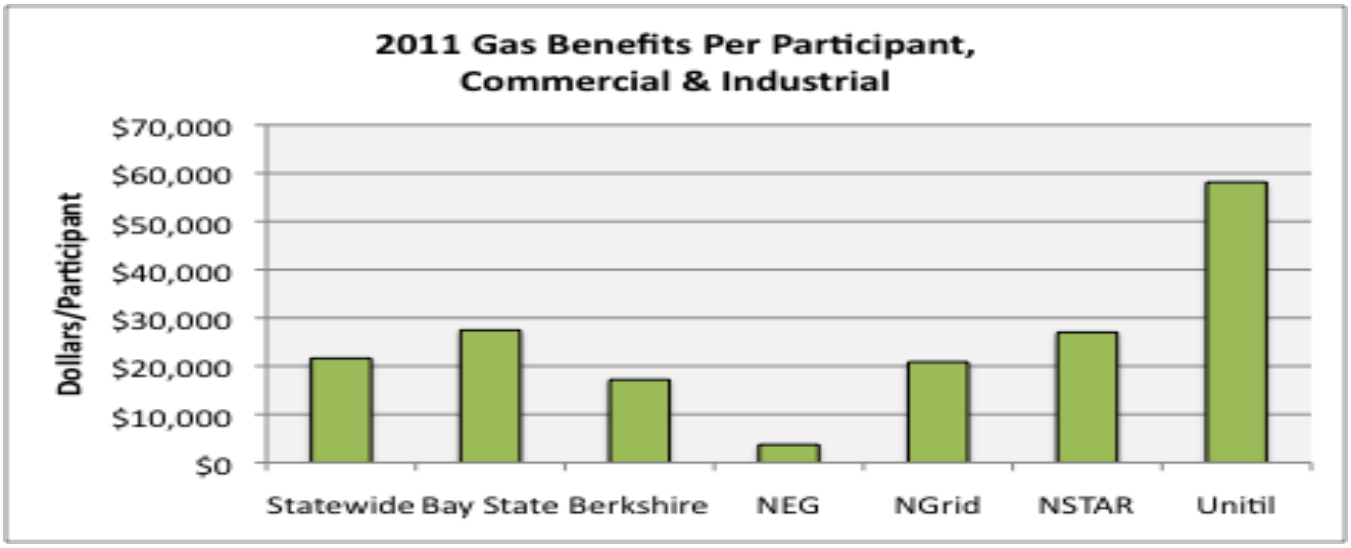

2011 Gas Therms Saved Per Participant, Residential
Therms/Participant
120
100
80
60
40
20
0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil

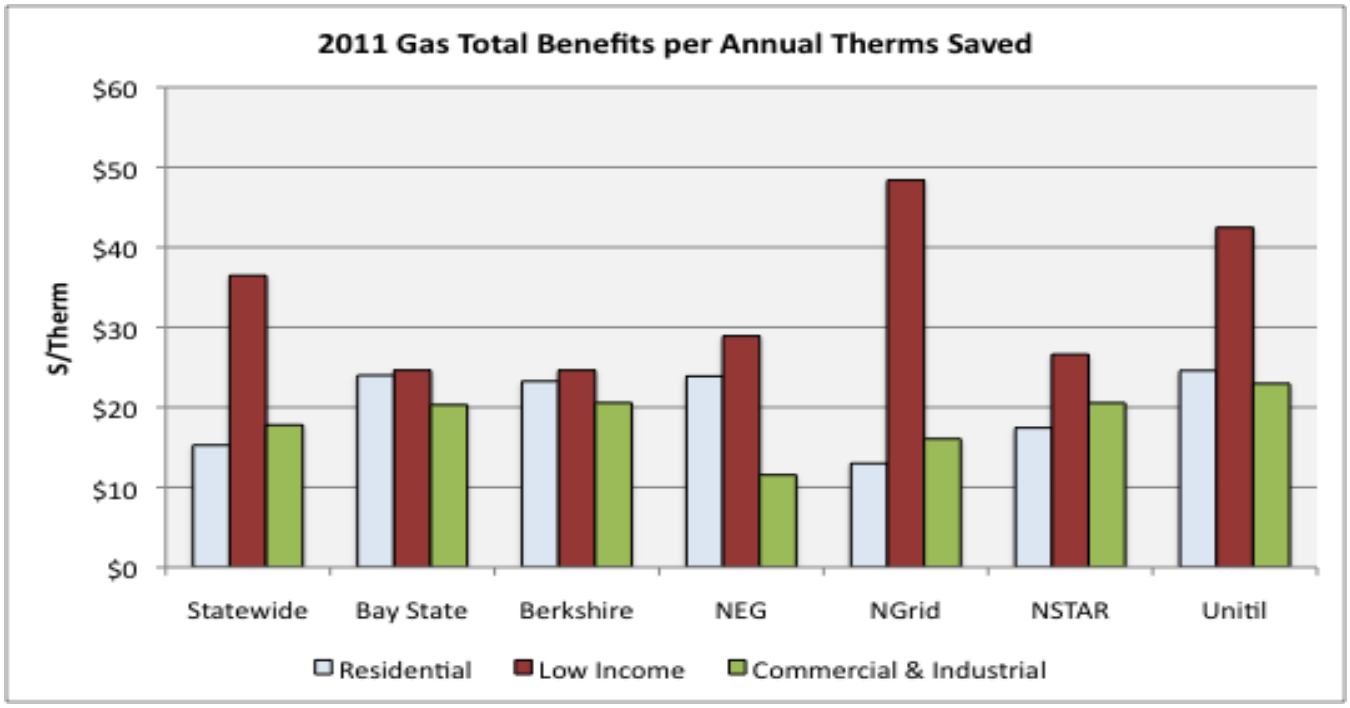

2011 Gas Therms Saved Per Participant, Low Income
Therms/Participant
700
600
500
400
300
200
100
0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil


2011 Gas Therms Saved Per Participant,
Commercial & Industrial
Therms/Participant
3,000
2,500
2,000
1,500
1,000
500
0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil

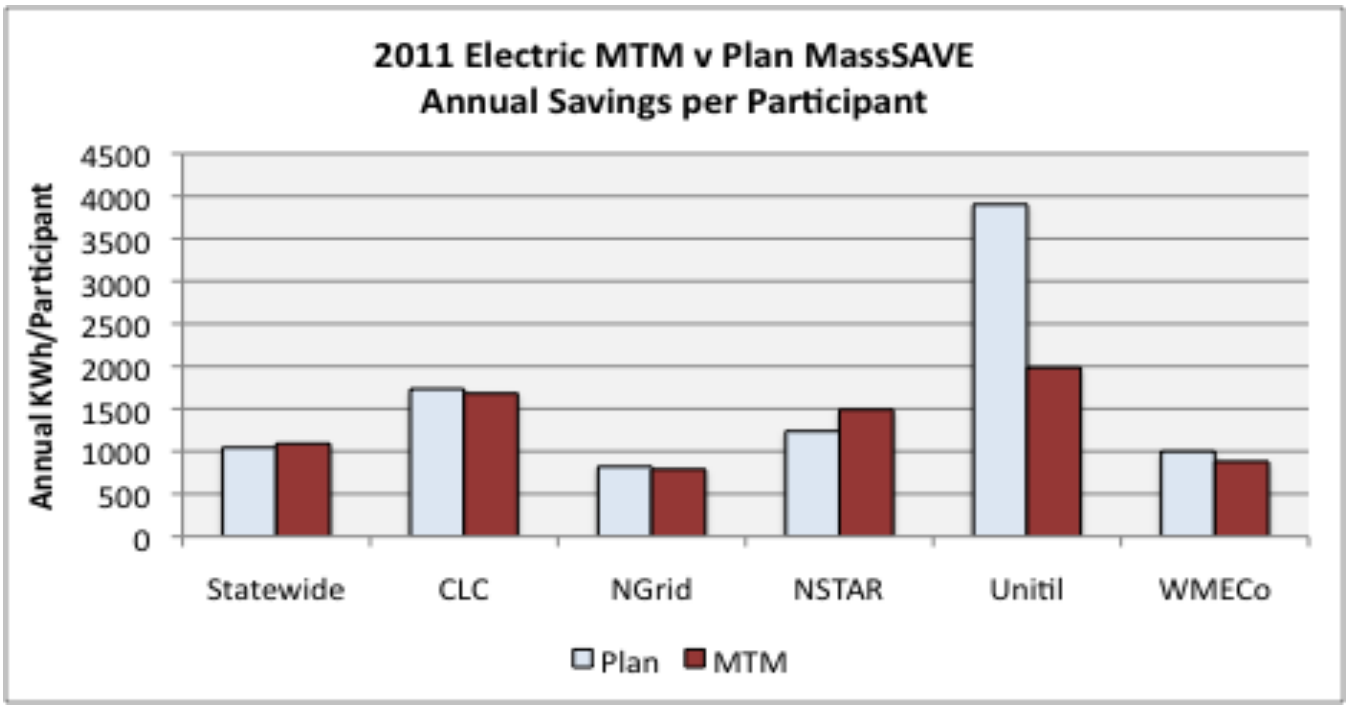

2011 Gas Benefits Per Participant, Residential
Dollars/Participant
$3,000
$2,500
$2,000
$1,500
$1,000
$500
$0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil

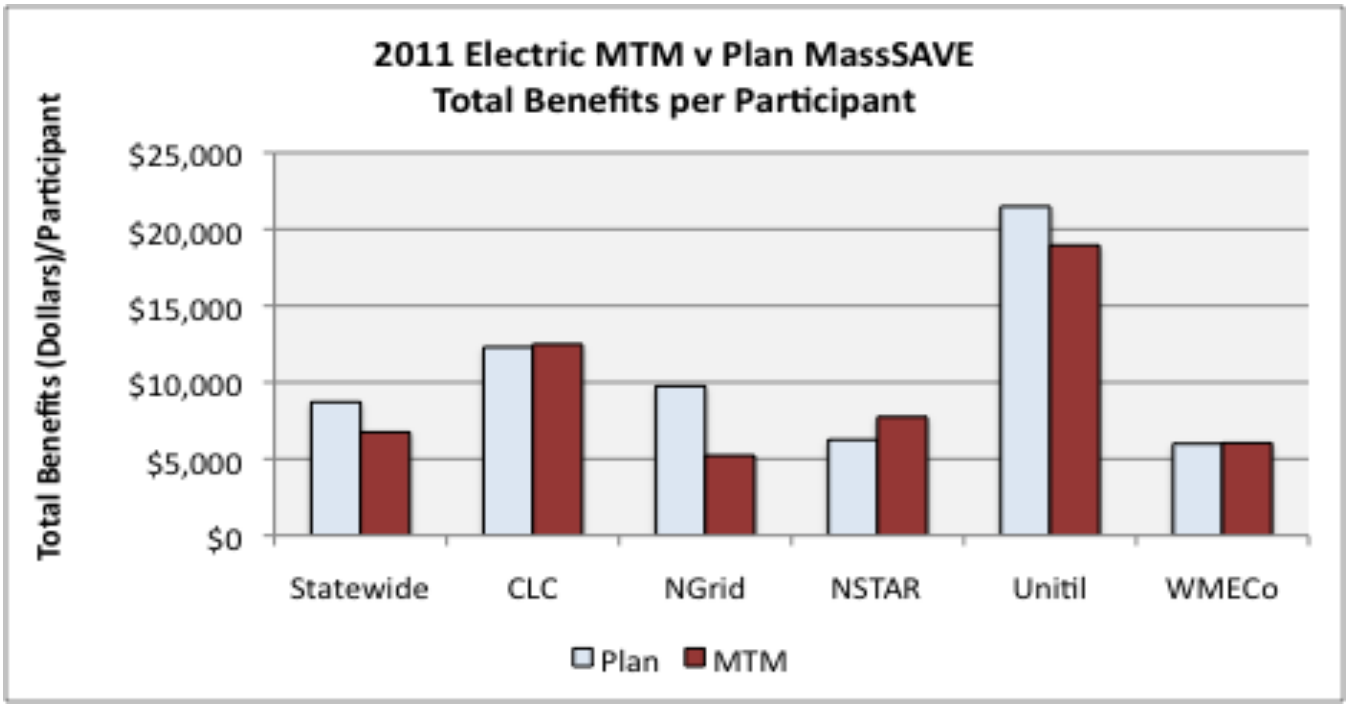

2011 Gas Benefits Per Participant, Low Income
Dollars/Participant
$16,000
$14,000
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil

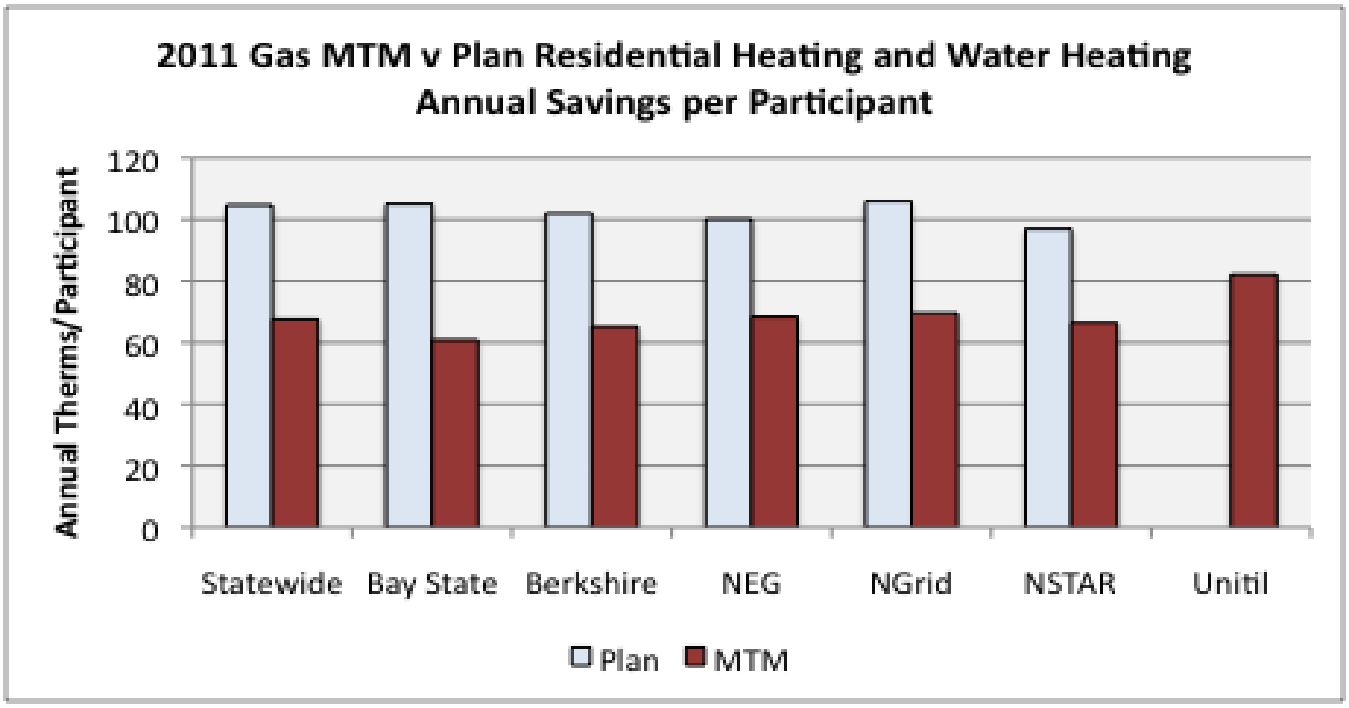

2011 Gas Benefits Per Participant,
Commercial & Industrial
Dollars/Participant
$70,000
$60,000
$50,000
$40,000
$30,000
$20,000
$10,000
$0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil

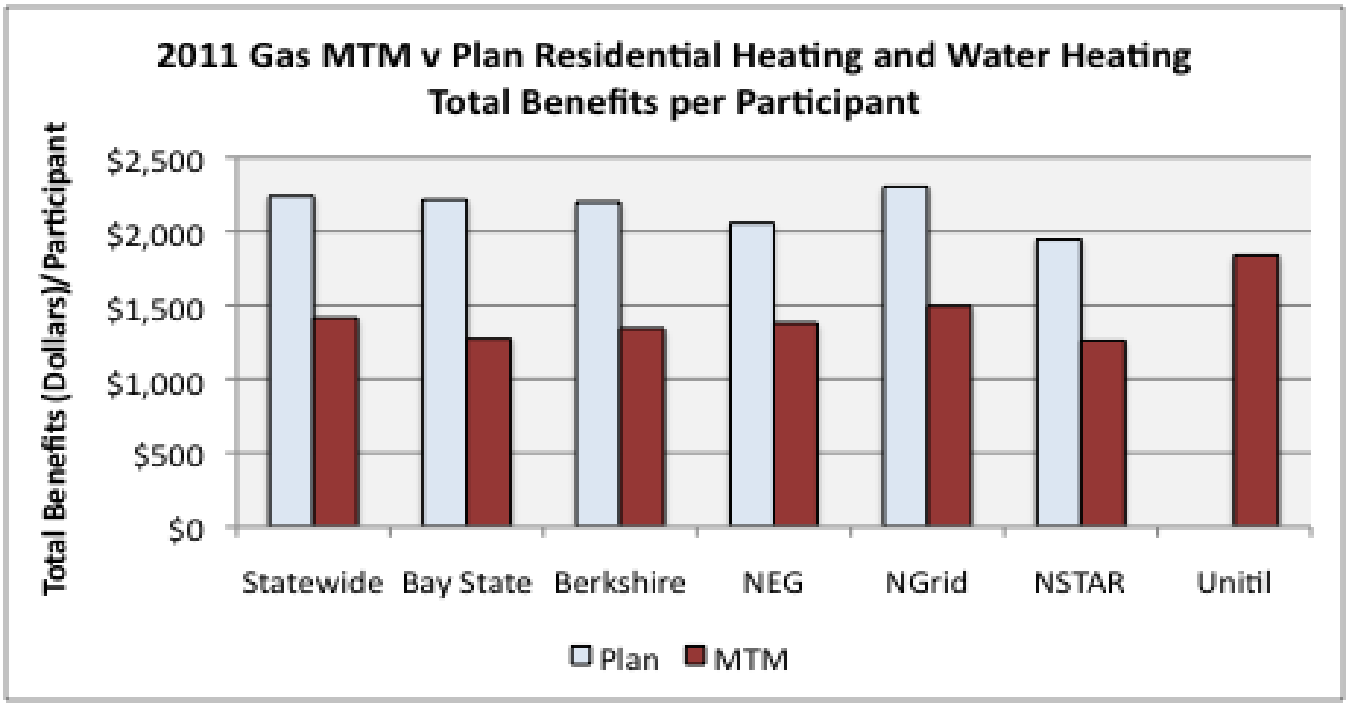

2011 Gas Total Benefits per Annual Therms Saved
$/Therm
$60
$50
$40
$30
$20
$10
$0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Residential
Low Income
Commercial & Industrial

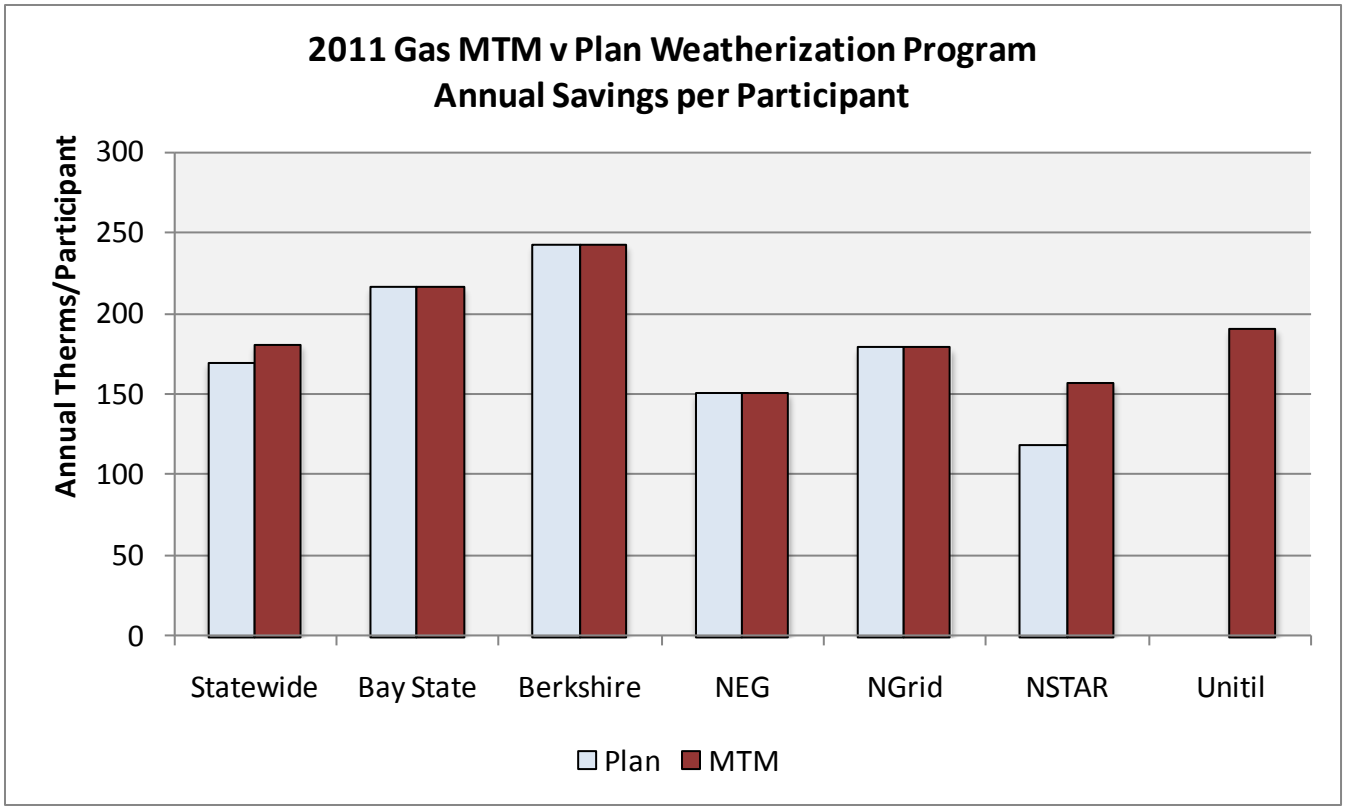
Savings and Benefits Per Participant – Examples for Several Programs

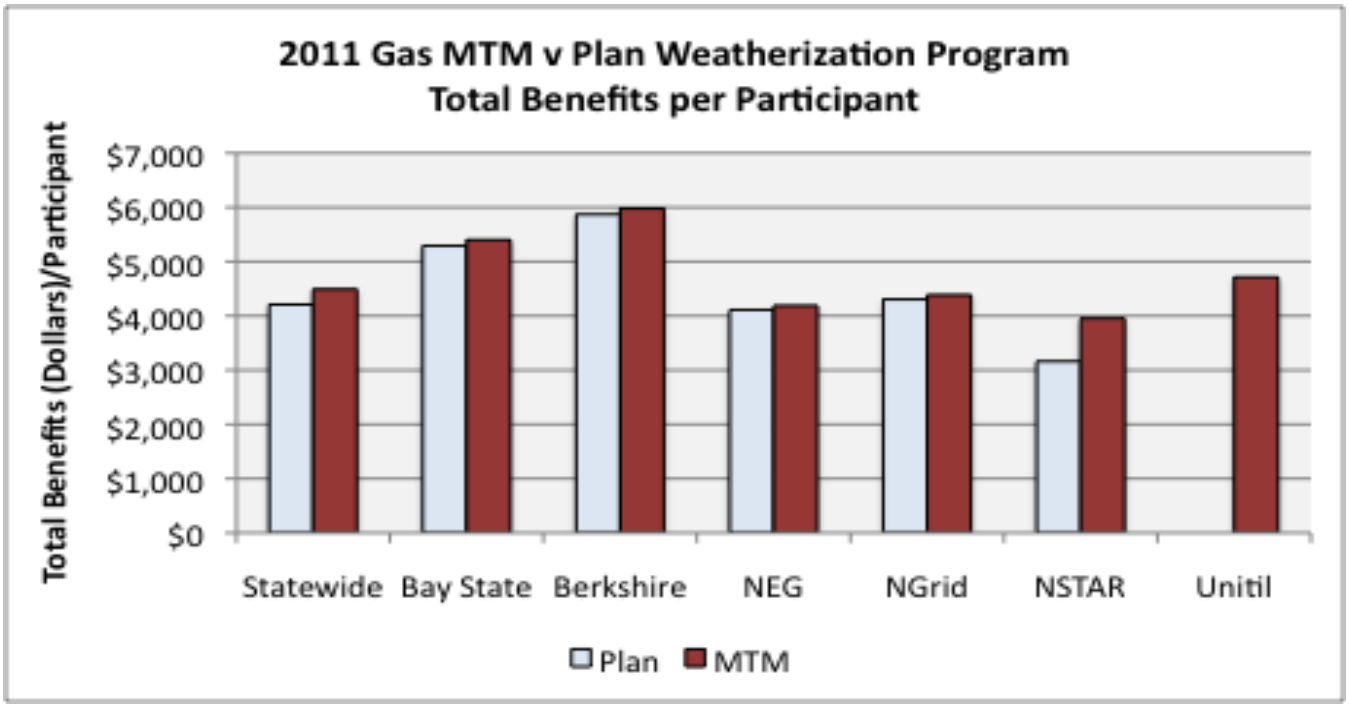


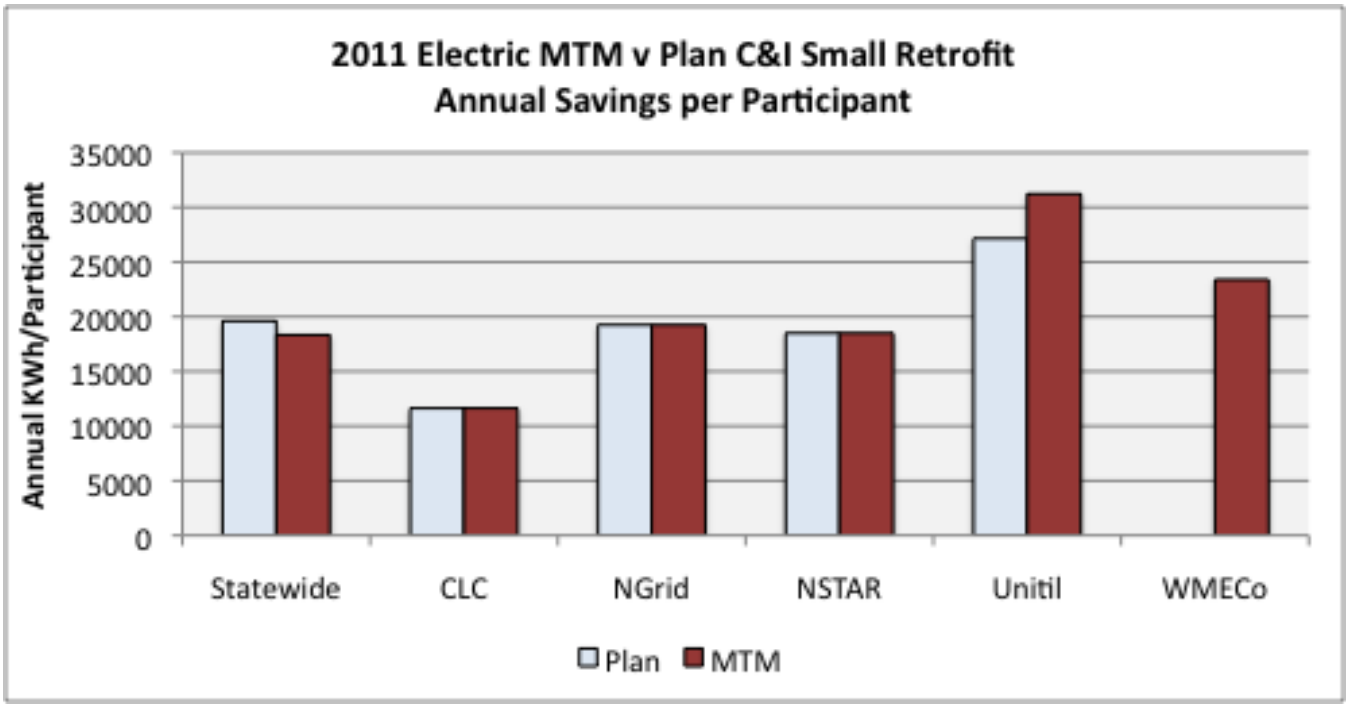


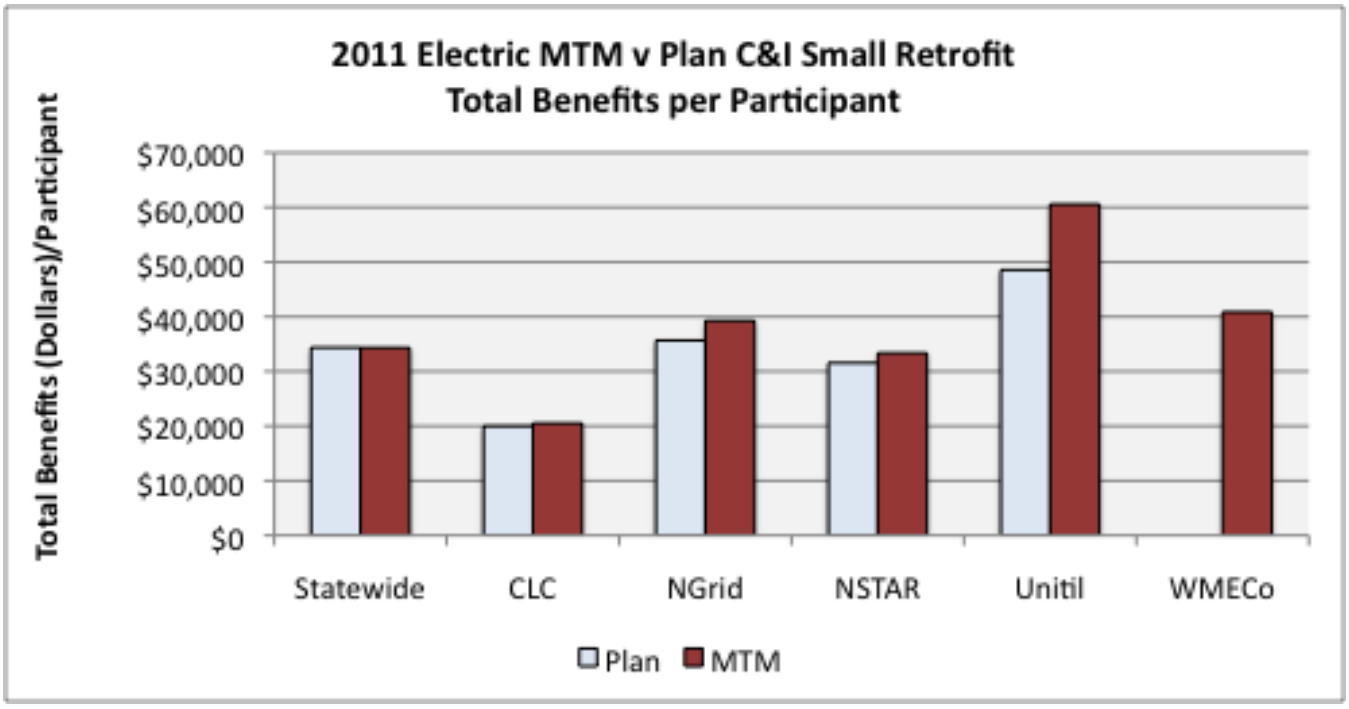

2011 Gas MTM v Plan Residential Heating and Water Heating
Annual Savings per Participant
Annual Therms/Participant
120
100
80
60
40
20
0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Plan
MTM

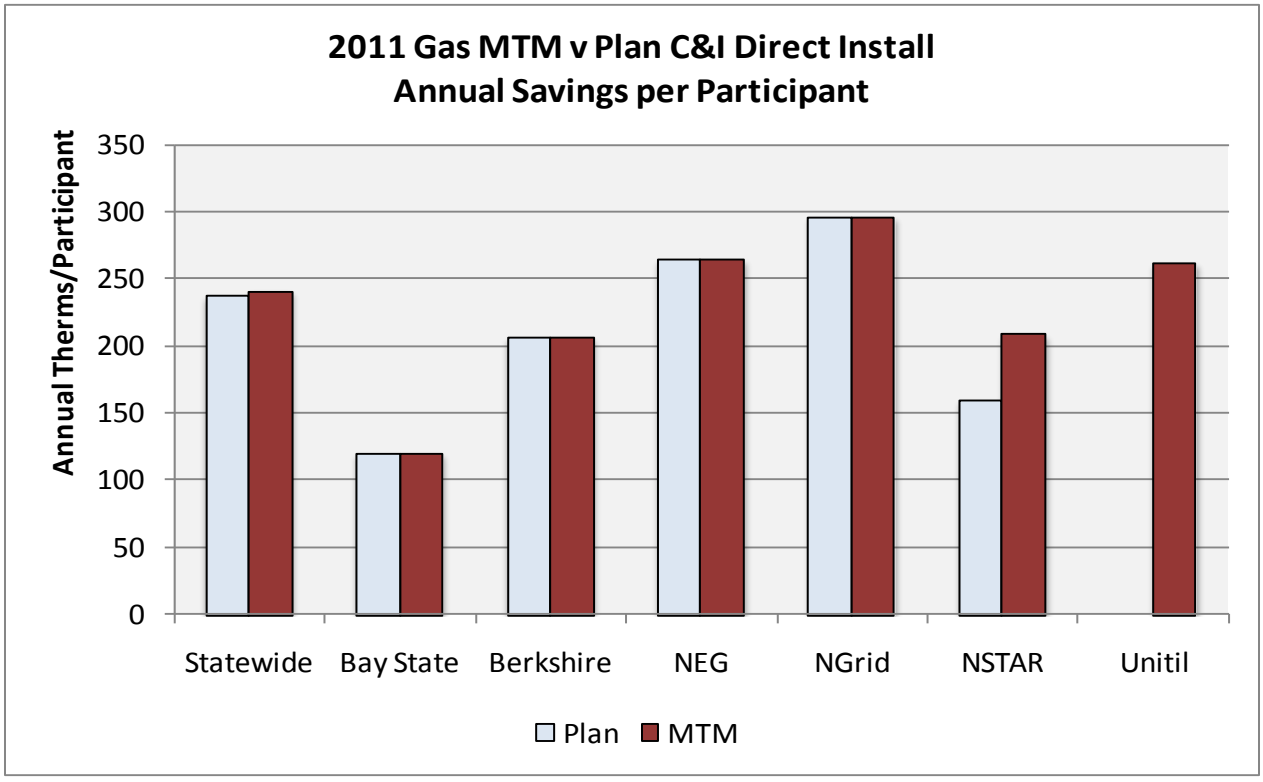

2011 Gas MTM v Plan Residential Heating and Water Heating
Total Benefits per Participant
Total Benefits (Dollars)/Participant
$2,500
$2,000
$1,500
$1,000
$500
$0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Plan
MTM

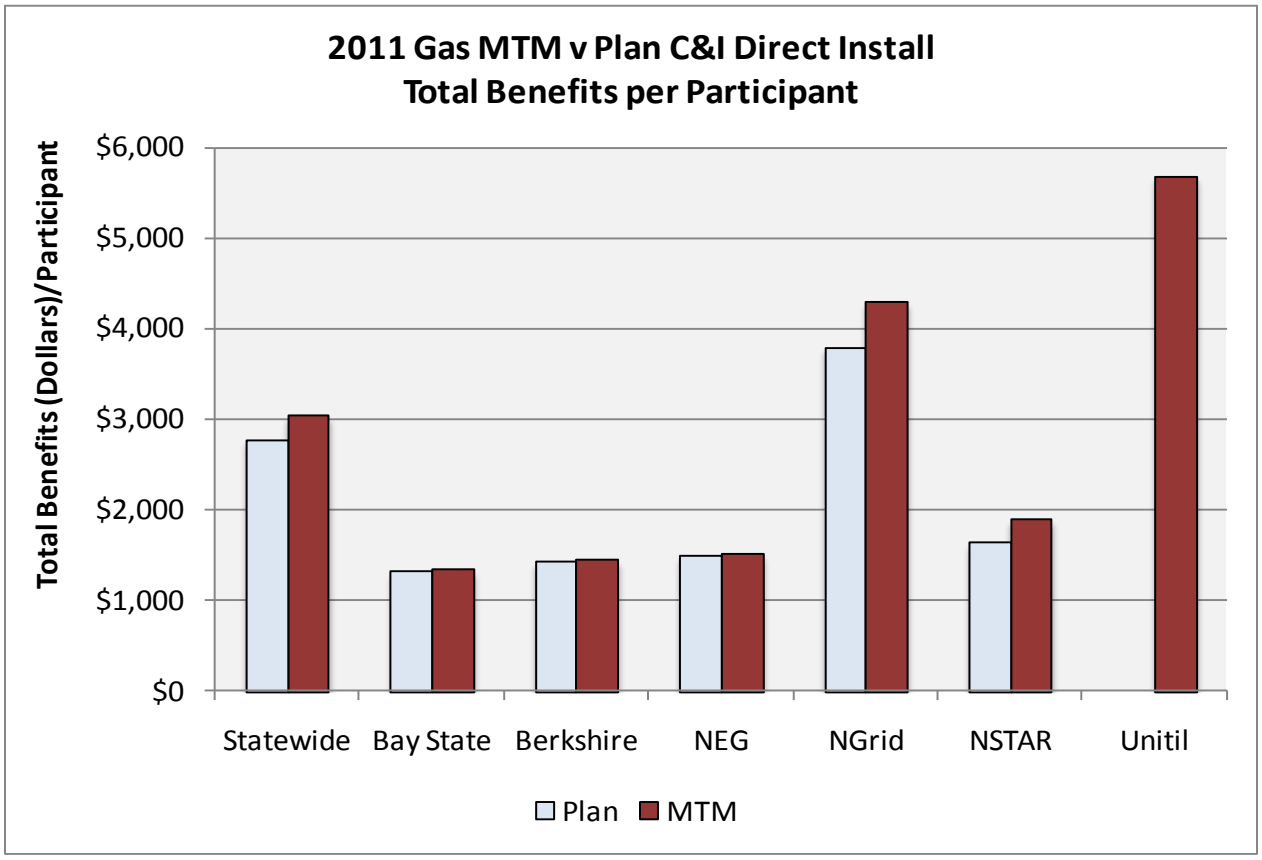

2011 Gas MTM v Plan Weatherization Program
Annual Savings per Participant
Annual Therms/Participant
300
250
200
150
100
50
0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Plan
MTM


2011 Gas MTM v Plan Weatherization Program
Total Benefits per Participant
Total Benefits (Dollars)/Participant
$7,000
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Plan
MTM


2011 Electric MTM v Plan C&I Small Retrofit
Annual Savings per Participant
Annual KWh/Participant
35000
30000
25000
20000
15000
10000
5000
0
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo
Plan
MTM


2011 Electric MTM v Plan C&I Small Retrofit
Total Benefits per Participant
Total Benefits (Dollars)/Participant
$70,000
$60,000
$50,000
$40,000
$30,000
$20,000
$10,000
$0
Statewide
CLC
NGrid
NSTAR
Unitil
WMECo
Plan
MTM


2011 Gas MTM v Plan C&I Direct Install
Annual Savings per Participant
Annual Therms/Participant
350
300
250
200
150
100
50
0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Plan
MTM


2011 Gas MTM v Plan C&I Direct Install
Total Benefits per Participant
Total Benefits (Dollars)/Participant
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
Statewide
Bay State
Berkshire
NEG
NGrid
NSTAR
Unitil
Plan
MTM

Appendix C-1
Summary of Electric PA Mid-Term Modifications

and

Appendix C-2
Summary of Gas PA Mid-Term Modifications

Appendix C-1 – Summary of Electric PA MTMs

	National Grid	NSTAR	WMECO	Unitil	CLC
MTMs (Significant Modifications – formal filings with the DPU)	2	none)	none	1	none
Modifications that do not trigger formal filings (savings, cost, PI)	12	10	8	7	1
Supplemental Information as directed by the Department for 2011					
1) Revised 2011 performance incentive allocations and metrics	Each PA has proposed revised 2011 performance incentive allocations and metrics. No agreement with the consultants on PI				N/A
2) 2011 EM&V Plan	PAs provided their version of the 2011 plan, for the most part a consensus plan. A few key issues remain				
3) Pilot program budgets	2 new 1 – increase in budget; 1 – decrease in budget Pilots exceed 1% of budget in 2011	1 – increase in budget	No change	none	4 changes to pilots: Two increases in budget; One decrease in budget; One elimination of a pilot
4) Savings goals and budgets in order to reflect outside funding received	The PAs not proposing to modify their savings goals or budgets for 2011 based on the level of outside funding obtained in 2010.				

National Grid Electric

MTMs (Significant Modifications – formal filings with the DPU)
1. The Company proposes to increase the program budget for its *Behavior/Feedback program* by approximately $1 million for 2011. This is a 72% increase in program cost for the year, and 38% over the three year 2010-2012 period. 2. The Company proposes to increase the savings goals for its Low-Income Residential New Construction program by approximately 128% in 2011, (34% over the three years). 3. The Company proposes to increase the Multi-Family Retrofit performance incentive and decrease the Mass Save performance incentive budgets to amend the accidental interchange of these values in the Company's Plan. These both result in performance budget changes for each program in excess of 20 percent over three years, but have no impact at the sector level. 4. The Company proposes to add a Community Based Initiative/Pilot program for residential customers for 2011. The estimated budget for this pilot is approximately $250,000. 5. The Company proposes to add a Pilot program for residential customers for Research & Development and Demonstration ("R&D and Demonstration") for 2011. The estimated budget for this pilot is approximately $250,000.
Modifications that do not trigger formal filings
1. 2011 Adjustments: 2. The Company proposes a -41% adjustment in total benefits in the Residential new construction & major renovation program, for a total Residential sector adjustment of -32%. 3. The Company proposes a 29% adjustment in Lifetime MWh in the Residential Cooling & Heating program. 4. The Company proposes a -24% adjustment in Lifetime MWh savings in the Mass Save HES program. 5. The Company proposes 50% adjustment in Lifetime MWh savings in the Energy Star Lighting program. 6. The Company proposes a -22% adjustment to the budget of the Deep Energy Retrofit pilot. 7. The Company proposes a 265% increase in budget for the Residential new construction lighting design statewide pilot. 8. The Company proposes a 24% increase in Annual MWh savings for the Low-income 1-4 family retrofit program. 9. The Company proposes a -24% adjustment in Annual WMh savings for the Low-income MF retrofit program. 10. The Company proposes modifications in Performance Incentives: -35% in Residential, -38% in Low-income, and an increase of 37% in C&I.
PA Specific Supplemental Information
In addition to proposing budgets for its new pilots, Company requests approval of its remaining 2011 pilots, as noted in Exhibit A and Exhibit D**.** The total budget for Pilot programs has exceeded one percent of the 2011 National Grid annual electric energy efficiency fund, and is approximately 1.07 percent of the 2011 National Grid annual electric energy efficiency fund.

NSTAR Electric

MTMs (Significant Modifications – formal filings with the DPU)
1. The Company proposes to reduce C&I statewide marketing & education program by 63% in 2011, and by 26% 2010-2012. 2. The Company proposed to reduce 2011 low-income sector costs by 26%.
Modifications that do not trigger formal filings
2011 Adjustments: 1. The Company proposes an increase in Annual MWh savings by 30% in Residential new construction & major renovation. 2. The Company proposes an increase in Annual MWh savings by 42% in the Residential cooling and heating equipment program. 3. The Company proposes a decrease in Performance Incentives by 24% in the Residential MF retrofit program. 4. The Company proposes an increase in Total Benefits by 21% in the Mass Save HES program. 5. The Company proposes an increase in Lifetime MWh savings by 72% in the Low-income residential new construction program. 6. The Company proposes to reduce the budget by 44% in the Low-income MF retrofit program. 7. The Company proposes an increase in the budget by 48% for the Community-based Pilot. 8. The Company proposed an increase in TRC costs in the portfolio by 34%. 9. The Company proposes to add a Sponsorships & Subscriptions category to both Residential and C&I sector budgets.
PA Specific Supplemental Information - none

WMECO

MTMs (Significant Modifications – formal filings with the DPU)
None
Modifications that do not trigger formal filings
1. The Company proposes an 86% increase in non-electric benefits, and 40% increase in TRC costs, for the Energy Star Lighting program. 2. The Company proposes a 24% increase in Lifetime MWh savings for the Low-income sector. 3. The Company proposes a total benefits adjustment of -29% for the Low-income residential new construction program. 4. The Company proposes a -38% adjustment in Performance Incentives in the Low-income sector, and an increase of 20% in the C&I sector. 5. The Company proposes a -35% adjustment in PI for the Low-income MF retrofit program. 6. The Company proposes a 21% increase in Lifetime MWh savings for the C&I sector. 7. The Company proposes to add a Sponsorships & Subscriptions category to both Residential and C&I sector budgets.
PA Specific Supplemental Information - none

Unitil Electric

MTMs (Significant Modifications – formal filings with the DPU)
The Company proposes to increase funding for Low-income Multifamily projects in 2011, increasing overall low-income sector spending in 2011 by 32%, and savings by 30%.
Modifications that do not trigger formal filings
2011 Adjustments: 1. The Company proposes a decrease in Net Benefits of 46% in the Residential new construction & major renovation program. 2. The Company proposes a -22% adjustment to the Mass Save HES budget. 3. The Company proposes a 25% increase in Total Benefits in the Small C&I program.
PA Specific Supplemental Information - none

Cape Light Compact

MTMs (Significant Modifications – formal filings with the DPU)
none
Modifications that do not trigger formal filings
CLC proposes a 22 percent increase in the low Income MultiFamily Retrofit 2011 annual savings 2011 Adjustments.
PA Specific Supplemental Information – The CLC proposed pilot budget adjustments for 2011 (and 2012). The CLC notes that its pilot budget in 2011 is approximately 2.32% of its 2011 total budget, and its 2010-2012 total pilot budget is approximately 2.05% of its 2010-2012 total budget.

Appendix C-2 - Summary Gas PA MTMs

	National Grid	NSTAR	Columbia	New England	Berkshire	Unitil
MTMs (Significant Modifications – formal filings with the DPU)	5	3	1	none	none	
Modifications that do not trigger formal filings (savings, cost, PI)	6	6	7	2	5	2
Supplemental Information as directed by the Department for 2011						
1) Revised 2011 performance incentive allocations and metrics	Each PA has proposed revised 2011 performance incentive allocations and metrics, as mandated by the Gas Order.					
2) 2011 EM&V Plan	PAs provided their version of the 2011 plan, for the most part a consensus plan; A few key issues remain					
3) Pilot program budgets	none	2	none	none	Eliminate one	none
4) Savings goals and budgets in order to reflect outside funding received	The PAs are not proposing to modify their savings goals or budgets for 2011 based on the level of outside funding obtained in 2010.					

National Grid Gas

MTMs (Significant Modifications – formal filings with the DPU)
1. The Company proposes to increase the program budget for its *Behavioral/Feedback program* (O Power) by approximately $1 million (67% increase in 2011 cost, 42% for the 2010-2012 period). Savings are expected to increase by 40% in 2011 and 46% over the 2010-2012 period. 2. The Company proposes to decrease the savings goals for its *Residential New Construction & Major Renovation program* by approximately 66% in 2011 and 21% over the 2010-2012 period. 3. The Company proposes to increase the program budget for its *Low Income Multifamily Retrofit* program by approximately $2.7 million. Costs are expected to increase by 97% in 2011 and 33% over the 2010-2012 period. This modification is intended to address the cost to serve this market sector relative to the therm savings realized, as estimated by the Low Income Energy Affordability Network (LEAN) for this new program that provides very comprehensive measure installations in a unique market sector. 4. The Company proposes a Low Income sector budget increase of approximately 19 percent as a result of increasing the Low Income Multifamily Retrofit incentive budget. 5. The Company proposes to add a Sponsorships & Subscriptions category to both Residential and C&I sector budgets. 6. The Company proposes modifications to performance incentives resulting in 3-year budget changes: Multifamily Retrofit (21.9% increase), Residential New Construction & Major Renovations (20.0% decrease), Low-Income Multifamily Retrofit (24.1% decrease).
Modifications that do not trigger formal filings
1. The Company proposes to decrease the savings goals for its *Residential High Efficiency Heating Equipment program* by approximately 51 percent. The primary drivers of the 2011 change are the results of a Heating and Water Heating Process and Impact Evaluation completed during the 2010 program year. The report showed high free-ridership among program participants for the seven program measures evaluated. 2. The Company proposes to decrease Total Benefits in the Residential sector by 34%. 3. The Company proposes to increase annual therm savings by 56% in the Residential Multifamily retrofit program. 4. The Company proposes to increase by 26% the budget of the Energy Analysis: Internal Audit Program.
PA Specific Supplemental Information - none

NSTAR Gas

MTMs (Significant Modifications – formal filings with the DPU)
1. The Company proposes to increase the program budget for its *Low Income Multifamily Retrofit* program by approximately $1.5 million, to address the demand for energy efficiency in the multi-family sector. Costs are expected to increase by 128% in 2011 and 41% over 2010-2012. Savings goals increase by 111% in 2011 and 36% over 2010-2012. 2. The Company proposes to increase the program budget for its *C&I New Construction and Major Renovation Program* by approximately $850,000. Costs are expected to increase by 105% in 2011 and 191% over 2010-2012. Savings goals increase by 30% in 2011 and 56% over 2010-2012. The budget increase is intended to address projection of program activity in 2011 based on 2010 year-to-date tracking information, accounting for new 2010 participation in the EE programs by T-1 and G-53 customers. 3. The company proposes to extend the *Residential Behavior Feedback Program* (OPower) for 2011. This results in an increase in 2010-2012 cost of 88% and savings of 68%.
Modifications that do not trigger formal filings
1. *Residential New Construction and Major Renovation* **–** The proposed 40% budget increase for 2011(14% over the 2010-2012) is due to an expected increase in program participation (i.e., new homes being built) and rebate production over the forecasted period. This increase also includes a 30% increase of homes built in electric municipal territories where the gas program pays 100% of the incentives due to the inability to cost share with municipals. Updated savings in 2011 are projected to decrease by 43% (15% over 2010-2012), the result of building code changes that went into effect in July 2010 (lowering savings by approximately 30%), and (2) the estimated split between single family and multi-family homes shifted, with fewer single family units anticipated being built (and thus lowering savings as well). 2. *Mass Save HES* – The 10% budget increase is associated with the 2011 planned roll-out of the 3. electric and gas statewide/fuel-blind program redesign, including the full integration of weatherization/home performance contractors into the RCS program delivery. This redesign results in additional implementation dollars being required for program delivery and administration. 4. *Residential Heating and Water Heating* – Savings for this program are projected to decrease by 34% (11% over 2010-2012), based on the draft final evaluation results from an NMR study conducted during 2010 and changes to the program offerings and anticipated production. 5. *C&I Retrofit* – Based on 2010 year-to-date experience on actual spending and a projection of 2011 activity, the proposed budget for this program was reduced by 42% (11% over 2010-2012) and shifted to New Construction and Major Renovations (see MTM above) . Savings are consequently also reduced, 36% in 2011, 10% over 2010-2012. 6. *C&I Direct Install* – The 33% savings increase in 2011 (11% for 2010-2012) in this program is largely due to a larger increase in program offerings than was originally planned. 7. *Deep Energy Retrofit* – The Company proposes to reduce the budget for this pilot by 40% in 2011, due to lower

than expected customer demand.
PA Specific Supplemental Information
1. The Company is proposing a Community Based Pilot for 2011, which includes a budget of approximately $59,500. 2. The budget for the existing C&I Deep Energy Retrofit is proposed to be reduced by 34% in 2011 (1% over 2010-2012) based on the anticipated lack of activity in the C&I sector next year.

Columbia Gas

MTMs (Significant Modifications – formal filings with the DPU)
The Company proposes to reduce its *Low Income Multi-Family* savings goal by 61% in 2011 (21% over the 2010-2012 period). The 2011 budget will decrease by 1% reduction in 2011. This modification is intended to address the cost to serve this market sector relative to the therm savings realized, as estimated by the Low Income Energy Affordability Network (LEAN) for this new program that provides very comprehensive measure installations in a unique market sector.
Modifications that do not trigger formal filings
1. *Residential New Construction & Major Renovations*: The net annual savings for this program is expected to decrease by 51% in 2011 (for the 2010-2012 period the decrease is projected to be 16%). *2.* *Residential New Construction & Major Renovations*: The budget for the program is expected to decrease by 36% in 2011 (for the 2010-2012 period the decrease is projected to be 12%). 3. *Residential Heating and Water Heating*: The net annual savings for the program is expected to decrease by 46% in 2011 (for the 2010-2012 period the decrease is projected to be 16%). The primary drivers of the 2011 change are the results of a Heating and Water Heating Process and Impact Evaluation completed during the 2010 program year. The report showed high free-ridership among program participants for the seven program measures evaluated. 4. *Residential Heating and Water Heating*: The budget for the program is expected to increase by 23% in 2011 (for the 2010-2012 period the increase is projected to be 7%). **1.** Lifetime Therms in the Residential sector are expected to decrease by 33% in 2011, and by 23% in the Low-income sector **2.** Total Benefits in the Residential sector are expected to decrease by 33% in 2011, and by 22% in the Low-income sector. **3.** Performance Incentives are in the Low-income sector are proposed to decrease by 36% in 2011, and increase by 48% in the C&I sector.
PA Specific Supplemental Information – none

New England Gas

MTMs (Significant Modifications – formal filings with the DPU)
The Company is not proposing any significant modifications to its approved Plan, nor is the Company proposing to add or subtract any programs.
Modifications that do not trigger formal filings
1. *Residential Heating and Water Heating*: The net annual savings for the program is expected to decrease by 29% in 2011 (for the 2010-2012 period the decrease is projected to be 10%). The primary drivers of the 2011 change are the results of a Heating and Water Heating Process and Impact Evaluation completed during the 2010 program year. The report showed high free-ridership among program participants for the seven program measures evaluated. *2.* Performance Incentives are proposed to decrease in 2011 by 33% in the Residential sector, and increase by 27% in the Low-income sector.
PA Specific Supplemental Information – none

Unitil Gas

MTMs (Significant Modifications – formal filings with the DPU)
The Company proposes to increase funding for the Low-income Multifamily in the amount of approximately $227,300 in 2011, resulting in an increase in 2010-2012 Low-income savings of 33%.
Modifications that do not trigger formal filings
1. *Residential Heating and Water Heating*: The net annual savings for this program is expected to decrease by 25% in 2011 (for the 2010-2012 period the decrease is projected to be 16%). The primary drivers of the 2011 change are the results of a Heating and Water Heating Process and Impact Evaluation completed during the 2010 program year. The report showed high free-ridership among program participants for the seven program measures evaluated. 2. Total Benefits in 2011 are expected to decline in the Residential sector by 23%, and increase in the Low-income sector by 132%. 3. TRC Costs in 2011 are expected to increase in the Low-income sector by 144%.

Berkshire Gas

MTMs (Significant Modifications – formal filings with the DPU)
None
Modifications that do not trigger formal filings
1. *Residential Heating and Water Heating*: The net annual savings for this program is expected to decrease by 42% in 2011 (for the 2010-2012 period the decrease is projected to be 14%). The primary drivers of the 2011 change are the results of a Heating and Water Heating Process and Impact Evaluation completed during the 2010 program year. The report showed high free-ridership among program participants for the seven program measures evaluated. 2. *C&I New Construction & Major Renovation*: The net annual savings for the program is expected to decrease by 29% in 2011 driven by experience in the field and projections of construction activity for 2011 (for the 2010-2012 period the decrease is projected to be 10%). *3.* *Deep Energy Retrofit pilot:* The Company proposes to eliminate this pilot in both the Residential and C&I sectors due to lack of customer demand. *4.* In the Residential sector, Net Benefits are expected to decrease by 25%, and Total Benefits expected to decrease by 24% in 2011. *5.* Performance Incentives in the C&I sector are proposed to increase by 33% in 2011.
PA Specific Supplemental Information
The Company is proposing to eliminate the *Deep Energy Retrofit pilot* (in both the Residential and Commercial & Industrial sectors) in 2011 and 2012 due to its determination of the lack of available participants in the Company's service territory. The Company will continue to actively monitor Deep Energy Retrofit matters and reserves the right to review this pilot effort in 2012 based on then-current conditions.
PA Specific Supplemental Information – none

Appendix D

Program-Specific Variance Data

Program-Specific Variance Data

The material below provides examples of differences in program data across PAs. Section J of the report lists three categories of likely reasons for these differences: inconsistencies in planning numbers and methodologies across the PAs; lack of coordinated planning across the PAs; and need to more accurately account for shifting baselines and future impacts. These examples are meant to highlight directionally the value of information and processes that provide the opportunity for the PAs to coordinate program planning across the service territories even further and to harmonize data assumptions, methods, and inputs for program factors where it can be done. The Consultants expect that this process will provide insights into factors which are different across PAs, and may enable additional ways to examine market segmentation and to acquire savings. This will be especially valuable before the 2012 mid-term modification planning and subsequent planning cycles are fully underway.

Residential

Cool Smart Program

For several measures NSTAR and Unitil have savings/unit values in their screening models that are different from the other three electric PAs. For example, Unitil and NSTAR claim 72kWh/yr for a 14.5 SEER CAC while the other PAs claim 103 kWh/yr

Lighting Program

There is a wide variation in the 2011 cost per savings values for this program across the PAs. NSTAR's 2011 value of $239/MWh is twice that of WMECo's ($119/MWh). WMECo's lower cost per savings value appears to be a combination of different measure mix than that of other PAs (lesser emphasis on specialty CFLs and greater focus on hard to reach CFLs) and lower incentive levels for each product type (all the PAs offer different incentives for different CFL type or delivery target, but WMECO's are lower for each category). The following tables show these relationships across the PAs. This results in an average incentive per CFL that is less than half that of the other PAs.

	2011 CFL Incentives				
	NGrid	**NSTAR**	**CLC**	**WMECo**	**Unitil**
Spiral CFL	$ 1.60	$ 1.60	$ 1.60	$ 1.50	N/A
Specialty CFL	$ 6.00	$ 6.00	$ 6.00	$ 3.00	$ 6.00
Hard to Reach CFL	$ 1.60	$ 2.00	$ 1.60	$ 1.50	N/A
School fundraising CFL	$ 4.50	$ 4.50	$ 4.50	$ 2.00	$ 5.00
Average Incentive/CFL	**$ 3.74**	**$ 4.03**	**$ 3.71**	**$ 1.74**	**$ 5.11**

There is also significant variation in the number of CFLs that will be rebated per residential customer in 2011, with the program impact at WMECO expected to be significantly higher than that of the larger PAs (NSTAR and NGrid). WMECo has noted that they have allocated more

resources to their lighting program to help attain their overall residential goals while minimizing program costs and rate impacts.

CFLs/Customer			
	CFLs	**Customers (2007)**	**CFLs/Customer**
NGrid	1,320,000	1,061,719	1.24
NSTAR	1,095,000	628,471	1.74
CLC	355,000	158,000	2.25
WMECo	459,698	180,795	2.54
Unitil	9,204	24,376	0.38
TOTAL/Average	3,238,902	2,053,361	1.58

There are large differences across PAs in their proposed CFL measure mix in 2011. The percentage of spiral CFLs that are being rebated as a percentage of total CFLs varies from 0% for Unitil to 32% for National Grid while the percentage of hard-to-reach CFLs varies from 89% for Unitil to 18% for NSTAR. While some differences across PAs would be expected, the observed differences in planning assumptions raise some questions about the level of coordination among PAs in their 2011 program planning.

Breakout of CFL Measure Mix							
	CFLs	**% of All CFLs**	**NGrid**	**NSTAR**	**CLC**	**WMECo**	**Unitil**
Screw-in Bulbs	796,976	25%	32%	27%	6%	12%	0%
Screw-in Bulbs (Specialty bulbs)	1,401,837	43%	48%	52%	45%	9%	11%
Hard to Reach Bulbs	884,999	27%	19%	18%	45%	58%	89%
Screw-in Bulbs - School Fundraiser	155,090	5%	2%	2%	4%	21%	0%
TOTAL	3,238,902	100%	100%	100%	100%	100%	100%

Appliance Program

While the 2011 cost per savings Appliance program indicators do not vary as much as they do for lighting across the PAs, there are some significant differences that may warrant further inquiry in a way similar to the presentation on lighting products above. For example, National Grid's cost to acquire savings in this program ($436/MWh) is more than 50% higher than that of the CLC ($288/MWh).

As with the Lighting Program, the PAs have very different measure mixes for this program. WMECo relies on the refrigerator and freezer recycling measure for 79% of its program savings compared to only 20% for the CLC. The CLC and Unitil rely much more on consumer electronics measures to meet their Appliance Program goals. CLC plans to rebate 2,672 power strips in 2011 (16% of program savings) compared to only 140 units (2% of savings) by WMECo. Because each program measure has a different cost, differences in measure mixes produces differences in the overall cost of savings across the PAs.

Appliance Savings by Major Measure Categories					
	NGrid	**NSTAR**	**CLC**	**WMECo**	**Unitil**
Refrigerator/Freezer Recycling	68%	63%	20%	79%	30%
Appliance & Pool Rebates	13%	15%	28%	13%	46%
Consumer Electronics	19%	22%	52%	8%	23%
TOTAL	100%	100%	100%	100%	100%

There is also wide variation in 2011 Appliance Program savings and budget relative to each PAs' size. Specifically, WMECo plans to obtain considerably fewer appliance savings than the other PAs and has devoted fewer resources to this program. WMECo has noted that they have limited their Appliance program budget to allocate resources to other residential programs that generate greater savings per program dollar.

Appliance Program Savings and Budget Savings/HH					
	Savings (kWh)	**PA Cost ($)**	**Customers (2007)**	**Savings (kWh)/Cust**	**PA Cost ($)//Cust**
NGrid	6,699,790	$2,919,609	1,061,719	6.31	2.75
NSTAR	6,277,306	$2,302,761	628,471	9.99	3.66
CLC	1,245,199	$358,766	158,000	7.88	2.27
WMECo	513,509	$177,515	180,795	2.84	0.98
Unitil	159,880	$83,000	24,376	6.56	3.40
	14,895,684	5,841,650	2,053,361	7.25	2.84

Multi-family Retrofit Program (Electric)

Among the electric PAs only the CLC claims non-electric energy benefits for the Multi-family Retrofit Program, including natural gas, which may be why its 2011 benefits per participant ($5,174) are over three times the statewide average ($1,634). There may a difference in the way the PAs, or at least the CLC, treat oil and propane heated buildings in this program. It is also not clear as to why CLC is claiming gas savings.

Multi-family Retrofit Program (Gas)

There are very large differences in the cost per acquired therm and savings per participant values across the PAs for the Gas Multi-family Retrofit Program.

Across PAs the 2011 $/therm indicator varies from $16.78/therm to $4.94/therm, with a statewide average of $5.82/therm. Savings per participant range from 27.6 therms per participant to 351.6 therms per participant with a statewide average of 72.4 therms per participant. These are fairly large spreads, particularly the savings per participant, and should be explored further. It is possible that the PAs may be defining "participant" differently.

There is a fairly large difference in Columbia Gas's savings and budgets in 2011 relative to NGrid and NSTAR. Variations in the size of the residential customer population do not seem to fully

explain these savings and budget differences, but there may also be differences in the proportion of customers residing in program eligible multifamily housing. Further, NGrid and NSTAR may be better able to build off of their prior electric multifamily program efficiency efforts.

Gas Multi-family Retrofit		
	2011 PA Costs	**2011 PA Therm Savings**
NGrid	$2,195,691	444,633
Columbia	$403,843	39,935
NSTAR	$1,087,013	150,670
Berkshire	$55,999	7,947
NEG	$82,579	15,820
Unitil	$18,330	1,092

New Construction & Major Renovations

Electric

Comparing Indicators

The Residential New Construction and Major Renovation Program filings and screening model inputs show a wide variety of differences and inconsistencies across PAs. For example, in examining six outcome indicators across the PAs, PA values of any single indicator vary from the statewide average by 2.0 and 4.5. The table below shows the details. Some of this variance can be explained by the difference in PA size and the ability to spread base program costs over a larger volume of participants (e.g., NSTAR or NGrid vs. Unitil or WMECo), but this is not always the case. As an example, the values of the indicators at CLC are often in line with those at NGrid and NSTAR. CLC explains that their customers may be more willing to go further to generate additional savings in new homes, but while there may be reasonable explanations for these differences, it is not immediately apparent how benefits per participant can be over three times that of NSTAR and NGrid while the cost for those lifetime savings are in the same range as those other PAs (or why those PAs are not producing similar levels of benefits per participant.

	Residential New Construction & Major Renovation Comparing 2011 Indicators by Electric PA MTM						
	Statewide	**CLC**	**NGrid**	**NSTAR**	**Unitil**	**WMECo**	**Variance from Statewide**
PA Cost/Annual MWh	$963	$821	$993	$756	$2,660	$3,470	3.2
PA Cost/Lifetime MWh	$79	$83	$75	$65	$214	$272	3.1
Annual kWh/Participant	$2,453	$6,107	$2,650	$2,245	$1,012	$1,753	2.5
Total Benefits/Participant	$6,070	$19,758	$5,378	$4,456	$11,848	$19,259	2.8
Total Benefits/MWh	$202	$326	$153	$170	$940	$861	4.5
Non-Electric Benefits % of Total Benefits	34%	58%	21%	19%	69%	75%	2.0

Indicators from the approved PA three year Plans were also compared with those from the 2011 MTM filings and revealed a range of results.

The following table highlights the wide range of differences from the statewide averages (in the last column). The 28% to 65% range does raise questions whether these are indeed due to service territory characteristic and housing type differences or whether there are some real inconsistencies in approaches or underlying assumptions that were used in developing the results.

	Residential New Construction & Major Renovation 2011 Indicators by Individual PA Variance between Plan and MTM						
	Statewide	**CLC**	**NGrid**	**NSTAR**	**Unitil**	**WMECo**	**Range of Difference**
PA Cost/Annual MWh	-21%	-12%	-24%	-23%	23%	0%	46%
PA Cost/Lifetime MWh	-20%	-28%	-27%	-14%	-4%	0%	28%
Annual kWh/Participant	23%	13%	21%	31%	-30%	0%	60%
Total Benefits/Participant	-46%	-14%	-45%	-58%	-35%	1%	59%
Total Benefits/MWh	-55%	-38%	-57%	-64%	-28%	1%	65%
Non-Electric Benefits % of Total Benefits	-22%	-13%	-28%	-34%	-10%	-1%	35%

While one would expect savings to be adjusted downwards to account for a new baseline that may not have fully been considered a year ago, many of these differences suggest the need for further explanation, and for future planning, the process proposed in the report to limit such outcomes.

Benefits

There is some significant erosion in the net and total benefits of this program. For 2011, statewide net benefits drop by almost two-thirds compared to the filed plan a year ago. Total benefits drop by more than 40%. Much of this would appear to be associated with a reduction in fossil fuel savings due to a higher baseline from the new building energy code.

The outlier in this is WMECo, which trends the opposite way. WMECo's net benefits *increase* in 2011. This would appear to be due to WMECo not adjusting its projections from the three year plan a year ago, and making the assumption that eroding savings from a rising baseline could be negated based on more efficient electric equipment (e.g., heat pumps) that are projected to be installed in new homes. As a result, they apparently did not change much from last year's filing projections.

	Variance Analysis -Benefits 2011					
	Net Benefits			Total Benefits		
	Plan	MTM	Variance	Plan Total Benefits	MTM Total Benefits	Variance
Statewide	$8,293,245	$3,098,330	-63%	$ 18,019,243	$ 10,118,540	-44%
CLC	$720,570	$575,455	-20%	$ 1,079,829	$ 928,618	-14%
NGrid	$1,795,601	$635,788	-65%	$ 5,844,412	$ 3,473,998	-41%
NSTAR	$4,573,616	$888,074	-81%	$ 9,015,263	$ 3,809,480	-58%
Unitil	$482,669	$259,692	-46%	$ 807,981	$ 616,076	-24%
WMECo	$720,789	$739,321	3%	$ 1,271,759	$ 1,290,368	1%

Low Income Residential New Construction

Costs & Savings

There has been some moderate increase in both overall budgets and savings for the Low Income Residential New Construction Program. This appears to be driven by National Grid, which increased its 2011 planned program savings enough to trigger a formal mid-term modification filing with the DPU. As a result of Grid's projected increase in heat pump savings, the company expects to see savings increases of 128% in 2011 and 35% over the three year Plan, with associated budget increases of 20% in 2011 and 6% for the three years. For all PAs, budget adjustments are expected to increase about 8% in 2011 and 3% for the three year period. While NSTAR is also expecting an increase in savings, the primary driver behind the 66% statewide savings increase in 2011 and 21% increase in 2010-2012 is Grid. However, despite the seemingly large percentage increases, since this program is so small, the absolute values of both costs and savings are relatively insignificant across all programs and sectors.

	Low Income Residential New Construction Variance Analysis - Costs & Savings 2011					
	PA Costs			Annual MWh		
	Plan	MTM	Variance	Plan	MTM	Variance
Statewide	$ 1,263,840	$ 1,360,294	8%	507	842	66%
CLC	$ 30,752	$ 33,772	10%	12	14	14%
NGrid	$ 280,141	$ 336,230	20%	181	412	128%
NSTAR	$ 803,339	$ 841,737	5%	263	364	38%
Unitil	$ 50,938	$ 49,885	-2%	26	27	3%
WMECo	$ 98,671	$ 98,671	0%	25	25	1%

Gas Programs

Costs

Overall, for 2011 gas PA budgets for this program are projected to drop slightly compared to the total gas budget included in the approved three years Plans. While projected costs for some PAs are expected to go up by as much as 40% in 2011, others are expected to decrease, resulting in a net decrease in statewide budgets of 3% for 2011. Bay State (36% budget reduction) and NSTAR (40% budget increase) have the biggest changes. These changes are likely due to the challenges of estimating program participation in the three year Plans and represent a true-up of housing start projections.

	Residential New Construction - Gas Individual PA Variance Between Plan and MTM -2011-			
	PA Costs	Annual Therms	Net Benefits	Total Benefits
Statewide	-3%	-54%	-61%	-51%
Columbia	-36%	-51%	-52%	-51%
Berkshire	4%	0%	0%	2%
New England	2%	0%	1%	2%
NGRID	3%	-66%	-75%	-62%
NSTAR	40%	-43%	-61%	-39%
Unitil	2%	16%	121%	15%

Savings

As a result primarily of the increasing building energy code, statewide savings (therms) are expected to decrease in by 54% in 2011 (see table above). There are some differences across the PAs in planned savings - some gas PAs are projecting as much as a 66% reduction in savings for 2011 (Grid), Unitil is reporting an expected *increase* in savings of 16% (apparently due to one large efficient participating project), while a few are showing no net saving change from what was filed a year ago. While there are generally reasonable explanations for most of these differences, there still appear to be inconsistent approaches to projecting savings. These differences lead us to suggest the need for further coordination and use of some common approaches among the PAs during upcoming planning periods

Benefits

Across the board, net and total benefits are down or close to unchanged except for Unitil, which shows an increase in net and total benefit (see table above). This is likely due to a particular project that is aiming to achieve the Tier 3 (highest) level of efficiency. In 2011, statewide net benefits are projected to be 61% lower and total benefits 51% lower than the values included in the three year Plans. Again, there are large variances between PAs, raising questions about consistency in methodologies and suggesting the need for closer coordination and consistency during the planning phase.

Several indicators were examined and revealed wide range of values, presented in the table below. This wide disparity of values across PAs again raises questions about whether the PAs use different input assumptions and values in conducting the analyses that lead to their proposed plans.

	2011 Indicators by Individual PA Variance between Plan and MTM								
	PA Cost/Annual Therm			Annual Therms/Participant			Total Benefits/Participant		
	Plan	MTM	Variance	Plan	MTM	Variance	Plan	MTM	Variance
Statewide	$8.62	$18.18	111%	349	157	-55%	$10,136	$4,890	-52%
Columbia	$8.85	$11.69	32%	343	259	-25%	$10,064	$7,687	-24%
Berkshire	$8.69	$9.05	4%	343	343	0%	$10,025	$10,211	2%
New England	$14.06	$14.32	2%	260	260	0%	$7,094	$7,225	2%
NGRID	$7.84	$24.08	207%	370	110	-70%	$10,512	$3,538	-66%
NSTAR	$9.46	$23.47	148%	319	127	-60%	$9,582	$4,107	-57%
Unitil	$9.43	$8.28	-12%	no data	332		no data	$10,985	

While we would expect savings to be adjusted downwards (annual therms per participant) to account for a new baseline that may not have fully been considered a year ago, the lack of a similarity in the variance again supports the need for further explanation of the underlying differences and the need for more coordinated planning.

Commercial and Industrial

The C&I statewide MTM plans, goals, budgets and key indicators for 2011 overall are consistent with the original 2011 plans filed in the PAs' three-year Plans. For example, electric PA cost/annual MWh shifted only by 2.5% (increase). Similarly, total benefits per lifetime MWh increased by 7%. On the gas side, these indicators are similar, with gas PA cost/annual therm dropping by 2.7% and total benefits per lifetime therm dropping by 1%. In general, the PAs MTM filings are consistent with the originally filed 2011 plan, with little change in goals, savings, and net benefits. Tables 1 and 2 below provide a summary of some key statewide electric C&I indicators by program, and how they compare between the original 2011 Plan and the MTM. Tables 3 and 4 provide the respective gas information.

Table 1. Electric PA Cost/Annual MWh

	PA Cost/Annual MWh	
	Statewide Plan	Statewide MTM
Commercial & Industrial (total)	$375.96	$385.62
C&I New Construction and Major Renovation	$450.63	$450.62
C&I New Construction and Major Renovation - Government	$361.47	$373.64
C&I Large Retrofit	$302.16	$324.20
Large C&I Retrofit - Government	$511.66	$528.64
C&I Small Retrofit	$515.94	$514.79

Table 2 —Total Benefits/Lifetime MWh – Electric Plans

	Total Benefits/Lifetime MWh	
	Statewide Plan	**Statewide MTM**
Commercial & Industrial (total)	$128.12	$136.93
C&I New Construction and Major Renovation	$128.40	$135.84
l New Construction and Major Renovation - Government	$143.20	$145.80
C&I Large Retrofit	$124.79	$134.00
Large C&I Retrofit - Government	$145.82	$148.61
C&I Small Retrofit	$140.99	$150.49

Table 3 — Gas PA Cost/Annual Therm

	PA Cost/Annual Therm	
	Statewide Plan	Statewide MTM
Commercial & Industrial (total)	$3.05	$2.95
C&I New Construction and Major Renovation	$3.74	$3.54
C&I Large Retrofit	$2.50	$2.45
C&I Small Retrofit	$1.86	$1.76

Table 2 —Total Benefits/Lifetime Therm – Gas Plans

	Total Benefits/Lifetime Therm	
	Statewide Plan	Statewide MTM
Commercial & Industrial (total)	$1.14	$1.17
C&I New Construction and Major Renovation	-	-
C&I Large Retrofit	-	-
C&I Small Retrofit	-	-

Variances by PA

While on a statewide basis the PAs' MTM C&I filings are virtually unchanged from the original 2011 plan, there are some significant variations in key indicators *between* different PAs for specific programs. These variances are also generally consistent with variances that existed in the original 2011 plans when considered by individual PAs, and reflect historic differences with different PAs relative costs and success in delivering different programs. As such, the variances are not new, and do not represent a large concern on the part of the Consultants. That said, however, we do still have some concerns that certain variances are large and have never been adequately explained by the PAs. We reviewed these variances in 2009 but were unable to discern their exact causes, and whether they reflected poor performance for some PAs, or other factors such as, but not limited to:

- Internal PA cost structures and accounting practices *(e.g.,* how administrative costs are allocated across programs);
- Different customer mixes in different territories *(e.g.,* some PAs may have a larger proportion of small customers that are more costly to work with);
- Different economic drivers *(e.g.,* new construction activity may be more robust in some areas than others);
- Differences in implementation contractors and cost commitments that are locked in; Differences in PA size *(e.g.,* smaller PAs are understood generally to have higher per unit costs due to their *size* and inherent inability to spread administrative and other fixed costs over a larger base of savings);
- Different input assumptions to program planning.

In general, these variances have narrowed over time, which the consultants view as a good sign, and we hope to see further convergence, especially as PAs offerings are more and more consistent and delivered jointly.

The most significant variance relates to the C&I new construction program indicators. National Grid estimates a cost per annual MWh saved of $565 versus $377 estimated for NSTAR. This is roughly a 50% increase in cost per MWh for this program, despite the similar sizes of the PAs and the same program design. On the gas side, National Grid projects a PA cost of $4.34 per annual therm, compared to NSTAR at $2.54 — roughly 70% higher. These differences reflect historic actual results. We plan to seek further information about how practices may differ between National Grid and NSTAR, whether there are some clear efficiencies to be gained by modifying National Grid's implementation procedures, or whether these variances are justified by some issue(s) not under the control of the PAs. Some evidence exists to indicate that the large variance may be. For example, National Grid's average electric savings per participant in the new construction program is less than half that for NSTAR. This may be a result of much larger new construction projects happening in the Boston area than in National Grid's more suburban/rural territory. Because many of the costs of doing a comprehensive C&I new construction project do not vary dramatically by the magnitude of savings *(e.g.,* plan reviews, technical assistance, simulation modeling, coordinating with customers architects and engineers, etc.), this 2 to 1 size difference alone could explain most of these variances. However, we have not confirmed whether or not this is a main driver.

The consultants will continue to investigate the underlying basis for significant variances among key indicators during 2011, and work with the PAs to ensure that either: 1) consultants understand the underlying causes of variances and agree they are appropriate; or 2) we identify underlying causes that are a concern and encourage the PAs to ensure that modifications are made to remedy them and converge on more consistent and optimal performance results across the Commonwealth over time. We also expect the PAs to work together during the planning phases of the 2012 mid-term modifications work so that differences in the value of the indicators can be identified and explained, and further planning actions can be taken as may benefit the overall savings.

Appendix E

Review of Program Administrator Drafts of the MA 2011 Plan Version TRM

Review of Program Administrator Drafts of the MA 2011 Plan Version TRM

11/10/2010

The comments below are based on reviews of the following Program Administrator (PA) drafts the 2011 Plan Version TRM:

- MA TRM Draft 09-29-2010_DRAFT FOR CONSULTANT REVIEW
- MA TRM Draft 10-06-2010_DRAFT FOR CONSULTANT REVIEW
- MA TRM Draft 10-24-2010_FINAL DRAFT

The version reviewed for each measure or TRM section is identified in file:

MA TRM_REVIEW SCHEDULE - Tracking Sheet 11-03-2010.xls

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Residential Electric Measures

General

Issue #: ResElec 1

Pertains to: Residential Net-to-Gross Factors (Appendix C), including gas measures.

Issue Description:

1. The TRM cites the source of most residential electric NTG factors as "Massachusetts common assumptions for all residential electric measure free-ridership, spillover and net-to-gross values." We have requested an actual document or citations for these "common assumptions" in the past but have yet to receive an actual document or citations. Thus we don't really know the basis or source of the "common assumptions" and have to consider these values to be without citations. To meet the goal of transparency for the TRM, the actual basis and/or source of the NTG factors should be clarified.

2. Many of the residential NTG ratios in the Net-to-Gross Impact Factor table (Appendix C) are 100% (i.e., zero free-ridership). Measures that have 100% NTGRs include:
    a. High Efficiency Heating and Hot Water (HEHE) Program gas measures that were not addressed by the recent (fall 2010) evaluation. These include new measures that are only incrementally more efficient than measures that were evaluated. For example, 94% AFUE furnaces have an evaluated 38% NTGR (62% free-ridership), but the new 96% AFUE furnace measure has a 100% NTGR. Programmable thermostats, which have been on the market for decades, also have a 100% NTGR value. This single measure comprises a significant percentage of all HEHE savings.
    b. All Residential New Construction measures
    c. All consumer electronics measures
    d. All appliance measures except for refrigerators and room AC.

    This default assumption of 100% NTG is reportedly due to the lack of any formal evaluation of these measures the NTG ratios.

    However, this 100% NTGR (0% free-ridership) position is held even for measures where state level market share data (from ENERGY STAR) and the PAs' own retailer surveys point to significant penetration by the efficient measure in Massachusetts and, for the ENERGY STAR market share data, nationally and in non-program states. For example, the RNC dishwasher measure has a 0% free-ridership value, yet in 2009 ENERGY STAR estimated that 68% of all dishwashers sold nationally and 74% sold in Massachusetts were ENERGY STAR compliant.

Yet, while holding this 100% NTG, the PAs proposed and used in their 2011 planning a set of "reduced" free-ridership values for a set of existing HEHE measures that would be targeted to hard to reach (HTR) customers. As non-HTR measures, the free-ridership values for these measures was between 60 and 69%, based on the fall 2010 HEHE Program evaluation. However, as new, hard to reach measures, the PAs reduced the assumed free-ridership by two-thirds. Thus while there's no specific evaluation for HTR measures, the PAs used good professional judgment to select a reasonable NTG ratio – the same could be done for other measures.

3. There are a large number of measures where a single program-wide free-ridership value has been applied to most or all measures in that program. The derivation of these free ridership numbers is either dated or unknown. For the 1-4 Retrofit and Multifamily Retrofit Programs the values appear to be notably low for many measures. Specifically:
    a. CoolSmart (electric HVAC) Program: all measures have a 15% free-ridership. The recent HEHE evaluation gave preliminary indications that ECM fans may have a much higher free-ridership. Over 40% of the CoolSmart program savings come from this single measure. No reference is provided in the TRM for these values.
    b. 1-4 Retrofit (MassSave HES) Program: Nearly all measures have a zero or 2% free-ridership based on a 2004 evaluation.
    c. Multifamily Retrofit Program: Nearly all measures have a zero or 3% free-ridership. No reference is provided in the TRM for these values.

Issue #: ResElec 2

Pertains to: HVAC end use and load shape

Issue Description: For a number of residential measures the Quantec HVAC load shape is applied to estimate savings. It would be good to clarify whether this is a heating, cooling, or a combined load shape (same for all HVAC load shapes).

Issue #: ResElec 3

Pertains to: Calculation of avoided O&M costs

Issue Description: O&M costs are calculated several times – particularly for lighting measures – with the measure cost subtracted from the O&M savings to derive the final avoided O&M costs. This is incorrect. However, from previous conversations with the PAs, it appears that this calculation is an artifact of the PAs' screening tool's input requirements. However, if this is indeed the case, then it should be clearly explained.

Further, it is not clear if the avoided O&M cost calculations include discounting over the measure life, as they should be – please clarify.

Issue #: ResElec 4

Pertains to: Presentation of gross demand impact values and coincidence factors

Issue Description: There appears to be inconsistent presentation and description of gross demand savings values. In some cases the demand values are coincident impacts, in others they are the maximum connected kW reduction. The use of the connected (max) kW should be used consistently with the TRM's definition for all measures except for special cases where noted as an exception. It appears that the coincidence values listed are not always consistent with the listed kW reduction, e.g., a a maximum kW reduction is provided, but one or both seasonal CFs are set to 1.00, which is not expected.

Also, for several measures, the presented coincidence factors appear to be normalized to the factor that is largest, e.g., one seasonal coincidence factor is set to 1.00. This may be OK in special cases, but should be explained if that's the case.

Issue #: Res Elec 5

Pertains to: MF measure savings

Issue Description: Many of the MF measure savings reference National Grid's Multifamily Screening Tool that was developed in the early 1990s. However, documentation to support the per unit savings estimates in this tool are not available.

Issue #: ResElec 6

Pertains to: CF/CFL savings and lifetimes

Issue Description: The estimated CFL savings and lifetimes for all CF related measures do not consider the impacts of the 2012-2014 and 2020 EISA lighting standards, or the introduction of LED (SSL) lighting this decade. With proposed CF TRM measure lives of six to nine years, and the one to two year measure life of the base technology (incandescent or halogen) the TRM characterizations may be overstating the lifetime savings for CFLs. The easiest way to address this, given the limitations of the PAs' screening tool, would be to shorten the proposed measure lifetimes for CF lighting measures.

Low Income

Issue #: ResElec 7

Pertains to: Low Income CFL demand impact

Issue Description: The presented value of 0.011 kW would appear to be a coincident demand reduction. However, a summer coincidence factor of 0.35 is provided (and 1.00 for winter coincidence). Has the coincidence factor been applied twice? Further, National Grid's Quantec load shapes are footnoted for the gross kW reduction. Why aren't CFL specific demand reduction and/or coincidence factors values derived from evaluation work used?

Issue #: ResElec 8

Pertains to: Low Income Refrigerator and Freezer replacement

Issue Description: Full early retirement savings are claimed over the full measure lifetime based on the assumption that the customer would replace the unit with an inefficient one. First, if the customer lived in public housing this might not be the case. Second, as federal standards continue to improve, even a used unit may be relatively efficient.

Further discussion is recommended for this measure. Note as well the 19 year Low Income measure life vs. 12 years for Products Program refrigerator and freezer measures.

Issue #: ResElec 9

Pertains to: Low Income Freezer replacement

Issue Description: Appears that kW reduction value of 0.84 should be 0.084.

Issue #: ResElec 10

Pertains to: Low Income RAC replacement

Issue Description: The demand reduction value appears to be a coincident value. Is this value consistent with the regional RLW RAC study that found much lower RAC coincidence than had previously been assumed by the PAs? If not, should it be?

There is a small, unexpected winter coincident demand reduction (0.003 kW) – is this an error?

Issue #: ResElec 11

Pertains to: Low Income Waterbed mattress replacement

Issue Description: End use is listed as HAVC but load shape footnote states that a DHW load shape is used – apparently an error.

Are there really any summer peak demand savings (0.082) for this measure, or is this just an artifact of the load shape selected?

Issue #: ResElec 12

Pertains to: Low Income Oil Heating System Replacement

Issue Description: While there is a citation for the 194 kWh savings, there is no clear explanation as to where these savings come from – this should be clarified (e.g., reduced run fan time?). Note that Oil Heat Weatherization measure only has savings of 70 kWh. Are the savings from ECM fans? But this latter explanation would only apply to furnace, not boiler replacements. The source of the savings should be clarified.

Issue #: ResElec 13

Pertains to: Low Income Fuel Switching *(Note: the PAs are apparently removing this as a prescriptive measure, in which case the comment is no longer relevant.)*

Issue Description: Customer specific savings calculation requires access to billing files. Will these calculations be done in the manner specified in the TRM?

Default tune-up cost of $100 seems low. What are "Assumed fan or pump kWh consumption" values?

Residential Electric – HVAC

Issue #: ResElec 14

Pertains to: Central Air Conditioning

Issue Description: What is the basis for the baseline EER of 11?

0.85 summer coincidence factor seems much too high. Is this consistent with regional ADM study?

Issue #: ResElec 15

Pertains to: Air Source Heat Pump

Issue Description: What is the basis for the baseline EER of 11?

What are the bases for the summer and winter coincidence factors? Note that summer value of 0.67 is not consistent with CAC measure above.

Winter demand savings for HPs are not just a function of the rated HSPF and capacity as both of these values will be lower at typical winter peak temperatures. Also, size and control of resistance back up will affect actual winter kW reduction as back-up resistance will often be on at the time of system winter peak. It appears that the proposed algorithm overly simplifies actual kW savings calculation.

Issue #: ResElec 16

Pertains to: Ductless Mini Split Electric Heat Early Replacement (still under PA review)

Issue Description: What is the basis for the baseline EER of 11?

What are the bases for the summer and winter coincidence factors? Note that summer value of 0.67 is not consistent with CAC measure above.

As noted for ASHPs, winter demand savings for ASHPs are not just a function of the rated HSPF and capacity as both of these values will be lower at typical winter peak temperatures. Also, size and control of resistance back up will affect actual winter kW reduction.

Issue #: ResElec 17

Pertains to: Ductless Mini Split HP

Issue Description: No baseline efficiencies are specified.

What is kWh_{seal}?

See also comments above for ASHPs and ductless HP replacement.

Issue #: ResElec 18

Pertains to: Ductless Mini Split CAC

Issue Description: Measure algorithms do not match the measure description. It is treated as a ductless split replacement for electric heat and RAC. Savings appear to be based on KEMA/RLW pilot analysis, not on upgraded efficiency of ductless unit.

Issue #: ResElec 19

Pertains to: CAC and Heat Pump QIV; CAC and Heat Pump Digital Check-up

Issue Description: There is insufficient documentation for the assumed 5% savings for these measures.

Baseline condition/efficiency is unclear. Is the 5% savings just applied to the nameplate capacity and efficiency ratings of the installed or current unit? There may not be a need to identify both the base and high efficiency case for these measures; just the installed case.

As noted above, the calculation of HP heating demand savings is more complicated than the current set of algorithms being proposed.

Issue #: ResElec 20

Pertains to: Duct Sealing, Down Size ½ ton, and HVAC Right Sizing, and Quality Install with Duct Sealing

Issue Description: Savings are deemed based on DOE2 modeling, but the measure savings are not specified.

In the future, the savings for this measure should to be tied to CFM reduction (duct sealing) or actual reduction in installed capacity (downsizing).

Issue #: ResElec 21

Pertains to: CAC and Heat Pump Early Retirement

Issue Description: The savings algorithms do not treat this as a true early retirement measure. The algorithms do not specify the two separate savings steams typically generated from an early retirement measure. These algorithms only address the savings from the initial early retirement component of the removed

unit. There are no savings calculated from after when the retired unit would have normally failed. Given the 7 year measure life, the savings for this measure may have been simplified and no post normal replacement savings were assumed.

What are the assumed baseline efficiencies for the specified 13 year old unit?

There is no avoided retirement cost/credit calculated.

Issue #: ResElec 22

Pertains to: TXV Valve Replacement, HVAC Furnace ECM, and Brushless Fan Motor

Issue Description: kW reduction savings algorithm is not specified. What is meant by "Quantec End use modeling"?

For Brushless Fan Motor: This measure is essentially the same as the Warm Air Furnace ECM. These two measures should be combined.

Residential Electric – Lighting

Issue #: ResElec 23

Pertains to: CFLs

Issue Description: What is basis for 0.50 ISR for Hard to Reach CFLs?

Residential Electric – Appliances and Consumer Electronics

Issue #: ResElec 24

Pertains to: Room AC

Issue Description: Both 10% and 15% savings over federal standard are referenced. What is the measure definition?

What is assumed Btuh and base EER? Is the calculated maximum kW reduction of 0.24 consistent with these values?

Issue #: ResElec 25

Pertains to: Freezers

Issue Description: 136 kWh savings seems a high for a 10% improvement; may need to redo the referenced 2008 NEEP savings analysis.

Issue #: ResElec 26

Pertains to: Refrigerator/**Freezer Recycling**

Issue Description: Rhode Island Opportunity Study does not appear to be an adequate reference for energy and demand savings. Hasn't program vendor Jaco provided savings estimates? And Jaco estimates typically include a sizeable embedded free-ridership adjustment.

Issue #: ResElec 27

Pertains to: Set Top Boxes

Issue Description: kWh savings of 30 kWh seems low for 30% savings. Need proper citations.

Residential Electric – RNC, SF and MF

Issue #: ResElec 28

Pertains to: CFL Direct Install

Issue Description: In-service rate for MF is 1.04, apparently an error.

Issue #: ResElec 29

Pertains to: Refrigerator (Retrofit)

Issue Description: While measure correctly notes two different savings streams for this early retirement measure, the sources of these savings estimates are not well documented.

Issue #: ResElec 30

Pertains to: RNC Heating, Cooling and DHW

Issue Description: References and methodology should reflect on-going/current screening being done to develop 2011 program savings estimates. Has the UDRH been revised as a result of MA's adoption of IECC 2009?

Issue #: ResElec 31

Pertains to: Vendor Measures (MassSave)

Issue Description: How do the vendor software packages calculate demand savings?

Lack of heating system replacement coincidence factors implies that there are no electricity savings, though electricity savings are claimed for this measure in the low income program.

Issue #: ResElec 32

Pertains to: Heat Pump Tune-up

Issue Description: 1162 kWh savings do not seem consistent with 5% savings claim from above Heat Pump Digital Check-up measure.

Also, it's not clear that a kW/kWh ratio can be applied to this measure to determine winter peak. See above comments on ASHP winter demand savings.

Issue #: ResElec 33

Pertains to: MF Refrigerator/Freezer Replacement

Issue Description: Not properly characterized as an early replacement measure, though the shortened non-LI measure life of 7 years may be an attempt to simplify the savings calculation for this measure. Note comments above for Low Income refrigerator replacement as to claiming full savings over the full measure life of 19 years.

Issue #: ResElec 34

Pertains to: MF CFLs and Fixtures

Issue Description: Coincidence factors appear to be incorrect: 0.35 for summer and 1.00 for winter.

Issue #: ResElec 35

Pertains to: Solar DHW

Issue Description: Summer demand calculation appears overly simplified; not clear what "hours of operation" means for this measure or how it is determined.

Why a zero winter coincidence factor?

Issue #: ResElec 36

Pertains to: OPower

Issue Description: Should savings be updated to better reflect current National Grid savings which appear to be less than stated 2%?

Why a 1.00 winter coincidence factor, but a 0.251 CF for summer?

Commercial Electric Measures

General

Issue #: ComElec 1

Pertains to: "Secondary Energy Impact" field in measure characterizations

Issue Description: The titles used in the measure descriptions should consistent. In some measures "Heating energy (non-electric)" is used, while in others "Space Heating Fossil Fuel Savings" is used.

Lighting – Advanced Lighting Design (Performance Lighting)

Issue #: ComElec 2

Pertains to: Text regarding the HVAC-lighting interaction on the top of p. 185.

Issue Description: The text states that the interactions are captured in "energy realization rates and demand coincidence factors and realization rates." The CFs should be independent of the HVAC interactions. The interactions should be accounted for in the realization rates, if not specifically calculated. The methodology for accounting for HVAC interactions should be consistent across PAs.

Issue #: **ComElec 3**

Pertains to: The "$/unit" O&M savings presented on the top of p.187. (*Note: this has been corrected in the final 2011 plan version, so the comment is no longer relevant.*)

Issue Description: The value used in the "$/fixture" form of the equation is inappropriate. The source document (Optimal Energy, Inc., *Non-Electric Benefits Analysis Update,* November 2008) states that the levelized annual O&M savings estimate of $17.93 applies to CFL fixtures only. Since Performance Lighting projects can incorporate many different lighting technology types, the use of this factor for this measure is inappropriate. This should be corrected before the PAs start to track 2011 savings.

Issue #: **ComElec 4**

Pertains to: Table 1: Heating Impact Factors by Program, p.186.

Issue Description: The interaction factors in the table do not agree with those in the source memo (Optimal Energy, Inc., *Non-Electric Benefits Analysis Update,* November 2008). These factors should be revised to agree with the source memo, or an alternate source should be provided.

Lighting – Lighting Systems

Issue #: **ComElec 5**

Pertains to: Text regarding the HVAC-lighting interaction on the top of p. 190.

Issue Description: The text states that the interactions are captured in "energy realization rates and demand coincidence factors and realization rates." The CFs should be independent of the HVAC interactions. The interactions should be accounted for in the realization rates, if not specifically calculated. The

methodology for accounting for HVAC interactions should be consistent across PAs.

Issue #: **ComElec 6**

Pertains to: The "Baseline Efficiency" and "High Efficiency" sections on p.190.

Issue Description: The baseline efficiencies still need to be completed. The referenced "MassSAVE Wattage Tables" for the high efficiency case should be included in the TRM entry or in the Appendices. This is a major omission as the majority of program savings will likely come from lighting projects. The baseline wattage tables should ideally be completed and reviewed by the consultant team before the PAs start tracking 2011 savings.

Issue #: **ComElec 7**

Pertains to: Table 1: Heating Impact Factors by Program, p.191.

Issue Description: The interaction factors in the table do not agree with those in the source memo (Optimal Energy, Inc., *Non-Electric Benefits Analysis Update,* November 2008). These factors should be revised to agree with the source memo, or an alternate source should be provided.

Lighting – Lighting Controls

Issue #: **ComElec 8**

Pertains to: Text regarding the HVAC-lighting interaction on the bottom of p.195.

Issue Description: The text states that the interactions are captured in "energy realization rates and demand coincidence factors and realization rates." The CFs should be independent of the HVAC interactions. The interactions should be accounted for in the realization rates, if not specifically calculated. The methodology for accounting for HVAC interactions should be consistent across PAs.

Issue #: **ComElec 9**

Pertains to: Table 7: Heating Impact Factors by Program, p.196.

Issue Description: The interaction factors in the table do not agree with those in the source memo (Optimal Energy, Inc., *Non-Electric Benefits Analysis Update,* November 2008). These factors should be revised to agree with the source memo, or an alternate source should be provided.

HVAC – Single–Package and Split System Unitary Air Conditioners

Issue #: **ComElec 10**

Pertains to: Table 9: Unitary Air Conditioners Baseline Efficiency Levels, p.200.

Issue Description: It is noted that the baseline efficiencies are under review and reflect some weighting of the IECC 2006 and 2009 requirements for replacement units. What is the rationale for the weighting? Is this because replacement units do not need to meet MA State Building Code but only federal manufacturing standards?

HVAC – Single Package or Split System Heat Pump Systems

Issue #: **ComElec 11**

Pertains to: Table 10: Unitary and Applied Heat Pumps Baseline Efficiency Levels, p.205.

Issue Description: It is noted that the baseline efficiencies are under review and reflect some weighting of the IECC 2006 and 2009 requirements for replacement units. What is the rationale for the weighting? Is this because replacement units do not need to meet MA State Building Code but only federal manufacturing standards?

HVAC – Dual Enthalpy Economizer Controls (DEEC)

No Comments

HVAC – Demand Control Ventilation (DCV) / Ventilation CO2 Controls

Issue #: **ComElec 12**

Pertains to: Entire measure.

Issue Description: As noted, NSTAR has advised removing this measure from the TRM and ceasing to offer it for 2011 as new building codes will not warrant the cost. We agree that the measure should be removed.

Issue #: **ComElec 13**

Pertains to: "Algorithms for calculating Secondary Energy Impacts" field on p.212.

Issue Description: The heating impact factors shown in the tables are exactly the same as those used for the C&I lighting measures (and do not agree with the referenced source document - Optimal Energy, Inc., *Non-Electric Benefits Analysis Update,* November 2008). Factor descriptions reference "lighting savings", not DCV.

HVAC – Energy Management System (EMS)

Issue #: **ComElec 14**

Pertains to: Entire measure.

Issue Description: Due to their complexity, it appears that the PAs are planning to develop a common spreadsheet tool for assessing EMS measures. If this tool will ensure a consistent methodology and assumptions (such as measure life, baseline assumptions, etc.), this measure should be removed.

HVAC – High Efficiency Chiller

Issue #: **ComElec 15**

Pertains to: "Baseline Efficiency" section, p.221.

Issue Description: The text should be edited to require compliance with IECC 2009.

Issue #: **ComElec 16**

Pertains to: Table 15, p.221.

Issue Description: Since this is a new construction and major renovation measure, the requirements in this table should reflect the "As of 1/1/2010" values published in IECC 2009 Table 503.2.3(7), not the "Before 1/1/2010" values that are currently presented. All table values should be updated accordingly.

Issue #: **ComElec 17**

Pertains to: Variable descriptions for EER_{EE} and kW/ton_{EE}, p.220.

Issue Description: Both of these variables should state, "Site specific value" or something to that effect in lieu of "See Table 15 for values."

Issue #: **ComElec 18**

Pertains to: Load Factor (LF) variable, p.220.

Issue Description: Guidance or sourced default values should be included for this variable.

HVAC – Programmable Thermostats

Issue #: **ComElec 19**

Pertains to: Entire measure.

Issue Description: The EPA's ENERGY STAR specification for programmable thermostats was sunset as of December 31, 2009. During the extensive ENERGY STAR label review process, the EPA could not identify satisfactory savings information that would support a continued ENERGY STAR labeling program for these products. Several field studies conducted nationally cast doubt on the net energy savings realized through the use of programmable thermostats. Key issues identified include the proper installation and programming of programmable thermostats and questionable relative savings versus manual thermostat control. These studies were primarily focused on the residential sector, and even less evaluation work has been done for the commercial sector.

Unless the origins of the savings estimates in National Grid's tracking system (the source of the savings estimates presented in the TRM) can be located and verified, then offering this as a prescriptive measure (and including this in the TRM as such) is inappropriate, and all programmable thermostat installations should be considered custom measures.

Refrigeration – Freezer/Cooler Door Heater Controls

Issue #: **ComElec 20**

Pertains to: "High Efficiency" field, p.230.

Issue Description: The statement, "Door temperature is typically maintained about 5°F above the store air dewpoint temperature with the heaters operating at 80% on (adjustable)" does not appear to agree with the "%OFF" assumptions.

Refrigeration – Novelty Cooler Shutoff

No Comments

Refrigeration – ECM Evaporator Fan Motors for Walk–in Coolers and Freezers

Issue #: **ComElec 21**

Pertains to: "Algorithms for Calculating Primary Energy Impact" section, p.236-37.

Issue Description: The "Hours" (specifically, the assumption that evaporator fans run 5,600 hours annually if an energy management systems is installed) and "Eff_{RS}" factors require sources.

Refrigeration – Case Motor Replacement

Issue #: **ComElec 22**

Pertains to: Entire measure.

Issue Description: Additional effort is required to document the sources of assumptions. While, in general, the assumptions appear reasonable, the measure cannot be adequately reviewed in this state.

Refrigeration – Cooler Night Covers

Issue #: **ComElec 23**

Pertains to: Table 18, p. 241.

Issue Description: It is unclear how the savings factors presented in the Table 18 were developed from the source material. The source ASHRAE Transactions article documents the study of experimental night covers on a medium-temperature display case. The methodology for extrapolating to different temperature applications and normalizing to a per linear foot metric should be explained, or a document with background calculations should be cited.

Refrigeration – Electronic Defrost Control

Issue #: **ComElec 24**

Pertains to: "Algorithms for Calculating Primary Energy Impact" section, p.244-45.

Issue Description: The "Eff_{RS}" requires additional source information. Can a specific document be cited? The "Hours" assumption, developed by NRM, requires additional substantiation. Is there any data available that supports the assumptions regarding defrost cycle duration and frequency?

Refrigeration – Freezer/Cooler Evaporator Fan Controls

Issue #: **ComElec 25**

Pertains to: "Algorithms for Calculating Primary Energy Impact" section, p.229-30.

Issue Description: The calculation algorithm for "kW_{Fan}" and "kW_{CP}" should be explicitly defined, or a document with background calculations should be cited. The source for the "%Off" factor assumption of 46% is noted as "Select Energy (2004). *Analysis of Cooler Control Energy Conservation Measures.* Prepared for NSTAR." However, this document does not appear to specifically state the reduction in evaporator fan operating hours. The "Eff_{RS}" requires additional source information. Can a specific document be cited?

Issue #: **ComElec 26**

Pertains to: "Algorithms for Calculating Primary Energy Impact" section, p.229-30.

Issue Description: The savings algorithm appears to be double-counting a portion of the evaporator fan savings. The "%Off" factor appears to capture the percentage of hours that the evaporator fan motor is off due to the installation of evaporator fan temperature control, based on a report by Select Energy. However, the algorithm claims an additional 5% savings on the remaining evaporator fan energy. It appears that the fan savings due to the efficient controls are being accounted for twice. Please explain.

Refrigeration – Freezer/Cooler LEDs

Issue #: **ComElec 27**

Pertains to: "Algorithms for Calculating Primary Energy Impact" section, p.232-33.

Issue Description: The "Eff_{RS}" requires additional source information. Can a specific document be cited? Why is this value (1.3 kW/ton) different from the 1.6 value used in other refrigeration measures?

Issue #: **ComElec 28**

Pertains to: "Measure Life" section, p.233.

Issue Description: The measure life has not been finalized.

Compressed Air – High Efficiency Air Compressor

Issue #: **ComElec 29**

Pertains to: Table 21, p.239.

Issue Description: While the savings estimates in Table 21 appear reasonable, they still lack development documentation. If the supporting analysis cannot be located, at a minimum the evaluation work that supports these savings estimates should be referenced and described.

Compressed Air – Refrigerated Air Dryers for Air Compressors

Issue #: **ComElec 30**

Pertains to: "Description" section, p.241.

Issue Description: The measure description indicates that both cycling and VSD refrigerated compressed air dryers are applicable; however, there is only a single set of savings factors presented. Is there adequate justification to assume that both types of technologies will provide similar savings?

Issue #: **ComElec 31**

Pertains to: Table 22, p.242.

Issue Description: While the savings estimates in Table 22 appear reasonable, they still lack development documentation. If the supporting analysis cannot be located, at a minimum the evaluation work that supports these savings estimates should be referenced and described.

Motors – Variable Frequency Drives

Issue #: **ComElec 32**

Pertains to: Table 25, p.249.

Issue Description: The savings factors presented in this table do not have any associated source documentation.

Residential Gas Measures
General

Issue #: **ResGas 1**

Pertains to: End-Uses; Program Names

Issue Description: End-use and Program fields are not filled in for any of the Residential Natural Gas measures. See Appendices B and E in the TRM for correct program and end-use names and acronymns.

ENERGY STAR Programmable Thermostats

No Comments

Boiler Reset Controls (retrofit/add on only)

No Comments

Heat Recovery Ventilator

Issue #: **ResGas 2**

Pertains to: Measure Description

Issue Description: Lacking detail; possibly difficult to understand application of measure technology. There is no algorithm to inform the user.

Condensing Water Heater

No Comments

Tankless Water Heaters

No Comments

Indirect Water Heater

Issue #: **ResGas 3**

Pertains to: Description Field

Issue Description: The description is not informative of exactly what part of an indirect water heating system saves energy, and how. Because it is a deemed savings value, it is impossible to infer this information from an algorithm.

Stand Alone Storage Water Heater

Issue #: **ResGas 4**

Pertains to: High Efficiency Description

Issue Description: The Energy Factor for the high efficiency case is being increased from .62 to .67. This is not noted anywhere in the measure.

Integrated water heater/condensing boiler

No Comments

Integrated water heater/non-condensing boiler

No Comments

Furnace (Forced Hot Air) with ECM

Issue #: **ResGas 5**

Pertains to: High Efficiency Description

Issue Description: The 92% or 94% AFUE Furnace with ECM is going to sunset over the next year. Eventually the high efficiency case will be a Furnace with a 96% AFUE. This is not mentioned in the measure characterization.

Boiler (Forced Hot Water)

Issue #: **ResGas 6**

Pertains to: High Efficiency Description

Issue Description: The lowest acceptable AFUE rating, 85%, is going to sunset over the next year. A new high-end rating of 96% AFUE will be phased in.

Low Income – Gas Heating System Replacement

Pending.

Low Income – Gas Weatherization

Pending.

OPOWER - Gas

Issue #: **ResGas 7**

Pertains to: Algorithms for Calculating Primary Energy Impacts

Issue Description: The algorithm is confusing. The ΔMMBtu column in the Gas Savings Factors tables does not match up with the algorithm. Either, the Units are irrelevant, or the explanation of how the savings are calculated is very unclear. Needs to be changed to clarify explanation of what the ΔMMBtu means, or change the algorithm.

Commercial Gas Measures
General

Issue #: **ComGas 1**

Pertains to: C&I Net-to-Gross Factors for Natural Gas Measures (Appendix C)

Issue Description: All C&I Natural Gas measures are assumed to have zero free-ridership and spillover, and thus NTG ratios of 100%, due to not having any Massachusetts-specific evaluations for C&I gas programs. We believe that assuming a NTG ratio of 100% in the absence of a specific evaluation is inappropriate, since we expect significant free-ridership for some measures and thus NTG ratios that are significantly less than 100%. It would be more reasonable to assume a value based on the overall average of recent results for the electric programs as a proxy for gas program NTG ratios. In addition, the results of gas program evaluations elsewhere could be used for corroboration.

While only addressing select measures in GasNetworks' residential heating program, NMR's recent evaluation identified very high freeridership rates – on the order of 60% for some measures (spillover was not studied). While not directly applicable to the commercial natural gas efficiency measures, this study provides a clear indication that a 100% NTG assumption can result in significant savings overestimates.

HVAC – ENERGY STAR® Natural Gas Programmable Thermostat

Issue #: **ComGas 2**

Pertains to: "Algorithms for Calculating Natural Gas Savings," p.284.

Issue Description: The average annual savings of 7.7 MMBtu references a study that was conducted for residential applications of programmable thermostats. It is not clear that these residential savings can be extrapolated to commercial applications.

HVAC – Boiler Reset Controls (retrofit/add on only)

Issue #: **ComGas 3**

Pertains to: "Algorithms for Calculating Natural Gas Savings," p.286.

Issue Description: The "ΔMMBtu" savings estimate of 35.5 MMBtu is based on the assumptions that the reset controls will save 5% of a typical 710.46 MMBtu annual boiler load. The referenced sources for both of these assumptions do not provide adequate information to assess validity. Specifically, the 710.46 MMBtu assumed base usage appears low. A 2005 study suggests that the average

commercial boiler size is ~9.6 MMBtu/h[24]. Assuming that the typical annual usage assumption employed in the draft TRM is correct, this would mean the average boiler only runs for 71 hours annually. This is certainly not the case. At a minimum, this savings algorithm should be revised to accept boiler capacity as an input to account for a range of available boiler sizes.

HVAC – Condensing Unit Heater

Issue #: **ComGas 4**

Pertains to: "Baseline Efficiency" section, p.288.

Issue Description: While the efficiency requirements remain unchanged, the referenced document should be updated to reflect IECC 2009, the basis for current MA state energy codes.

Issue #: **ComGas 5**

Pertains to: "Algorithms for Calculating Natural Gas Savings," p.288.

Issue Description: The 40.9 MMBtu savings estimate per unit heater installed is derived from the NYSERDA Deemed Savings Database, but it is unclear how the original savings estimates were obtained. By back-solving given the variables presented, it appears that the savings estimate makes the implicit assumption that there are an average 1,180 full load heating hours in Massachusetts. This is a reasonable estimate; however, the source of the estimates should be better documented.

Issue #: **ComGas 6**

Pertains to: "Algorithms for Calculating Natural Gas Savings," p.288.

Issue Description: The savings algorithm presents savings estimates "per condensing unit heater installed". Since the actual savings will be capacity dependent, we recommend revising the equation to be presented in terms of "per MMBtu/h input capacity installed".

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[24] Characterization of the U.S. Industrial Commercial Boiler Population, Energy and Environmental Analysis, Inc., 2005. <www.cibo.org/pubs/industrialboilerpopulationanalysis.pdf>

HVAC – Gas-Fired Low Intensity Infrared Heating

Issue #: **ComGas 7**

Pertains to: End-use and Program Description

Issue Description: Fields need to be populated selecting appropriate program and end-use types from appendices B and E for correct program and end-use names and acronyms.

HVAC – High Efficiency Natural Gas Boiler

Issue #: **ComGas 8**

Pertains to: "Notes" section, p.292.

Issue Description: We agree with the statement that this measure is a strong candidate for developing a deemed calculation with inputs provided by the customer. This should be done as soon as possible.

Issue #: **ComGas 9**

Pertains to: Table 26, p.292-3.

Issue Description: The savings values presented in Table 26 do not agree with any values published in the reference document, ODC. Evaluation Study of Keyspan's Commercial and Industrial High Efficiency Heating Equipment Program. pg 40. Oct, 2007. The equipment capacity and full load operating hours assumed to calculate the savings values for each technology and capacity bin should be explicitly stated and documented.

HVAC – High Efficiency Natural Gas Warm Air Furnace

Issue #: **ComGas 10**

Pertains to: Table 28, p.295.

Issue Description: It is not clear how the savings values presented in Table 28 have been derived from the referenced sources. Additional documentation showing how the estimates presented in the draft TRM have been determined should be provided.

Issue #: **ComGas 11**

Pertains to: Table 28, p.295.

Issue Description: Typo in table heading, reads, "Boiler Type," should be "Furnace Type."

Issue #: **ComGas 12**

Pertains to: "Algorithms for Calculating Natural Gas Savings" section, p.295.

Issue Description: The "Units" variable suggests that unit "for specific type/size" should be tallied; however, this algorithm as presented is not dependent on equipment capacity. We strongly suggest that the savings algorithm be modified to include equipment capacity as an input.

HVAC/Hot Water – Combined High Efficiency Boiler and Water Heater

Issue #: **ComGas 13**

Pertains to: Table 30, p.298.

Issue Description: The savings estimated presented in the source documentation do not agree with the values presented in the draft TRM.

Issue #: **ComGas 14**

Pertains to: "Algorithms for Calculating Natural Gas Savings" section, p.298.

Issue Description: The "Units" variable suggests that unit "for specific type/size" should be tallied; however, this algorithm as presented is not dependent on equipment capacity. We strongly suggest that the savings algorithm be modified to include equipment capacity as an input.

Issue #: **ComGas 15**

Pertains to: "Baseline Efficiency" section, p.298.

Issue Description: The baseline efficiency should be more explicitly defined. What are the assumed EF and AFUE of the baseline water heater and boiler? What is the basis of these assumptions?

Hot Water – Condensing Stand-Alone Water Heater

Issue #: **ComGas 16**

Pertains to: "Algorithms for Calculating Natural Gas Savings" section, p.300.

Issue Description: The 25.0 MMBtu annual savings per condensing stand-alone water heater installed was calculated with an online savings estimation tool provided on ESource's website. This exact calculation methodology used by this tool is unclear, and its reliability is questionable. Furthermore, the assumed usage of 250 gallons per day is unsubstantiated. Water usage, equipment capacity, and equipment efficiency will all be site-specific. The savings algorithm should be modified to accept these factors as inputs to provide better estimates of actual savings.

Hot Water – Pre-Rinse Spray Valve

No Comments

Hot Water – Repair/Replace Malfunctioning Steam Trap

Issue #: ComGas 17

Pertains to: "Algorithms for Calculating Natural Gas Savings" section, p.304.

Issue Description: While the methodology used to derive the 25.7 MMBtu savings per steam trap repaired or replaced appears reasonable, the calculation would benefit from additional clarity. Specifically, it recommended that the calculation of the savings estimate be fully presented in a referenced spreadsheet noting which assumptions are based on previous program experience and which assumptions are based on externals sources.

Hot Water – Low Flow Shower Heads

Issue #: **ComGas 18**

Pertains to: Water Resource Imapcts

Issue Description: Claims the measure saves 7,300 gallons of water per year, needs a source for this. Does this assume specific building types, or is it averaged across all types. If this comes from the FEMP faucet and showerhead calculator,

need to know how entered data relates to other deemed values in measure characterization.

Hot Water – Faucet Aerator

Issue #: **ComGas 19**

Pertains to: Water Resource Impacts

Issue Description: Claims the measure saves 5,460 gallons of water per year, needs a source for this. Does this assume specific building types, or is it averaged across all types. If this comes from the FEMP faucet and showerhead calculator, need to know how entered data relates to other deemed values in measure characterization.

Hot Water - High Efficiency Indirect Water Heater

Issue #: **ComGas 20**

Pertains to: "Algorithms for Calculating Natural Gas Savings" section, p.310.

Issue Description: The 30.4 MMBtu annual savings per indirect water heater installed was calculated with an online savings estimation tool provided on ESource's website. This exact calculation methodology used by this tool is unclear, and its reliability is questionable. Furthermore, the assumed usage of 250 gallons per day is unsubstantiated. Water usage, equipment capacity, and equipment efficiency will all be site-specific. The savings algorithm should be modified to accept these factors as inputs to provide better estimates of actual savings.

Issue #: **ComGas 21**

Pertains to: "Baseline Efficiency" section, p.310.

Issue Description: The baseline efficiency should reference IECC 2009. The erroneous references to IECC 2009 with 2007 Supplement should be removed.

Hot Water – High Efficiency Tankless Water Heater

Issue #: **ComGas 22**

Pertains to: "Algorithms for Calculating Natural Gas Savings" section, p.312.

Issue Description: The 7.1 MMBtu annual savings per tankless water heater installed was calculated with an online savings estimation tool provided on the Federal Energy Management Program's website. The assumed usage of 64 gallons per day is unsubstantiated. While this estimate may be adequate for small units, it will underestimate savings for larger equipment. Water usage, equipment capacity, and equipment efficiency will all be site-specific. The savings algorithm should be modified to accept these factors as inputs to provide better estimates of actual savings.

Issue #: **ComGas 23**

Pertains to: "Baseline Efficiency" section, p.312.

Issue Description: The baseline efficiency should reference IECC 2009. References to IECC 2006 with 2007 Supplement should be removed.

Hot Water – High Efficiency Free Standing Water Heater

Issue #: **ComGas 24**

Pertains to: "Algorithms for Calculating Natural Gas Savings" section, p.314.

Issue Description: The savings estimate depends upon the unsubstantiated assumption that the baseline unit consumes 18.1 MMBtu annually.

Issue #: **ComGas 25**

Pertains to: "Baseline Efficiency" section, p.314.

Issue Description: The baseline efficiency should reference IECC 2009. References to IECC 2006 with 2007 Supplement should be removed.

Food Service – Commercial Gas-Fired Oven

Issue #: **ComGas 26**

Pertains to: Table 31, p.316.

Issue Description: The references in Table 31 to the Food Service Technology Center website all reference the same savings tool for combination ovens. These references should be corrected to point to the appropriate savings calculators.

Issue #: **ComGas 27**

Pertains to: "Water Resource Impacts", p.317.

Issue Description: The combination oven should have water resource impacts. The current entry states: "There are no operation and maintenance cost impacts for this measure."

Food Service – Commercial Gas-Fired Griddle

No Comments

Food Service – Commercial Fryer

Issue #: **ComGas 28**

Pertains to: "Algorithms for Calculating Natural Gas Savings" section, p.320.

Issue Description: The "ΔMMBtu" savings value of 58.6 MMBtu does not agree with the result of the savings equation when using minimum ENERGY STAR equipment requirements of 15,500 Btu preheat energy, 9,000 Btu/h idle energy rate, and 50.0% heavy load efficiency. The equation should result in savings of 50.5 MMBtu.

Food Service – Commercial Gas-Fired Steamer

No Comments

Appendices

Issue #: Appendices 1

Pertains to: Appendix A: Table 34: Default Effective Lighting Hours by Building Type, p. 340.

Issue Description: There are several building types for which no estimated operating hours have been given. If savings will not be tracked by these building types, they should be removed.

Issue #: Appendices 2

Pertains to: Appendix A: Table 35: Cooling Equivalent Full Load Hours by Building (or Space) Type, p. 347.

Issue Description: The bulk of this table requires a source.

Issue #: Appendices 3

Pertains to: Appendix A: Table 36: Cooling and Heating Equivalent Full Load Hours by Building (or Space) Type, p. 348.

Issue Description: This table requires a source. This table appears to be redundant with Table 35.

Issue #: Appendices 4

Pertains to: Appendix A: Table 33: Lighting Power Densities Using the Space-by-Space Method (WATTSb,i)

Issue Description: The first row should not be formatted as "heading rows repeat". Or, split the "Building-Specific Space Types" into a separate table.

Issue #: Appendices 5

Pertains to: Appendix D: Table of Referenced Documents

Issue Description: All referenced document citations with corresponding digital versions should appear in Appendix D: Table of Referenced Documents. We have not reviewed each citation. A TRM user should be able to determine the corresponding digital document for a citation, and retrieve that document for review.

Issue #: **Appendices 6**

Pertains to: Appendix F: Glossary

Issue Description: Typo under Program Administrator: “natural gase PAs”