Regional Net Savings Research, Phase 2: Definitions and Treatment of Net and Gross Savings in Energy and Environmental Policy

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Northeast Energy Efficiency Partnerships:

Evaluation, Measurement, and Verification Forum

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Executive Summary

This report, conducted for the Northeast Energy Efficiency Partnerships, Inc. (NEEP) and its Evaluation, Measurement, and Verification (EM&V) Forum (hereafter EMV Forum or the Forum), summarizes the results of research on net and gross savings definitions, and the treatment of energy savings estimates in the policies of various entities in the Northeast. The research is intended to help NEEP and the Forum make progress toward the goal of improving and ensuring the understanding, transparency, and credibility of electric and gas energy efficiency resources implemented in the Northeast and mid-Atlantic region by addressing the following objectives:

- To increase clarity and regional consistency in the nomenclature used in describing and reporting modifications to estimates of gross savings from efficiency resources, specifically adjusted gross savings and net savings.
- To catalog and characterize policies in the region with respect to how net savings, adjusted gross savings, gross savings, and possibly other measures of efficiency impacts are used to develop and measure progress toward policy goals in order to help inform discussions about whether and how policy goals are aligned with policy metrics.

This report builds on a 2010 EM&V Forum Project, the *Net Savings Scoping Study* (NMR and Research Into Action, 2010). The current research involved two primary tasks. First, we reviewed how gross savings, net savings, realization rate, and the parameters of gross and net savings are defined and applied in the evaluations of programs that vary by their market approach (whole house retrofit programs, large C&I custom measure programs and upstream residential lighting programs).[1] Second, we reviewed several types of state and regional policies, including state energy efficiency policies and regional transmission policies, with respect to how gross and net savings are used in measuring progress toward policy goals. We supplemented our policy review by conducting interviews with 19 key informants who have shed light on how the policies are implemented, and by gathering feedback from Forum members and stakeholders.

Key Findings

Definitions of Gross and Net Savings

We found evidence that NEEP members states and opinion leaders in the region are converging on definitions of gross and net savings consistent with the NEEP *Glossary of Terms,*[2] and

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[1] Please note that this report does not provide a thorough review of the methods and measurement of net savings in the review of the evaluations but instead focuses on how net and gross savings are defined and applied. The *Net Savings Scoping Study* (NMR and Research Into Action, 2010) provides a review of measurement issues associated with net savings.

[2] Horowitz, Paul. 2011 *Glossary of Terms: Version 2.1.* A Project of the Regional Evaluation, Measurement, and Verification Forum. http://neep.org/uploads/EMV%20Forum/EMV%20Products/EMV_Glossary_Version_2.1.pdf

consistent with definitions of the State and Local Energy Efficiency Action Network (SEE Action)'s in its *Model Impact Evaluation Guide.*[3] The definitions are as follows.

Gross savings are defined as "The change in energy consumption and/or demand that results directly from program-related actions taken by participants in an efficiency program, regardless of why they participated."

Net savings are defined as "The change in energy consumption and/or demand that is attributable to a particular energy-efficiency program. This change in energy use and/or demand may include, implicitly or explicitly, consideration of factors such as Free Ridership, Participant and Non-Participant Spillover, and induced market effects. These factors may be considered in how a Baseline is defined and/or in adjustments to Gross Savings values."[4]

Net-to-Gross (NTG) ratio is a term that is most commonly defined as the ratio of net and gross program savings. The NTG ratio is applied to gross program savings to convert them into net program savings.

These definitions align with the conceptualization of the *Net Savings Scoping Study.* In that study, we proposed that adjustments to gross savings should be limited to parameters that can be measured directly because they have actually occurred, such as hours of use or installation rates. Net savings should be limited to savings attributable to the program, in other words savings that *would not have happened* in the absence of the program. Free ridership and spillover, parameters of net savings, are approximated by estimating a counterfactual, or something that did not happen—in this case, what energy savings would have been in the same context but without the program.[5]

We found value in Schiller's[6] recommended nomenclature for referring to the timing and time period of the savings, as follows:

- **Projected savings** (sometimes referred to as *ex ante* savings)

- **Claimed savings**, which include Program Administrator (PA) adjustments for data errors and current tracking data (also sometimes referred to as *ex ante* savings, but more commonly referred to as adjusted gross savings, *ex post* savings or tracked savings)

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[3] http://www1.eere.energy.gov/seeaction/index.html, forthcoming

[4] In considering how a baseline is defined, we suggest that the baseline should explicitly account for naturally occurring energy efficiency.

[5] By definition, the counterfactual never happened, and therefore cannot be directly measured. Therefore, it is necessary to "construct" what would have happened in the absence of the programs, and one cannot be certain that the methods truly captured this fictional condition. Concerns about accurately measuring free ridership and spillover are well summarized by Hossein Haeri and M. Sami Khawaja in a recent article of *Public Utilities Fortnightly (*http://www.fortnightly.com/fortnightly/2012/03/trouble-freeriders*).*

[6] Steve Schiller is currently working on the (SEE Action) *Model Impact Evaluation Guide* definitions of gross and net savings. As part of the project he is comparing the glossary of terms to the NEEP Glossary of Terms (conference call with Elizabeth Titus, January 17, 2012).

- **Evaluated savings**, with evaluations conducted by a third party evaluator to document and further adjust savings estimates (commonly referred to as *ex post* or *ex post evaluated* savings, with consequent confounding of evaluated and claimed savings)

Realization Rate is primarily used for the ratio of gross evaluated savings to gross claimed savings. Thus, it provides a measure of the savings that were achieved compared to the savings that were predicted.

We did not find value in the use of gross and adjusted gross savings as distinct terms. Theoretically, all gross savings estimates are adjusted by a variety of parameters, such as hours of use and change in wattage. In practice, evaluated gross savings in one jurisdiction may be estimated with the same methods used to estimate claimed gross savings in another—for example, they both may apply parameters from a Technical Reference Manual, and one jurisdiction may go further and conduct primary research to develop new values for those parameters to derive evaluated savings estimates. We believe it is preferable to spell out what goes into projected, claimed, and evaluated savings than to use the imprecise term "adjusted gross."

Review of State and Regional Policies

Currently, there is no consensus on the preferred use of net savings or gross savings in the reviewed policies for measuring **compliance with goals**. Some policies, such as air regulations, have stated a preference for using gross savings for measuring progress toward goals while others, such as state energy efficiency plans, often use net savings. The inconsistency is governed by the individual state's legislature or regulation.

State Energy Savings Plans, Goals and Metrics

The **goals** of the state energy savings plans reviewed vary in whether net or gross savings are used to measure progress because the differences are governed by each state's legislature or regulation (i.e., savings metrics), how the goals are established, the magnitude of the goals, and the resources allocated to achieve the savings goals. Because of these inconsistencies, comparing savings goals and progress toward reaching savings goals across states is difficult. Yet interviewees agree that such comparison is important for purposes of assessing regional environmental impacts or potential regional impacts on systems.

Different savings metrics (i.e., gross and net) are used for utility regulatory **compliance purposes** across New England and the Mid-Atlantic regions,[7] and in some cases gross and net savings are applied for different purposes (i.e., gross for compliance purposes and net for program planning and measuring cost effectiveness; see Appendix A for more details).

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[7] Savings metrics used for utility regulatory compliance refers to the types of savings (i.e., gross or net) that PAs are required to report to their governing regulatory body, such as a Department of Public Utilities or a Department of Public Service.

Compared to New England and New York, states in the Mid-Atlantic more commonly use evaluated gross savings for utility regulatory compliance and net savings for program planning and measurement of cost effectiveness. In contrast, New England and New York are more likely to use evaluated net savings; in doing so, they apply NTG values prospectively rather than retrospectively.[8]

In addition, a recent Massachusetts DPU order recognized that many current energy-efficiency programs are multi-faceted and multi-year programs that are meant to bring about changes at the market level. These programs may result in spillover and other induced market effects that may not be captured by current evaluation approaches that focus on participants in specific programs in specific years. As a result, the Massachusetts DPU convened a working group "to explore if and how a market-based approach could be developed and implemented in a way that produces net savings results that improve upon the status quo."[9]

Pros and Cons of Using Net or Gross Savings for Energy-efficiency Programs

Interviewees expressed mixed views of the proper use of net and gross savings. Some interviewees said that gross represents a more accurate estimate of the impact of energy-efficiency programs on the electric grid, while others said that net is more accurate since gross does not take into account free ridership (potentially overestimating savings) and spillover and other market effects (potentially under counting savings).

Regardless of their state's regulatory treatment of gross savings and net savings, interviewees consistently expressed concerns that accurately estimating the net impacts of the programs is becoming increasingly difficult because of the number of policies and programs promoting energy efficiency and the emphasis on multi-year, multi-faceted energy-efficiency programs.

Finally, a number of interviewees, particularly those from states that use net savings for regulatory purposes, indicated that net savings has several important benefits, including assessing program effectiveness and helping insure that ratepayer and taxpayer funds are spent responsibly. (See NMR and Research Into Action. 2010. *Net Savings Scoping Paper* for a more detailed discussion of the benefits and limits of applying NTG retrospectively)

The inconsistent use of net and gross savings in the region reflects a variety of rationales about what metric should be used when, and reliance on legacy regulatory systems or practices that are difficult to change. Further, there has been no regional policy driver that makes consistency a priority.

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[8] Retrospective net savings refers to the process of estimating net savings and NTG ratios from data from past programs and applying them to past PA programs. In contrast, prospective net savings refers to the process of estimating net savings and NTG ratios from data from past programs and applying them to *future* programs.
[9] http://www.env.state.ma.us/dpu/docs/electric/11-120/81012dpuord.pdf

Energy Efficiency and System Planning

While the three RTOs (i.e., New England ISO [ISO-NE], New York ISO [NYISO], and PJM) incorporate energy efficiency into their forecasts, each has a different policy regarding net and gross savings.[10]

ISO-NE has no official policy regarding net and gross savings for resources that are bid into the wholesale forward capacity market (FCM) but it incorporates net energy efficiency into its long-range forecasts (i.e., ten-year forecasts, beyond the FCM period). New York ISO incorporates evaluated net savings into its forecasts based on data reported by program administrators to the New York Department of Public Service (via the Energy Efficiency Portfolio Standard or EEPS scorecard, which tracks progress towards the state's EEPS goals). In the case of PJM Interconnection, in its long-term forecasts PJM accounts only for energy efficiency resources that clear the Reliability Pricing Model (RPM) capacity market. As a result, no new energy efficiency resources are counted after the third year of the long-term forecast, which likely understates the impact of long-term energy efficiency investments. PJM has no clearly stated policy regarding whether providers should bid net or gross savings into the RPM, and utilities bid gross savings. Hence both ISO-NE and New York ISO reflect net savings in their long-term forecasts, while PJM does not (though the RPM capacity market has a shorter forecasting horizon).

Outside the region, the Northwest Power and Conservation Council (NPCC) nominally incorporates gross energy-efficiency savings into its system planning, though the NPCC's definition of gross savings is comparable to evaluated net savings according to the definitions recommended in this report. The NPCC's estimate of gross savings is net of naturally occurring energy efficiency, which attempts to predict what would happen in the absence of the program, and thus takes into account free ridership, spillover and other market effects.

Efforts to Quantify the Energy Savings Associated with Efficiency Actions for Air Regulations and Policies

Treatment of savings varies among policies that quantify the energy savings associated with efficiency actions, such as EPA Guidance (*Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans*)[11] and the Regional Greenhouse Gas Initiative's (RGGI) reference case. The US EPA is interested in evaluated gross savings that can be linked to Electric Generating Units (EGUs) and associated emissions. Separately, RGGI relies on individual states to report energy-efficiency savings from their energy-efficiency programs, and whether this is gross or net varies by state (e.g., net savings for Massachusetts and New York, gross savings for Maryland and

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[10] It should be noted that if energy-efficiency programs result in spillover and net savings estimates do not account for spillover, then programs will not be credited with all of the program-induced savings in RTO forecasts. Instead, the savings would be counted as naturally occurring energy efficiency savings.

[11] http://www.epa.gov/airquality/eere/index.html; http://neep.org/uploads/EMV%20Forum/EPA_Moskal_PPT.pdf; http://neep.org/uploads/EMV%20Forum/Dietsch%20EMV%2010.12.pdf

Pennsylvania). The goal of the RGGI reference case is to provide electricity sector projections over the next several years from RGGI states' assumptions, including energy demand assumptions.

The goals stemming from the Massachusetts state policies set forth in the Global Warming Solutions Act (GWSA) and the Clean Energy and Climate Plan (CECP) are net savings goals, and currently the PAs report net savings in the annual reports used to document energy-efficiency program contributions toward the achievement of the goals. There are some discussions underway regarding whether to use net or gross savings to track progress toward the GWSA goals.

Net Savings and Gross Savings in Recent Evaluations

In our review of how gross savings, net savings, realization rate, and the parameters of gross and net savings are defined and applied in recent evaluations, we found that gross and net savings have been defined consistently with the conceptualization of the terms proposed in this report while realization rate continues to be a term that is defined inconsistently in evaluations.

Whole-house Retrofit Programs

Evaluations of whole-house retrofit programs generally define gross and net savings consistently with the conceptualization of the terms proposed in this report, though some methods used to estimate net savings may miss non-participant spillover and count it as free ridership. In contrast, realization rate continues to be a term that is defined inconsistently in evaluations.

Evaluations often do not report separate savings values for the individual parameters of gross savings for each installed measure (i.e., hours of use or installation rates). Evaluations typically use pre-post retrofit billing analysis, sometimes in combination with energy modeling of the installed measures, to estimate gross savings.[12] In this way, the individual parameters of gross savings are incorporated into the estimate of evaluated gross savings, but the values of each parameter are not reported.

Similarly, the estimates of net savings do not always include separate estimates of free ridership and spillover. Instead, when comparing the energy usage of program participants to the usage of non-participants, the method implicitly accounts for free ridership and spillover. However, billing analysis may underestimate net savings because it effectively counts any nonparticipant spillover as free ridership.

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[12] Evaluations that use energy or engineering modeling to estimate gross savings commonly rely upon Program Savings Documents or Technical Reference Manuals to set parameters of gross savings, such as hours of use, for the installed measures. However, the evaluations do not attempt to establish new values of the individual parameters based on the combination of measures installed by the program in each participating home.

Large C&I Custom Measure Programs

We reviewed C&I impact evaluations for custom-measure programs, including new commercial construction programs and industrial programs. The evaluations we reviewed estimated and reported gross savings but not the individual parameters of gross savings for each installed measure (i.e., hours of use or installation rates). However, the evaluations often examined the individual parameters of net savings (i.e., free ridership and spillover). Overall, gross savings, net savings, NTG and realization rate were defined consistently with the conceptualization of the terms proposed in this report.

Upstream Lighting Programs

Evaluations that examine the gross savings of upstream residential lighting programs address the individual parameters of gross savings, often using methods such as onsite visits and lighting loggers to record lighting usage. However, upstream lighting programs represent a measure/program type that, because market participants may not be aware of program effects, do not lend themselves to separate estimates of free ridership and spillover, but rather commonly combine free ridership and spillover into a single estimate of the net-to-gross ratio or net savings. For some methods, such as a multistate modeling approach, any spillover into non-program areas would be counted negatively as it would raise the baseline to which the program areas are compared. Overall, gross savings, net savings and realization rates have been defined consistently with the conceptualization of the terms proposed in this report.

Conclusions and Recommendations

Conclusion 1: Energy efficiency and system planning policies across the region vary considerably in the clarity and accessibility of the policies and their application of gross and net savings as metrics of progress toward policy goals. Yet there is evidence that NEEP member states and opinion leaders are converging on definitions of gross and net savings consistent with those developed by SEE Action and proposed in this report.

Recommendation 1a: The NEEP region should adopt these definitions, as well as the terms projected gross savings, claimed gross savings, evaluated gross savings, projected net savings, claimed net savings, and evaluated net savings, as defined in this document. Reporting all types of savings would help facilitate comparison of savings from energy-efficiency programs across the NEEP region.

Recommendation 1b: The Forum should encourage the agencies and regulators in the region to make their documents more accessible.

Conclusion 2: Use of net and gross savings in energy efficiency forecasts for system planning, air quality planning, and RGGI forecasting purposes differ and in some cases lack transparency. Moreover, forecasting approaches and methods differ.

Recommendation 2: Efforts should be made to increase the consistency, understanding and transparency of forecasting approaches used, and the underlying application of net or gross savings, with an overall objective to better coordinate energy efficiency forecasts (and their respective underlying data inputs, baselines, definitions and methodologies) to support energy and environmental policies.

Conclusion 3: The state energy savings goals and metrics reviewed vary substantially.

Recommendation 3: Support state efforts to develop strong, technically sound energy savings goals, to clearly document and communicate goals, and to encourage consistency in savings metrics used to estimate progress toward goals (such as annual savings goals and lifetime savings goals). Savings metrics should be clearly labeled to increase clarity and transparency.

Conclusion 4: Many current energy-efficiency programs are multi-faceted and multi-year programs intended to bring about changes at the market level. Because programs differ in their theory, reach, and relative contribution to portfolio savings, the most commonly used methods for estimating net savings appear to be inappropriate for some efforts.

Recommendation 4: Investigate and explore the specific situations in which market-level net savings estimation might be appropriate and outline the implications of any such approach.

Conclusion 5: Currently, there is no venue for a technical discussion that cuts across the range of issues and stakeholders identified above. The Regional EM&V Forum, which includes a broad range of stakeholders, can serve in this unique role to bring parties together.

Recommendation 5: NEEP should facilitate a series of technical sessions or workshops with representatives from the energy-efficiency community, air regulators, and the ISO/RTO system forecasters to review and discuss the use of consistent definitions for net and gross savings, and to explore how to incorporate net savings, gross savings and naturally occurring energy efficiency into planning for various policy needs. From these meetings, NEEP should recruit a committee from among workshop attendees to develop guidance and recommendations that build on those provided herein and vetted at the technical workshop.

1 Introduction

This report, conducted for the Northeast Energy Efficiency Partnerships, Inc. (NEEP) and its Evaluation, Measurement, and Verification (EM&V) Forum (hereafter EMV Forum or the Forum), summarizes the results of research on net and gross savings definitions, and the place of energy savings estimates in the policies of various entities in the Northeast. The research is intended to help NEEP and the Forum make progress toward the goal of improving and ensuring the understanding, transparency, and credibility of electric and gas energy efficiency resources implemented in the Northeast and mid-Atlantic region by addressing the following objectives:

- To increase clarity and regional consistency in the nomenclature used in describing and reporting modifications to estimates of gross savings from efficiency resources, specifically adjusted gross savings and net savings.
- To catalog and characterize policies in the region with respect to how net savings, adjusted gross savings, gross savings, and possibly other measures of efficiency impacts are used in the development and measurement of progress toward policy goals in order to help inform discussions about whether and how policy goals are aligned with policy metrics.

This report builds on a 2010 EM&V Forum Project, the *Net Savings Scoping Study* (NMR and Research Into Action, 2010), the purpose of which was to improve Forum members' understanding of how net energy savings are defined, how stakeholders use net savings, and the opportunities and barriers to increasing the consistency of and quality in net savings definitions and measurement in the region.

The current research involved two primary tasks, which are presented below.

First, we reviewed how gross savings, net savings, realization rate, and the parameters of gross and net savings are defined and applied in the evaluations of programs that vary by their market approach.[13]

Second, we reviewed several types of state and regional policies, including state energy efficiency policies and regional transmission policies, with respect to how gross and net savings are used in measuring progress toward policy goals. We supplemented our policy review by conducting interviews with 19 key informants who have shed light on how the policies are implemented, and by gathering feedback from Forum members and stakeholders.

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[13] Please note that this report does not provide a thorough review of the methods and measurement of net savings in the review of the evaluations but instead focuses on how net and gross savings are defined and applied. The *Net Savings Scoping Study* (NMR and Research Into Action, 2010) provides a review of measurement issues associated with net savings.

1.1 Definitions of Adjusted Gross and Net Savings

Our first task began by briefly reviewing how adjusted gross savings, net savings, realization rates and the parameters of adjusted gross savings are defined and presented in the *Net Savings Scoping Paper* (NMR and Research Into Action, 2010). Next we reviewed how these terms are defined and applied in the evaluations of three types of programs that vary by their market approach (whole house retrofit programs, large C&I custom measure programs and upstream residential lighting programs). [14]

1.2 Exploratory Policy Research and Recommendations

For the second task, the NMR team, in consultation with NEEP, has reviewed several types of state and regional policies, including state energy efficiency policies and regional transmission policies, with respect to how gross and net savings are used in measuring progress toward policy goals. We supplemented our policy review by conducting interviews with 19 key informants who have shed light on how the policies are implemented, and by gathering feedback from Forum members and stakeholders. The NMR team has reviewed and conducted interviews concerning the following policies:

- State Energy Efficiency Plans and Policies:
    - Connecticut's 2012 Draft Integrated Resource Plan and Connecticut Public Act 11-80 – An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future
    - Maryland— EmPower Maryland Act of 2008 (Article: Public Utilities §7–211) and PSC Order No. 84569
    - Efficiency Maine Triennial Plan, 2011-2013
    - Massachusetts Green Communities Act, 2010-2012 DPU orders for electric and gas and 2013-2015 Massachusetts Joint Statewide Three-Year Electric and Gas Energy Efficiency Plan
    - New York's Energy Efficiency Portfolio Standard, initial electric order, initial gas order, and NYSERDA 2011-2014 plan
    - Rhode Island's 3-Year Least Cost Procurement Plan for 2009-2011 and 2012-2014
    - Vermont Public Service Board orders related to Energy Efficiency Utility Budget for 2012-2014 Demand Resources Plan and Vermont Comprehensive Energy Plan
    - Delaware—Title 26, Energy Efficiency Resource Standards
    - Pennsylvania—Act 129 and Implementation Order, Energy Efficiency Resource Standard

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[14] Please note that this report does not provide a thorough review of the methods and measurement of net savings in the review of the evaluations but instead focuses on how net and gross savings are defined and applied. The *Net Savings Scoping Study* (NMR and Research Into Action, 2010) provides a review of measurement issues associated with net savings.

- Regional transmission planning and wholesale markets for energy efficiency/demand resources:
    - ISO-NE: Proof of Concept Forecast of New State-Sponsored Energy Efficiency 2014-2020 and Final Energy Efficiency Forecast in the ISO-New England Planning Process
    - PJM Interconnection: Manual 18b: Energy Efficiency Measurement & Verification
    - New York ISO (NYISO): Incorporating Energy Efficiency in Long Term System Planning
    - Vermont /New Hampshire Transmission Needs Assessment
- Efforts to Quantify the Energy Savings Associated with Efficiency Actions for Air Regulations and Policies:
    - The Regional Greenhouse Gas Initiative (RGGI) Reference Case Assumptions and Results
    - US EPA – Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans and Linking EE & Air Quality – Opportunities for the EM&V Forum
- US Department of Energy's Uniform Methods Project
- Other state or regional policies
    - Massachusetts:
        - Department of Public Utilities, Notice of Investigation, Issues Associated with Energy Efficiency Program Benefits
        - Global Warming Solutions Act
        - Clean Energy and Climate Plan
    - California Greenhouse Gas Regulatory Strategy
    - Northwest Power and Conservation Council power planning documents and process

We examined each policy to answer the following questions for each jurisdiction:

- What metric of energy-efficiency impacts is used (gross savings, net savings, other)?
- How are the metrics used?
- Why was the metric selected for use? What alternatives were considered?
- What challenges, if any, have been experienced in measuring progress toward goals generally, and with each metric (e.g., gross savings, adjusted gross savings, net savings) in particular?
- How effective is each metric as an indicator of progress toward goals?
- Are there or should there be different policy or policy frameworks for different applications of net vs. gross savings? In other words, are net savings and gross savings applied in different ways for measure screening, determination of shareholder incentives, cost effectiveness, and program goals, and should they be?

In the course of this project, NMR did the following:

1. Developed recommended terms and definitions for net savings and gross savings
2. Identified and described each policy, its goals, the role of energy efficiency, and associated performance metrics.
3. Assessed how progress toward goals is measured for each policy—specifically whether net, gross, or other measurements are employed.
4. Identified similarities and differences among states, and among types of policies researched with respect to goals and measurement parameters.
   Recommended what types or categories of savings (e.g. net, adjusted gross, gross) may be appropriate for future use in developing objectives and measuring progress toward goals for energy, economic and environmental policies or trading markets such as RGGI.

2 Definitions of Gross and Net Savings

This chapter reports our findings regarding how gross savings, net savings, realization rate, and the parameters of gross and net savings have been defined and applied in recent evaluations.

As stated in the RFP, the overall goal of this portion of the Project is to increase clarity and regional consistency in the nomenclature used in describing and reporting modifications to estimates of gross savings from efficiency resources, specifically adjusted gross savings and net savings. The associated outcome is as follows:

1. Regionally common definitions for adjusted gross savings and net savings that can be recommended for future Forum adoption. The definitions will be based on background research in support of the proposed common definitions including identifying any weaknesses or gaps in current practice regarding existing definitions, reporting or related evaluation data regarding net savings that may need to be addressed by future evaluation, measurement and verification efforts to support common definitions of adjusted gross and net savings. In addition, the definitions will also take into consideration the implications of the Energy Independence and Security Act (EISA).

We began by reviewing the draft State and Local Energy Efficiency Action Network (SEE Action) [15] definitions of gross and net savings and briefly reviewing how adjusted gross savings, net savings, realization rates and the parameters of adjusted gross savings are defined and presented in the *Net Savings Scoping Paper* (NMR and Research Into Action, 2010). Next we reviewed how these terms are defined and applied in the evaluations of three types of programs (whole house retrofit programs, large C&I custom measure programs and upstream residential lighting programs).

The *Net Savings Scoping Paper,* developed for and approved by the Forum, reviewed definitions of net savings in order to help improve Forum members' understanding of how net energy savings is defined, how stakeholders use net savings, and the opportunities and barriers to increasing the consistency of and quality in net savings definitions and measurement in the region

2.1 Overview, Definitions of Gross and Net Savings

We found evidence that NEEP members states and opinion leaders in the region are converging on definitions of gross and net savings consistent with the NEEP *Glossary of Terms,* [16] and consistent with definitions of the State and Local Energy Efficiency Action Network (SEE Action)'s in its *Model Impact Evaluation Guide.*[17] The definitions are as follows.

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[15] http://www1.eere.energy.gov/seeaction/index.html, forthcoming

[16] Horowitz, Paul. 2011 *Glossary of Terms: Version 2.1.* A Project of the Regional Evaluation, Measurement, and Verification Forum. http://neep.org/uploads/EMV%20Forum/EMV%20Products/EMV_Glossary_Version_2.1.pdf

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Net-to-Gross (NTG) ratio is a term that is most commonly defined as the ratio of net and gross program savings. The NTG ratio is applied to gross program savings to convert them into net program savings.

These definitions align with the conceptualization of the *Net Savings Scoping Study.* In that study, we proposed that adjustments to gross savings should be limited to parameters that can be measured directly because they have actually occurred, such as hours of use or installation rates. Net savings should be limited to savings attributable to the program, in other words savings that *would not have happened* in the absence of the program. Free ridership and spillover are clearly parameters of net savings because they represent an accounting of what would not have happened without the program. Estimating free ridership and spillover necessitates estimating a counterfactual, or something that did not happen—in this case, what energy savings would have been in the same context but without the program.[19]

We found value in Schiller's[20] recommended nomenclature for referring to the timing and time period of the savings, as follows:

- **Projected savings** (sometimes referred to as *ex ante* savings)

- **Claimed savings**, which include PA adjustments for data errors and current tracking data (also sometimes referred to as *ex ante* savings, but more commonly referred to as adjusted gross savings, *ex post* savings or tracked savings)

- **Evaluated savings**, with evaluations conducted by a third party evaluator to document and further adjust savings estimates (commonly referred to as *ex post* or *ex post evaluated* savings)

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Realization Rate is primarily used for the ratio of gross evaluated savings to gross claimed savings. Thus, it provides a measure of the savings that were achieved compared to the savings that were predicted.

We did not find value in the use of gross and adjusted gross savings as distinct terms. Theoretically, all gross savings estimates are adjusted by a variety of parameters, such as hours of use and change in wattage. For example, an estimate of gross savings for energy-efficient lighting includes adjustments for hours of use, measure life, in-service rates, the difference between the wattage of the energy-efficient bulb and the wattage of a "standard" bulb, and other parameters.

In practice, evaluated gross savings in one jurisdiction may be estimated with the same methods used to estimate claimed gross savings in another—for example, they both may apply parameters from a Technical Reference Manual, and one jurisdiction may go further and conduct primary research to develop new values for those parameters to derive evaluated savings estimates. We believe it is preferable to spell out what goes into projected, claimed, and evaluated savings than to use the imprecise term "adjusted gross."

Next, we review how adjusted gross savings, net savings, realization rates and the parameters of adjusted gross savings are defined and applied in the evaluations of three types of programs:

1) Whole-house residential retrofit programs, representing program type that, because the efficiency level of an entire home is affected by all of the measures and their interactive effects in a home, not just the efficiency level of an individual measure, results in savings and efficiency measured at the whole-house level in addition to the measure level.
2) Large C&I custom programs, which typically allow separate measurement of free ridership and spillover estimates because market actors can be expected to be aware of program influences.
3) Upstream residential lighting programs, representing a program type that, because market participants may not be aware of program effects, do not lend themselves to separate estimates of free ridership and spillover, and therefore often combine free ridership and spillover into a single estimate of the net-to-gross ratio or net savings.

2.2 Whole-house Retrofit Programs

Evaluations of whole-house retrofit programs generally define gross and net savings consistently with the conceptualization of the terms proposed in this report, though some methods used to estimate net savings may miss non-participant spillover and count it as free ridership. In contrast, realization rate continues to be a term that is defined inconsistently in evaluations.

Evaluations often do not report separate savings values for the individual parameters of gross savings for each installed measure (i.e., hours of use or installation rates). Evaluations typically use pre-post retrofit billing analysis, sometimes in combination with energy modeling of the

installed measures, to estimate gross savings.[21] In this way, the individual parameters of gross savings are incorporated into the estimate of evaluated gross savings, but the values of each parameter are not reported. In addition, the gross savings are not always estimated for an individual measure but instead are sometimes only estimated for the entire retrofit.

Similarly, the estimates of net savings do not always include separate estimates of free ridership and spillover, particularly when the evaluation uses pre-post retrofit billing analysis with a control group... Instead, when comparing the energy usage of program participants to the usage of non-participants, the method implicitly accounts for free ridership, spillover, and external factors that may affect energy usage, such as economic conditions. However, billing analysis may underestimate net savings because it effectively counts any nonparticipant spillover as free ridership. Thus, the key benefit of a billing analysis is that it provides an estimate of the whole-house performance of the measures, but it misses non-participant spillover and may count it as free ridership

We should point out that some evaluations have developed individual estimates of free ridership and spillover. For example, the recent evaluation of Massachusetts Home Energy Assessment program, using a combination of participant self-reports, discrete choice modeling and trade ally interviews, estimated free ridership and spillover for individual measures, such as air sealing and insulation. An overall NTG ratio was estimated at the program level using a weighted average of the individual estimates of free ridership and spillover. Weights were based on the distribution of the installed measures during the 2010 program year (Cadmus 2011).[22]

Table 2-1 and Table 2-2 present a summary of definitions of gross savings, realization rates, and net savings found in recent evaluations of whole-house retrofit programs. We grouped gross savings and realization rates together in Table 1 because, while realization rate has been used in several contexts, the most common application is as a measure of gross savings that were achieved compared to gross savings that were predicted. In general, gross and net savings have been defined consistently with our conceptualization of the terms in the *Net Savings Scoping Paper* (NMR and Research Into Action, 2010) and with the conceptualization of the terms proposed in this report. In contrast, realization rate continues to be a term that is defined inconsistently. For example, while a recent evaluation of the Connecticut Home Energy Solutions program (Nexant, 2011) defined a gross realization rate consistently with our conceptualization (i.e., gross evaluated savings ÷ gross claimed savings), the same evaluation defined Adjusted Net Realization Rate as what is more commonly defined as a NTG ratio (i.e., net evaluated savings ÷ gross claimed savings).

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[21] Evaluations that use energy or engineering modeling to estimate gross savings commonly rely upon Program Savings Documents or Technical Reference Manuals to set parameters of gross savings, such as hours of use, for the installed measures. However, the evaluations do not attempt to establish new values of the individual parameters based on the combination of measures installed by the program in each participating home.
[22] Gross savings were not estimated in the 2010 Net-to-Gross evaluation (Cadmus, 2010).

Table 2-1: Definitions of Adjusted Gross Savings and Realization Rates, Whole House Retrofits

State	Evaluation	Evaluation Term or Parameter Used in Evaluation Report	Evaluation Method	Method of Estimation or Calculation
CT	Home Energy Solutions Evaluation (Nexant, 2011)	Gross Measured Savings	Engineering-adjusted billing analysis and on-site inspections	Gross savings estimated through engineering-adjusted billing analysis and on-site inspections
		Realization Rate		Gross evaluated savings ÷ gross claimed savings
NY	M&V Evaluation: Home Performance with ENERGY STAR (Nexant, 2007)	Adjusted Gross Savings	Participant billing analysis	Gross savings estimated through participant billing analysis
		Realization Rate		Gross evaluated ÷ gross claimed
MD[23]	EmPOWER Maryland 2010 Interim Evaluation Report (Navigant, 2010)	*Ex Post* Evaluated Gross Savings	Document and database review	Gross evaluated savings * Gross realized savings ratio
		Gross Realized Savings Ratio		Realization Rate * Data Factor
		Data Factor[24]		Gross program tracking savings ÷ gross PA claimed savings
		Realization Rate[25]		Gross evaluated savings ÷ gross claimed savings

[23] Maryland PSC Order No. 84569 has determined that gross savings will be reported to the PSC, with net savings used to examine cost-effectiveness and program design.

[24] In the EmPOWER MD Interim Evaluation Report (Navigant, 2010), the Data Factor is a parameter used to estimate the Gross Realized Savings Ratio, which is more commonly defined as a realization rate in the evaluation literature.

[25] In the EmPOWER MD Interim Evaluation Report (Navigant, 2010), the Realization Rate is a parameter used to estimate the Gross Realized Savings Ratio, which is more commonly defined as a realization rate in the evaluation literature.

Table 2-2: Definitions of Net Savings, Whole House Retrofits

State	Evaluation	Evaluation Term or Parameter Used in Evaluation Report	Evaluation Method	Method of Estimation or Calculation
CT	Home Energy Solutions Evaluation (Nexant, 2011)	Adjusted Net Realization Rate[26]	Engineering-adjusted billing analysis and on-site inspections	Net evaluated savings ÷ gross claimed savings
		Adjusted Net Savings		Adjusted Net Realization Rate * gross evaluated savings
MA	2010 Net-to-Gross Findings: Home Energy Assessment. (Cadmus, 2011)	NTG	Participant surveys, discrete choice modeling, trade ally interviews	NTG = 1 – FR + PS + NPS (FR = free ridership, PS = participant spillover, NPS = non-participant spillover)

2.3 Large C&I Custom Measure Programs

Our review of C&I impact evaluations focused on custom measure programs, including new commercial construction programs and industrial programs. Custom projects are typically evaluated at the subsystem, system, or site level. Evaluations we reviewed did not report values for individual parameters of gross savings, such as hours of use and installation rates, but the evaluations often examined the individual parameters of net savings (i.e., free ridership and spillover).

Table 2-3 and Table 2-4 present a summary of definitions of gross savings, realization rates, and net savings found in recent evaluations large C&I customer measure programs. The reviewed studies did not have a consistent method of evaluating gross savings, though most incorporated a combination of some of the following methods: document reviews, engineering reviews, site verifications, metering, and building simulations.[27] Studies varied both in the detail and clarity of their methodological descriptions, as well as in the methodologies themselves. Overall, gross savings have been defined consistently with our conceptualization of the terms in the *Net Savings Scoping Paper* (NMR and Research Into Action, 2010).

The definition and nomenclature of "realization rate" is consistent throughout the studied evaluations. The realization rate is universally considered to be the ratio of evaluated gross to program-claimed gross savings. While the definition is straightforward, the inputs can be unclear. As mentioned above, evaluated gross savings are calculated in different ways, such that the manner in which one of the key inputs to a realization rate is estimated (i.e., evaluated gross savings) varies from study to study.

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[26] In the EmPOWER MD Interim Evaluation Report (Navigant, 2010), the Adjusted Net Realization Rate is essentially a NTG ratio, though gross reported savings were used in the calculation rather than gross evaluated savings.

[27] Evaluations that use energy or engineering modeling to estimate gross savings commonly rely upon Program Savings Documents or Technical Reference Manuals to set parameters of gross savings, such as hours of use, for the installed measures. However, the evaluations do not attempt to establish new values of the individual parameters based on the combination of measures installed by the program in each participating building.

Net-to-Gross ratio is consistently defined throughout the evaluations (i.e., 1 – free ridership + spillover). The conceptual definition of free ridership is consistent through the programs, but the calculation of spillover is more nuanced in some evaluations than others. All of the evaluations incorporated nonparticipant spillover, but participant spillover is accounted for in some of the evaluations and not in others. The studies also differed in whether they calculated the inputs directly or used a value from secondary sources. One program evaluation (EmPOWER Maryland) used a benchmarking approach to determine the average free ridership and spillover in similar programs, and used this number to calculate net-to-gross.

Table 2-3: Definitions of Adjusted Gross Savings and Realization Rates, Large C&I Custom Measure Programs

State	Evaluation	Evaluation Term or Parameter Used in Evaluation Report	Evaluation Method	Method of Estimation or Calculation
CT	Evaluation of the 2009 Energy Conscious Blueprint Program: Final Results (GEP, 2011)	Adjusted gross savings	Document review, site verification, metering, and building simulation	Gross savings as estimated by document review, site verification, metering, and building simulation
		Realization Rate		Gross evaluated savings ÷ gross claimed
MA	Impact Evaluation of 2009 Custom HVAC Installations (KEMA, 2011)	Gross Energy Savings	Site visits, metering and building simulation	Gross savings as estimated by site visits, metering and building simulation
		Realization Rate		Gross evaluated ÷ gross claimed
MD	EmPOWER Maryland 2010 Interim Evaluation Report (Navigant, 2010)	Data Factor[28]	Document review	Gross program tracking ÷ gross Program Administrator (PA) claimed
		Ex Ante Reported Savings	Document and database review	PA claimed savings
		Ex Post Evaluated Savings	Document review, engineering review, and site verification	Gross evaluated savings * Gross realized savings ratio
		Realization Rate[29]	Document review, engineering review, and site verification	Gross evaluated savings ÷ gross claimed savings
		Gross Realized Savings Ratio	Document review, engineering review, and site verification	Realization Rate * Data Factor or Ex Post Evaluated Savings ÷ Ex Ante Reported Savings
NY	New Construction Program (NCP) MCAC Evaluation (Summit Blue, 2006)[30]	Installed Gross Savings	Document review, site verification,	Gross savings as estimated by document review, site verification
		Realization Rate	Document review, site verification,	Gross evaluated savings ÷ gross claimed savings

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[28] In the EmPOWER MD Interim Evaluation Report (Navigant, 2010), the Data Factor is a parameter used to estimate the Gross Realized Savings Ratio, which is more commonly defined as a realization rate in the evaluation literature.

[29] In the EmPOWER MD Interim Evaluation Report (Navigant, 2010), the Realization Rate is a parameter used to estimate the Gross Realized Savings Ratio, which is more commonly defined as a realization rate in the evaluation literature.

[30] The New Construction Program (NCP) Market Characterization, Market Assessment and Causality Evaluation (Summit Blue, 2006) used values for the M&V realization rate and realized gross savings estimated in the M&V Evaluation New Construction Program prepared by Nexant (2006).

Table 2-4: Definitions of Net Savings, Large C&I Custom Measure Programs

State	Evaluation	Evaluation Term or Parameter Used in Evaluation Report	Evaluation Method	Method of Estimation or Calculation
CT	Evaluation of the 2009 Energy Conscious Blueprint Program: Final Results (GEP, 2011)[31]	NTG	Participant surveys and trade ally surveys (vendors and site designers)	1 - FR + SP
		Net Savings		NTG * Adjusted gross savings
NY	New Construction Program (NCP) MCAC Evaluation (Summit Blue, 2006)	NTG	Participant, nonparticipant, participating and non-participating trade ally surveys (architects and engineers)	1 - FR + SP (inside, outside, non-part)
		Net Savings		NTG * Adjusted gross savings
MA	2010 Commercial and Industrial Electric Programs Free-ridership and Spillover Study (Tetra Tech, 2011)	NTG Ratio	Participant surveys trade ally surveys (vendors and site designers)	1- FR + SP (part, non-part)
MD	Verification of Reported Energy and Peak Savings from the EmPOWER Maryland Energy Efficiency Programs (Itron, 2011)	NTG (preliminary)	Deemed from benchmarking study	Deemed

2.4 Upstream Lighting Programs

Evaluations that examine the gross savings of upstream residential lighting programs address the individual parameters of gross savings, often using methods such as onsite visits and lighting loggers to record lighting usage. However upstream lighting programs represent a measure/program type that, because market participants may not be aware that they participated in a program, do not lend themselves to separate estimates of free ridership and spillover. Instead, evaluations commonly report a single estimate of the net-to-gross ratio or net savings.

Table 2-5 and Table 2-6 present a summary of definitions of gross savings, realization rates, and net savings found in recent evaluations upstream residential lighting programs. The evaluations have adopted similar evaluation approaches to estimate parameters of gross savings, generally using a combination of telephone surveys, onsite lighting audits with metering, engineering estimates, and in some cases in-store intercepts and review of the evaluation literature to estimate values of individual parameters such as hours of use, installation rate, measure life, leakage, change in watts, heat factor, and coincidence factor. Overall, gross savings have been defined

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[31] The Evaluation of the 2009 Energy Conscious Blueprint Program (GEP, 2011) used NTG, free ridership and spillover values estimated by the 2007 Commercial and Industrial Programs Free-Ridership and Spillover Study prepared by PA Consulting (2008).

consistently with our conceptualization of the terms in the *Net Savings Scoping Paper* (NMR and Research Into Action, 2010).

Evaluations that estimated parameters of gross savings adopted consistent approaches to estimating realization rates. Gross savings were estimated using the parameter values from the new study and compared to program estimated gross savings, which used previous values for the parameters.

Methods for estimating net savings and NTG ratios have evolved as lighting programs have shifted to an upstream approach, since market participants may not be aware of program effects. This is illustrated by comparing the evaluation approach taken to evaluate the 2003 Residential Lighting Programs (RLP) in Massachusetts, Rhode Island, and Vermont, a program that included instant rebate coupons and catalog sales (NMR and RLW, 2004) to more recent evaluations. The RLP evaluation was able to identify catalog or instant rebate coupon participants who were aware of program impacts and could make individual estimates of free ridership and spillover (NMR and RLW, 2004). With the widespread adoption of upstream programs, different approaches to estimating net impacts have been necessary; these approaches do not lend themselves to separate estimates of free ridership and spillover, but rather combine them into a single estimate of the net-to-gross ratio or net savings. For example, a recent evaluation of Vermont's residential lighting program used a comparison area approach, in which the sales per household in a non-program area are compared to sales per household in the program area (NMR 2009). A multistate modeling approach uses data drawn from telephone and onsite surveys conducted in areas with longstanding CFL programs, those with newer or smaller programs, and those with no CFL programs to estimate net program impacts (NMR 2011). Another recent study used five methods to estimate NTG ratios (conjoint/pricing elasticity analysis, multi-state modeling, revealed preference in-store surveys, supplier self-reports, and willingness-to-pay) and then a Delphi panel to integrate the findings of the five methods (NMR, Cadmus and KEMA, and TetraTech 2011). It is important to note that these methods are not always able to provide individual estimates for both free ridership and spillover. Some can measure free ridership but do not account for spillover (such as willingness to pay or revealed preference methods) while others, such as multistate modeling, provide a single NTG ratio that combines free ridership and spillover. In addition, any spillover into non-program areas would be counted negatively as it would raise the baseline to which the program areas are compared.

Table 2-5: Definitions of Adjusted Gross Savings and Realization Rates, Upstream Residential Lighting Programs

State	Evaluation	Evaluation Term or Parameter Used in Evaluation Report	Evaluation Method	Method of Estimation or Calculation
MD	EmPOWER MD Interim Evaluation Report (Navigant, 2010)	Parameters of gross savings: hours of use, installation or in-service rates, measure life, leakage, change in watts, heat factor, coincidence factor	Telephone surveys, onsite lighting audits and metering, in-store intercepts, evaluation literature	Combination of onsite lighting audits and metering, in-store intercepts, evaluation literature to estimate parameter values
		Ex Post Evaluated Gross Savings		Gross evaluated savings * Gross realized savings ratio
		Gross Realized Savings Ratio		Realization Rate * Data Factor
		Data Factor[32]		Gross program tracking savings ÷ gross PA claimed savings
		Realization Rate[33]		Gross evaluated savings ÷ gross claimed savings
CT, MA, RI, VT	Residential Lighting Markdown Impact Evaluation (NMR, RLW and GDS, 2009)	Parameters of gross savings: hours of use, installation rate, measure life, leakage, change in watts, heat factor, coincidence factor	Telephone surveys, onsite lighting audits and metering	Combination of telephone surveys, onsite lighting audits and metering to estimate parameter values
MA, RI, VT	Impact Evaluation of the Massachusetts, Rhode Island, and Vermont 2003 Residential Lighting Programs (NMR and RLW, 2004)	Parameters of gross savings: hours of use, installation rate, persistence rates, measure life, leakage, change in watts, heat factor, coincidence factor	Telephone surveys, onsite lighting audits and metering, engineering estimates	Combination of telephone surveys, onsite lighting audits and metering, and engineering calculations to estimate parameter values
		Realization rate		Evaluated gross savings (using parameters of gross) ÷ gross claimed savings

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[32] In the EmPOWER MD Interim Evaluation Report (Navigant, 2010), the Data Factor is a parameter used to estimate the Gross Realized Savings Ratio, which is more commonly defined as a realization rate in the evaluation literature.

[33] In the EmPOWER MD Interim Evaluation Report (Navigant, 2010), the Realization Rate is a parameter used to estimate the Gross Realized Savings Ratio, which is more commonly defined as a realization rate in the evaluation literature.

Table 2-6: Definitions of Net Savings, Upstream Residential Lighting Programs

State	Evaluation	Evaluation Term or Parameter Used in Evaluation Report	Evaluation Method	Definition or Method of Calculation
MD	EmPOWER MD Interim Evaluation Report (Navigant, 2010)	NTG ratio	Deemed from benchmarking study	Deemed
	EmPOWER MD Interim Evaluation Report (Navigant, 2010)	Net Savings		NTG * *Ex Post* Evaluated Gross Savings
NY	Results of the Multistate Modeling Effort (NMR, 2011)	NTG ratio	Multistate modeling effort that relies on data drawn from telephone and onsite surveys	Statistical model predicts purchases in the presence and absence of the program
		Net Savings		NTG * Gross savings
MA	Massachusetts ENERGY STAR® Lighting Program 2010 Annual Report (NMR, Cadmus and KEMA, and TetraTech 2011)	NTG Ratio	NTG ratios estimated by using five primary methods and integrated by a Delphi panel[34]	Delphi panel integrated NTG ratios estimated by five primary methods
MA, RI, VT	Impact Evaluation of the Massachusetts, Rhode Island, and Vermont 2003 Residential Lighting Programs (NMR and RLW, 2004)[35]	Net Savings	Telephone surveys	Gross savings * (1-FR + participant SO)
VT	Analysis of CFL Purchases in Vermont (NMR, 2009)	NTG Ratio	Telephone surveys and comparison area analysis	CFL sales per household in Vermont and non-program comparison areas

2.5 Review of Definitions and Recommendations

From our review of recent program evaluations, it appears that gross and net savings have been defined consistently with our conceptualization of the terms proposed in this report and in the *Net Savings Scoping Paper*, while the application of realization rate is more varied, usually applied to gross savings, but occasionally applied to net savings (NMR and Research Into Action, 2010).

However, the terminology used to describe gross savings and adjusted gross savings is quite varied and can lead to confusion. For example, adjusted gross savings has been referred to as gross measured savings, *Ex Post* evaluated gross savings, and installed gross savings. We

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[34] The five methods used to estimate NTG ratios were conjoint/pricing elasticity analysis, multi-state modeling, revealed preference in-store surveys, supplier self-reports, and willingness-to-pay.

[35] Because the evaluation of the 2003 Residential Lighting Programs surveyed participants who participated in the 2003 RLP through catalog or using instant rebate coupon purchases, participants were aware of program impacts and individual estimates of free ridership and spillover were possible.

suggest that gross and adjusted gross savings should not be thought of as distinct terms. Theoretically, all gross savings estimates are adjusted by a variety of parameters. For example, an estimate of gross savings for energy-efficient lighting includes adjustments for hours of use, measure life, in-service rates, the difference between the wattage of the energy-efficient bulb and the wattage of a "standard" bulb, and other parameters. It is impossible to estimate gross savings without including assumed or verified values for these types of parameters. While parameters of gross savings may be adjusted or updated through program evaluations, parameters of adjusted gross are either explicitly or implicitly specified in any definition of gross savings—even if the unstated assumption is that a given parameter makes no difference. Therefore, we recommend simply using the term gross savings, but indicate if the gross savings estimate has been projected by the program, claimed by the program or evaluated by a third party.

To help clarify and organize the discussion of adjusted gross and net savings we propose that they be conceptualized in relation to three types of savings estimates associated with energy efficiency programs. As suggested by Schiller,[36] we believe there are three distinct stages or types of savings estimates:

- Projected savings (sometimes referred to as *ex ante* savings)

- Claimed savings, which include PA adjustments for data errors and current tracking data (also sometimes referred to as *ex ante* savings, but more commonly referred to as adjusted gross savings, *ex post* savings or tracked savings)

- Evaluated savings, with evaluations conducted by a third party evaluator to document and further adjust savings estimates (commonly referred to as *ex post* or *ex post evaluated* savings)

As illustrated in Table 2-7, each of these three stages of savings can be estimates of either gross savings or net savings, and can be reported as annual savings (kWh or therms), lifetime savings (kWh or therms) or demand savings (kW).

Table 2-7: Types of Gross and Net Savings

Gross Savings	Net Savings
Projected gross savings	Projected net savings
Claimed gross savings	Claimed net savings
Evaluated gross savings	Evaluated net savings

"Realization rate" is a term that we believe is most usefully applied to gross savings. While it has been used in several contexts in the development of claimed program savings, the primary application has been the ratio of gross evaluated savings to gross claimed savings. We believe

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[36] Steve Schiller is currently working on the (SEE Action) *Model Impact Evaluation Guide* definitions of gross and net savings. As part of the project he is comparing the glossary of terms to the NEEP Glossary of Terms (conference call with Elizabeth Titus, January 17, 2012).

this is the most useful application of realization rate as it provides a measure of the savings that were achieved compared to the savings that were predicted.

Conceptually, realization rates can be defined in multiple ways according to the stage of savings (i.e., projected, claimed, and evaluated) and defined in terms of both gross savings and net savings (see Table 2-8). However, we recommend that the primary definition of realization rates be limited to estimations *across* stages of savings (i.e., projected, claimed and evaluated), without juxtaposing net and gross savings (e.g., gross evaluated ÷ gross claimed). We believe that evaluated ÷ claimed realization rates should take precedence over evaluated ÷ projected realization rates if claimed savings differs from projected savings. The net realization rates of net evaluated ÷ net claimed or net evaluated ÷ net projected do not appear to be used in practice, but are presented here for completeness. Net realization rates may be helpful measures if net savings factors have been assumed in either net claimed or net projected savings.

Table 2-8: Types of Realization Rates

Gross Realization Rates	Current or Potential Use	Net Realization Rates	Current or Potential Use
Gross evaluated ÷ gross claimed. Suggested name: Evaluated ÷ claimed gross realization rate	Recommended primary use of "realization rate"	Net evaluated ÷ net claimed. Suggested name: Evaluated ÷ claimed net realization rate	Not common, but best use of the term "net realization rate"
Gross evaluated ÷ gross projected. Suggested name: Evaluated ÷ projected gross realization rate	Recommended only if claimed does not differ from projected	Net evaluated ÷ net projected. Suggested name: Evaluated ÷ projected net realization rate	Not common; recommended only if claimed does not differ from projected
Gross claimed ÷ gross projected. Suggested name: Claimed ÷ projected gross realization rate	Rarely used and not clear if this is a useful realization rate	Net claimed ÷ net projected. Suggested name: Claimed ÷ projected net realization rate	Rarely used and not clear if this is a useful realization rate

As with realization rates, Net-to-Gross (NTG) ratios can be defined in multiple ways (see Table 2-9). In contrast with realization rates, we suggest that the most informative NTG ratios are those that are estimated *within* a given stage of savings—i.e., projected÷projected, claimed÷claimed, or evaluated÷evaluated.

Table 2-9: Types of Net to Gross Ratios

Net to Gross Ratios	Current or Potential Usage
Net projected÷ gross projected. Suggested name: Projected NTG	Used by PAs for planning purposes if they assume any adjustments for net
Net claimed ÷ gross claimed. Suggested name: Claimed NTG	Used by PAs when they conduct their own assessment of free ridership and spillover as part of program implementation
Net evaluated ÷ gross evaluated Suggested name: Evaluated NTG	Commonly claimed NTG ratio that is sometimes accompanied by a separate gross realization rate of gross evaluated savings ÷ gross claimed savings (see discussion above)
Net claimed ÷ gross projected	Rarely used and not clear if this is a useful ratio
Net evaluated ÷ gross projected	Rarely used and not clear if this is a useful ratio, particularly if a separate realization rate is reported
Net evaluated ÷ gross claimed	Sometimes used and not clear if this is a useful ratio, particularly if a separate realization rate is claimed

Table 2-10 provides examples of terminology used in the evaluations we reviewed and the corresponding terminology suggested in this memo.

Table 2-10: Definitions of Adjusted Gross Savings, Net Savings and Realization Rates

Evaluation	Evaluation Term or Parameter	Definition or Method of Calculation	Suggested NEEP Terminology
Home Energy Solutions Evaluation (Nexant, 2011)	Gross Measured Savings	Engineering-adjusted billing analysis and on-site inspections	Evaluated gross savings
Home Energy Solutions Evaluation (Nexant, 2011)	Adjusted Net Realization Rate	Net evaluated ÷ gross claimed	Evaluated NTG (Suggested modification: use gross evaluated savings rather than gross claimed savings)
Impact Evaluation of 2009 Custom HVAC Installations (KEMA, 2011)	Gross Energy Savings	Gross savings as estimated by site visits, metering and building simulation	Evaluated gross savings
New Construction Program (NCP) MCAC Evaluation (Summit Blue, 2006)	Installed Gross Savings	Gross savings as estimated by document review, site verification	Evaluated gross savings
EmPOWER MD Interim Evaluation Report (Navigant, 2010)	Gross Realized Savings Ratio	Realization Rate * Data Factor	Realization Rate

Finally, with regards to the rebound effect, we recommend remaining consistent with the NAPEE definitions and defining it as a parameter of net savings. The rebound effect, which is rarely measured, is a change in energy-using behavior that yields an increased level of service

that is accompanied by an increase in energy use and occurs as a result of taking an energy efficiency action. The result of this effect is that the savings associated with the direct energy efficiency action is reduced by the resulting behavioral change. Conceptually, rebound can be measured directly because it is associated with the use of the energy-efficient technologies. Conversely, the behavioral change likely would not have occurred without participation in the program (and subsequent installation of the energy-efficient technologies).

3 Exploratory Policy Research

The NMR team, in consultation with NEEP, has reviewed several types of state and regional policies, including state energy efficiency policies and regional transmission policies, with respect to how gross and net savings are used in measuring progress toward policy goals. We supplemented our policy review by conducting interviews with 19 key informants who have shed light on how the policies are implemented, and by gathering feedback from Forum members and stakeholders.

3.1 Summary of key findings

We begin this chapter by reviewing the key findings of our policy review, followed by a summary of each policy.

3.1.1 State Energy Savings Goals

Inconsistencies Across States. The goals of the state energy savings plans reviewed vary in terms of whether net or gross savings are used to measure progress toward reaching savings goals (i.e., savings metrics), how the goals are established, the magnitude of the goals, and the resources allocated to achieve the savings goals. Because of these inconsistencies, comparing savings goals and progress toward reaching savings goals across states is difficult. Yet interviewees agree that such comparison is important for purposes of assessing regional environmental impacts or potential regional impacts on systems.

For example, some states, such as Maryland and Massachusetts, establish savings goals in enabling legislation, while in other states, such as New York, goals are set through orders from regulatory bodies (in New York's case, the Department of Public Service (DPS)). Further, some states establish specific goals, such as New York's and Maryland's 15% by 2015 goals, while other states, such as Massachusetts and Vermont, set goals through an iterative process, in which goals are specified in terms of "cost effectiveness," often defined as all energy-efficiency savings that are less costly than generation, and determined through a public process moderated by the utility regulators. Finally, some goals are set according to energy usage in a baseline period while others are set according to projected usage. A summary of state energy saving plans and policies is provided in section 3.2 and in Appendix A.

Attempts at State Comparisons. Table 3-1 provides an overview of the 2012 savings goals and budgets for several NEEP states. Massachusetts, Vermont and Rhode Island have established savings goals and program budgets through a process of identifying all cost-effective savings, and have established higher per-capita savings goals and budgets when compared to Maryland and New York. Both New York and Maryland, in contrast, established hard savings goal in their enabling legislation or DPS orders. The Maryland savings goals reported in Table 3-1 represent the savings goals of the utility programs regulated by the Maryland Public Service Commission (PSC).[37] The New York and Maryland goals are also difficult to compare to other states because their savings goals are expressed in terms of cumulative savings goals whereas most other states provide annual savings goals. For example, it is difficult to compare New York's goal of 24,927 GWh of cumulative savings by 2015 to the Massachusetts single year goal of 1,219 GWh of annual savings for 2015.

Table 3-1: 2012 Electric Savings Goals and Budgets for Selected NEEP States

State	Savings goal (MWh)	Estimated budget ($)	kWh savings /capita[38]	Estimated budget per capita[38]	Estimated budget per kWh of savings
MA[39]	1,103,423	$490,005,649	169	$75	$0.444
VT[40]	131,185	$40,100,000	210	$64	$0.306
RI[41]	128,570	$64,385,628	122	$61	$0.501
MD[42]	535,634[*]	$137,548,977 [*]	93	$24	$0.257
NY[43]	NA	$739,593,048	NA	$38	NA

[*] Maryland savings goals and budgets do not include DHCD low-income programs

Diversity of use of net and gross in various policy frameworks. The diversity in savings goals and policies can be reviewed in more detail in section 3.2 and in Appendix A. Below are brief summaries of several state energy efficiency policy frameworks illustrating diversity in the region in the use of net and gross impacts:

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[37] Within utility service territories, utilities are responsible for 10% per capita reduction in electric demand. Statewide, the EmPOWER Maryland programs have not historically met the legislative target of 15% per capita savings by 2015. For example, the 2011 programs were expected to achieve approximately 45% of the legislative savings goals. See the 2010 Maryland Energy Outlook report:
http://www.energy.state.md.us/documents/MEOFINALREPORTJAN2010.pdf

[38] Per capita budget and savings are based on 2010 census estimates: http://quickfacts.census.gov/qfd/index.html.

[39] Savings goals and budgets based on the 2010 – 2012 Three Year Plans: http://www.ma-eeac.org/docs/DPU-filing/ElectricPlanFinalOct09.pdf.

[40] Savings goals and budgets based on the Vermont Public Service Board's Demand Resources Plan Proceeding for the 2012-2014 budget period: http://psb.vermont.gov/docketsandprojects/eeu/drp2010

[41] Savings goals and budgets based on the National Grid 2012-2014 Energy Efficiency and System Reliability Procurement Plan: http://www.ripuc.org/eventsactions/docket/4284-NGrid-3-YearLCP(9-7-11).pdf

[42] Savings goals and budgets based on filings with the Maryland Public Service Commission. Savings goals and budgets exclude DHCD low-income programs because overall savings goals were not reported in the filings. http://webapp.psc.state.md.us/Intranet/CaseNum/submit_new.cfm?DirPath=%5C%5CColdfusion%5CEWorkingGroups%5CDRDG%5C%5C2012%20EmPOWER%20Plans&CaseN=AMI/DSM%20Collaborative

[43] Budget estimates provided by Josh Craft of NEEP. Savings goals for 2012 were not available.

- Massachusetts: Savings goals are established by legislation, *The Green Communities Act*, which requires the acquisition of all cost-effective energy-efficiency resources, with a current (2013-2015 plans) savings target of approximately 2.5% of total retail electricity sales and 1% of natural gas sales. Savings goals are based on net.
- New York: A DPS order established a savings goal of 15% reduction in 2007 forecasted electricity usage by the 2015, based on net savings.
- Pennsylvania: Established an energy-efficiency resource standard in 2008 with total annual electric savings goals of 1% for 2011 and 3% for 2012 compared to a weather-adjusted baseline of June 1, 2009 to May 31, 2010. Evaluated gross savings are used by the regulators to track progress towards the state's goals.
- Connecticut: Savings goals were established by legislation from 2007 (*Public Act 07-242*) that requires the state to implement "all-cost effective energy efficiency" as well more recent legislation (PA 11-80) that requires the state to develop an Integrated Resource Plan (IRP). The legislation requires the IRP to maximize demand-side measures in developing a resource plan that minimizes total cost. Based on an energy-efficiency potential study, the IRP estimates 600 GWh of net annual energy-efficiency savings through 2022. Savings goals are based on net.
- Maryland: Savings goals were set by legislation, the *2008 EmPower Maryland Efficiency Act*, which included an Energy Efficiency Resource Standard (EERS). The EERS set a goal to reduce per capita consumption by 15% by 2015 and peak demand by 15% by 2015 against a 2007 baseline. Evaluated gross savings are reported to the regulators to track progress towards goals (while net savings are used to inform cost-effectiveness testing and program design).

3.1.2 Application of Net and Gross Savings

Currently, there is no consensus on the preferred use of net savings or gross savings in the reviewed policies. Some policies, such as air regulations, have stated a preference for using gross savings for measuring progress toward goals while others, such as state energy efficiency plans, often use net savings. Also, state energy efficiency programs apply net and gross savings inconsistently from state to state.

As discussed in the section above, different savings metrics are used for utility regulatory compliance purposes across New England and the Mid-Atlantic regions.[44] Some states use gross savings and some use net savings for compliance purposes, while in some cases gross and net savings are applied for different purposes (i.e., gross for compliance purposes and net for program planning and measuring cost effectiveness) (See Appendix A for more details). The inconsistent practices in use of net and gross savings reflect a variety in rationales about which

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[44] Savings metrics used for utility regulatory compliance refers to the types of savings (i.e., gross or net) that PAs are required to report to their governing regulatory body, such as a Department of Public Utilities or a Department of Public Service.

metric should be used when, including legacy regulatory systems or practices that are difficult to change. Further, there has been no regional policy driver that makes consistency a priority.

Compared to New England and New York, the Mid-Atlantic states more commonly use evaluated gross savings for utility regulatory compliance and net savings for program planning and measuring cost effectiveness. In contrast, New England and New York are more likely to use evaluated net savings; in doing so, they apply NTG values prospectively rather than retrospectively.[45] However, there are some variations; for example, Maine uses evaluated gross savings for compliance purposes.

As of August 10, 2012, Massachusetts became the last state in the region to stop applying retrospective net savings estimates for purposes of crediting savings to programs; instead, some states apply a prospective net savings estimate and others use gross savings.[46] The direction from the DPU is to apply the net savings estimates used in program design to the program planning period going forward—typically three years in Massachusetts. Essentially, this is prospective application of a retrospective NTG ratio to gross savings estimates. The DPU directs program administrators to continue to apply updated (or evaluated) gross savings estimates retrospectively to the most recent program period, because, "to ensure that the value of the resources procured through the energy efficiency programs is represented in an accurate and reliable manner, it is imperative that the adjusted gross savings associated with each program year be determined using the most up-to-date information available." Thus, Massachusetts is in the process of adopting a new evaluation and planning framework in which a naturally occurring energy-efficiency baseline (which includes free ridership) and a renewed emphasis on estimating market effects (including spillover) are established for planning purposes. This new framework recognizes the tendency for retrospective NTG to underestimate net savings, as market conditions developed or encouraged by a program become part of the assumed baseline.

The DPU accepted the argument that retrospective application of a NTG ratio creates uncertainty and puts program administrators at risk insofar as they invest in a program with an assumed NTG level that can later be revised downward. The DPU reasoned that this would encourage conservative program planning and implementation that would be unlikely to meet to the aggressive savings goals associated with the Green Communities Act.

In addition, the same DPU order recognized that many current energy-efficiency programs are multi-faceted and multi-year programs that are meant to bring about changes at the market level. These programs may result in spillover and other induced market effects that may not be captured by current evaluation approaches that focus on participants in specific programs in specific years. As a result, the Massachusetts DPU convened a working group "to explore if and

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[45] Retrospective net savings refers to the process of estimating net savings and NTG ratios from data from past programs and applying them to past PA programs. In contrast, prospective net savings refers to the process of estimating net savings and NTG ratios from data from past programs and applying them to *future* programs.

[46] Massachusetts Department of Public Utilities, DPU 11-120-A, "Order on Program Net Savings and Environmental Compliance Costs," August 10, 2012.

how a market-based approach could be developed and implemented in a way that produces net savings results that improve upon the status quo." [47]

A number of interviewees also suggested applying NTG values prospectively rather than retrospectively. Applying NTG retrospectively creates uncertainty in program administration and can send mixed signals to the PAs. One interviewee summarized the issues as follows:

> *I think that it's worth looking. Applying them [NTG factors] retroactively - I think it creates mixed signals for … how the program administrators are performing. I think it's simpler and provides better signals to the implementer if you use the same planning assumptions as you do in reporting. Because then what the PA is really accountable for is production. Did you deliver 20 widgets when you said you'd deliver 20 widgets and that would be reflected in the savings achievements for the year …. [When NTG ratios are applied retrospectively]… it creates uncertainty and unintended challenges. [The PAs] don't know throughout the year; they have this looming idea that 'we're going to get the evaluation results and we don't know what they're going to prove.' It's out of control of implementation to know how achievements will be counted. It demoralizes them a little bit, it has financial implications for people, when you find out it's too late. It creates a dynamic where everyone's not pointing at the same thing. It's better to have the goals be clear and not change the expectations and not change the perception of how well the PAs did.*

Pros and Cons of Using Net or Gross Savings for Energy-efficiency Programs There are mixed views of the proper usage of net and gross savings. Some interviewees feel that gross represents a more accurate estimate of the impact of energy-efficiency programs on the electric grid, while others feel that net is more accurate since gross does not take into account free ridership (potentially over counting savings) and spillover and other market effects (under counting savings). Interviewees from states that use gross savings for regulatory purposes expressed a number of concerns about net savings noted in the *Net Savings Scoping Paper* (NMR and RIA, 2010). For example, interviewees were concerned about the ability to assess net savings accurately. One interviewee expressed support for using gross savings and concerns about net savings as follows:

> *Getting from gross to adjusted gross (AG) is very factual, and we can make good refinements. But then getting to net, there is just so much variability—and you are adding some information, but that information has a lot of measurement error. There is a lot of debate about the precision of it.*

A second interviewee expressed concerns about estimating net savings as follows:

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[47] http://www.env.state.ma.us/dpu/docs/electric/11-120/81012dpuord.pdf

> *…in an assessment of net impacts, it's a fairly volatile metric. You can do a study different ways and get different answers whereas gross is relatively stable and predictable.*

Other interviewees from states that use gross savings for regulatory purposes expressed concerns about the costs of estimating net savings.

Regardless of their state's regulatory treatment of gross savings or net savings, interviewees consistently expressed concerns that accurately estimating the net impacts of the programs is becoming increasingly difficult because of the number of policies and programs promoting energy efficiency and the emphasis on multi-year, multi-faceted energy-efficiency programs. One interviewee summarized this view as follows:

> *With NTG ratios—it's getting increasingly more complex to determine what the most the scientific value for those things should be, given all of the policies, and market drivers that we have in place*

Another interviewee described the challenge as follows:

> *The challenge is with the assessment of free ridership and spillover and with so many things going on the market. We're not sure about the effects of attribution and other market dynamics are being captured.*

Finally, a number of interviewees, particularly those from states that use net savings for regulatory purposes, indicated that net savings has several important benefits, including assessing program effectiveness and helping insure that ratepayer and taxpayer funds are spent responsibly (see NMR and Research Into Action. 2010. *Net Savings Scoping Paper* for a more detailed discussion of the benefits and limits of applying NTG retrospectively). For example, one interviewee summarized the value of estimating net savings as follows:

> *But we felt that there is some value there—that the gross numbers are not exactly what's happening. We want to recognize some of the market effects—spillover— whether it's in project or out of project—is a useful tool to look at…..Even then it is still valuable in helping to understand the program benefits and when the program is not needed. And has more value than just the gross.*

3.1.3 Energy Efficiency and System Planning

While the three RTOs (i.e., New England ISO [ISO-NE], New York ISO [NYISO], and PJM) incorporate energy-efficiency into their forecasts, each has a different policy regarding net and gross savings.

ISO-NE has no official policy regarding net and gross savings for resources that are bid into the wholesale forward capacity market (FCM); the ISO will accept either net or gross savings as

long as the resource providers can verify their savings calculations and provide the resource when called upon. While at one point there was direction from the New England public utility commissions (via the New England Conference of Public Utility Commissioners or NECPUC) to bid gross savings into the FCM, it appears that some providers do bid net savings into the market.

With regard to long-term forecasting, ISO-NE is now incorporating energy efficiency into its long-range forecasts (i.e., ten-year forecasts, beyond the FCM period), due to the recent expansion of energy efficiency programs in the region, and NECPUC concern that ISO-NE was underestimating the impact of energy efficiency in its long-term forecast. The results of ISO-NE's 2012 EE forecast in its 2012 Regional System Plan show that energy efficiency resources can essentially flatten forecasted load growth over the forecasting period, which could have significant impacts on future transmission projects. Because of recent expansion of energy-efficiency programs, there have been concerns that past efforts by ISO-NE to incorporate energy efficiency through macro-economic forecast models do not adequately capture the effects of current programs.

New York ISO incorporates evaluated net savings into its forecasts based on data reported by program administrators to the NY Department of Public Service (via the Energy Efficiency Portfolio Standard or EEPS scorecard, which tracks progress towards the state's EEPS goals). While NY ISO's econometric modeling of its long-term forecast does account for foreseeable impacts on standards (e.g., the EISA lighting standards), it does not explicitly account for other future standards, upgrades in code adoption, free-ridership, or spillover (similar to ISO-NE assumptions).

In the case of PJM Interconnection, in its long-term forecasts, PJM accounts only for energy efficiency resources that clear the Reliability Pricing Model (RPM) capacity market. As a result, no new energy efficiency resources are counted after the third year of the long-term forecast, which likely understates the impact of future of energy efficiency investments. PJM has no clearly stated policy regarding whether providers should bid net or gross savings, and utilities bid gross savings into the RPM.

As such, both New England and New York ISOs reflect net savings in their long-term forecast, while PJM does not (though the RPM capacity market has a shorter forecasting horizon). For both ISO-NE and NYISO, it is unclear to what extent the energy efficiency forecast may over or under estimate energy efficiency savings. Additional research could help examine the extent to which the econometric model assumptions capture free ridership and spillover compared to the free ridership and spillover values reflected in reported net savings that serve as the basis for the energy efficiency production cost model estimates for the long-term energy efficiency forecast. As recommended in Recommendation 3 of the Executive Summary, this is an area that regulators, PAs, the ISOs and other stakeholders should more carefully examine.

Outside the region, the Northwest Power and Conservation Council (NPCC) nominally incorporates gross energy-efficiency savings into its system planning, though the NPCC's definition of gross savings is comparable to evaluated net savings according to NEEP's recommended definitions. The NPCC's estimate of gross savings is net of naturally occurring energy efficiency and attempts to predict what would happen in the absence of the program, and thus takes into account free ridership, spillover and other market effects.

3.1.4 Efforts to Quantify the Energy Savings Associated with Efficiency Actions for Air Regulations and Policies

Treatment of savings varies among policies that quantify the energy savings associated with efficiency actions, such as EPA Guidance and presentations to the NEEP EM&V forum (Incorporating Energy Efficiency and Renewable Energy Policies and Programs into Air Quality Plans; Linking Energy Efficiency & Air Quality -Opportunities for the EM&V Forum[48]) and Regional Greenhouse Gas Initiative RGGI. The US EPA is interested in evaluated gross savings that can be linked to Electric Generating Units (EGUs) and associated emissions. Separately, RGGI relies on individual states to report energy-efficiency savings from their energy-efficiency programs, and whether this is gross or net varies by state (i.e., net savings for Massachusetts and New York, gross savings for Maryland and Pennsylvania).

Net savings were used to set savings goals to comply with the Massachusetts state policies set forth in the Global Warming Solutions Act (GWSA) and the Clean Energy and Climate Plan (CECP), and currently the PAs are reporting net savings in the annual reports used to document energy efficiency program contributions towards the achievement of the goals. There are some discussions underway regarding whether to use net or gross savings for reporting purposes on progress toward the GWSA goals.

3.2 State Energy Efficiency Plans and Policies

3.2.1 Connecticut: Draft 2012 Integrated Resource Plan for Connecticut and Public Act 11-80

3.2.1.1 Background on Integrated Resource Plans:

With traditional utility resource planning, planners take into consideration the demand to be met, the reliability to be achieved, costs of available options, and applicable government policies and regulations. The planner then selects the types of fuels, power plants, distribution systems and patterns, and power purchases that will meet these objectives within acceptable reliability and cost parameters. For many utilities, energy efficiency has become a primary supply-side resource.

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[48] http://neep.org/uploads/EMV%20Forum/EPA_Moskal_PPT.pdf;
http://neep.org/uploads/EMV%20Forum/Dietsch%20EMV%2010.12.pdf

An Integrated Resource Plan (IRP) attempts to:

1. Evaluate all options (resource mix), from supply *and* demand sides, in a fair, consistent and comparable manner,
2. Minimize total costs (and not just average rates), and
3. Create a flexible plan that allows for uncertainty and permits adjustment in response to changed circumstances.

The traditional goals of utility planning are reliable service, economic efficiency, environmental protection, and equity. Reliable service necessitates the balancing of customer and investor interests (i.e., balancing the quality and reliability of service against cost). Equity necessitates the additional balancing of the interests of the various customer classes as well as the interests of present and future generations.

3.2.1.2 Connecticut IRP

Public Act 11-80 An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future requires the Department of Energy and Environmental Protection (DEEP) to develop an Integrated Resource Plan (IRP) every two years. In addition to the IRP requirements, the Act has five major provisions:

- Creation of an the Department of Energy and Environmental Protection
- Maintenance of the core energy-efficiency system, recognizing the success of the energy-efficiency structure and programs in CT, reversing a previously planned 35% "raid of efficiency funding"
- Promotion of increased energy efficiency
- Creation of a "green bank" with an expanded vision of "clean energy" projects
- Establishment of a residential solar provision and other renewables provisions

The IRP requirements of the legislation include maximizing the impact of demand side measures and the procurement of energy resources, including, but not limited to, conventional and renewable generating facilities, energy efficiency, load management, demand response, combined heat and power facilities, distributed generation and other emerging energy technologies to meet the projected requirements of their customers in a manner that minimizes the cost of such resources to customers over time and maximizes consumer benefits consistent with the state's environmental goals and standards.

The Connecticut IRP projects Connecticut's electric resource position and resource mix forward for the next 10 years, through 2022. The report focuses on "resource adequacy and metrics of

reliability," which are measures of how much generating capacity is/will be available to serve peak loads.[49]

The IRP concludes that, based on assumptions about market conditions and the expected completion of transmission projects, adequate generating resources will be available to CT to serve electricity loads readily through 2022 – under every scenario analyzed – and that it is likely that new generation will not be needed until 2022. The IRP discusses the resource balance, and offers a plan to increase the funding of energy efficiency, improving its viability as a supply-side resource over time. The primary recommendation is that, in light of expected rate increases from 2017 – 2022, Connecticut should pursue resource strategies that help customers reduce their volume of consumption. Based on estimates of expanding energy-efficiency programs, the IRP estimates that expanded energy-efficiency resources will result in 600 GWh of savings per year and 6,616 GWh savings from 2012 to 2022, which is equivalent to a 0.4% annual reduction in electricity usage.

According to interviews and the potential study that IRP relied upon (KEMA. 2010. *Connecticut Electric Residential, Commercial, and Industrial Energy Efficiency Potential Study*, the state of Connecticut and the IRP use net savings to estimate energy-efficiency savings,

Delaware: Title 26, Energy Efficiency Resource Standards, Title 26 - Act Defining Energy Efficiency as a Resource and How it Shall be Used

Delaware's Energy Efficiency Resource Standards (EERS), enacted in 2009, established the role of energy efficiency as the first source of energy price reduction and set the foundations for future energy-efficiency planning in the state.[50] The legislation established electricity savings goals of 2% savings by 2011 and 15% by 2015 compared to 2007 baseline and natural gas savings goals of 1% savings by 2011 and 10% savings by 2015 compared to 2007 baseline. The legislation also created a Sustainable Energy Utility (SEU) to implement energy-efficiency programs. EM&V protocols are currently under development, so decisions about using net or gross savings have not been made yet.

3.2.2 Maryland: EmPower Maryland Act of 2008 (Article: Public Utilities §7–211) and PSC Order No. 84569

The EmPower Maryland Act of 2008 (Article: Public Utilities §7–211) is legislation that mandates reductions in electricity usage and requires utilities to develop plans and programs to save electricity. The EERS indicates that energy efficiency is a low-cost option to meet growing electric demand in the state and can help provide affordable, reliable, and clean energy for consumers of Maryland. This document establishes the goal of 15% statewide per capita reductions in electric demand and peak demand by 2015 against base year 2007. Within utility

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http://www.dpuc.state.ct.us/DEEPEnergy.nsf/c6c6d525f7cdd1168525797d0047c5bf/63705e68f779af778525798b00 51d289/$FILE/DEEP%20Draft%202012%20IRP%20Report_Issued%2001-17-2012.pdf

[50] http://legis.delaware.gov/LIS/lis145.nsf/vwLegislation/SB+106/$file/legis.html?open

service territories, utilities are responsible for 10% per capita reduction in electric demand and 15% in peak demand by 2015. Every three years, electric utilities are required to consult with the Maryland Energy Administration (MEA) to discuss the design of the utilities' plans and their adequacy to meet electric savings and demand reduction targets. The Public Service Commission (PSC) will review electric company plans for energy savings to determine if the plans are appropriate and cost-effective, taking into consideration MEA's recommendations. The PSC will also consider rates, jobs, and environmental impacts.

Maryland PSC Order No. 84569 outlines the PSC's decisions on utilities' three-year plans for 2012-2014 and what is approved or denied. In the Order, the utilities were directed to continue existing energy efficiency and demand response programs from the previous program cycle, implement new programs, establish work groups to create new programs to meet goals and to transition limited income weatherization from the utilities to the Maryland Housing and Community Development Agency. The order also provides guidance on other issues such as cost-effectiveness, determining that cost-effectiveness will be measured at a sub-portfolio level (residential, C&I), savings will be reported as gross while net savings will be used for program design and cost-effectiveness, and 4% of budgets will be put aside for EM&V. Reporting will be filed semi-annually.

In addition the PSC developed the following guidelines: *EmPower MD Guidelines: Utility Portfolio Reporting*.[51] These explicit instructions were updated in response to decisions in PSC Order 84569. It provides details on the periods and reporting requirements for quarterly and semi-annual program-level reporting. A set outline is provided for the semi-annual report, including appendices. Net and gross savings are now required to be filed semi-annually. Gross savings will be used for evaluating the utilities' achievement towards their 2015 EmPower Maryland Goals, and net savings will be used for the purposes of forecasting and evaluating the cost-effectiveness of the programs.

3.2.3 Maine: Triennial Plan of the Efficiency Maine Trust (2011-2013)

The Triennial Plan of the Efficiency Maine Trust (EMT) is a three year strategic plan for the Trust's energy efficiency, alternative energy resources and conservation programs. The first Triennial Plan was developed in 2010 based on the statute creating the EMT trust, enacted in 2009.[52] The Trust's governing statute provides high level goals as well as some specific goals concerning reductions in energy usage, and amounts of weatherization.[53] Consistent with statute, the Triennial Plan enumerates goals of achieving electricity and natural gas savings of at least 30% and heating fuel savings of at least 20% by 2020; the first Triennial Plan also included a more immediate goal of 3.3 trillion BTUs of savings in electricity, fuel oil and natural gas by

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[51] PSC EmPower MD Guidelines
[52] http://www.mainelegislature.org/legis/statutes/35-a/title35-Ach97sec0.html
[53] http://www.mainelegislature.org/legis/statutes/35-A/title35-Asec10104.html

2013. The EMT Triennial Plan is the only plan NMR reviewed that includes explicit savings goals for fuel oil and other delivered fuels.[54]

According to EMT staff interviewees, the Trust uses both evaluated (adjusted) gross and net savings, depending on the context. The Trust's Annual Reports typically document evaluated (adjusted) gross savings. Both evaluated (adjusted) gross and net savings are used in program evaluations, cost effectiveness analysis, and program planning. The Trust's Residential and Commercial Technical Reference Manuals (TRM) provide guidance for estimating both evaluated (adjusted) gross and net savings.[55]

3.2.4 Massachusetts Policies: Massachusetts Green Communities Act, the Massachusetts DPU orders for Electric and Gas (2010 to 2012), the Massachusetts Global Warming Solutions Act, the Massachusetts Clean Energy and Climate Plan for 2020 and the Department of Public Utilities Investigation into Update Energy Efficiency Guidelines.

NMR reviewed the Massachusetts Green Communities Act,[56] the Massachusetts DPU orders for Electric and Gas (2010 to 2012) and associated three-year plans,[57] the Massachusetts Global Warming Solutions Act, and the Massachusetts Clean Energy and Climate Plan for 2020,[58] the Department of Public Utilities Investigation into Update Energy Efficiency Guidelines.

The Massachusetts Green Communities Act (GCA) establishes the savings goals and requirement that the PAs develop plans for energy-efficiency programs, but it does not specify an explicit savings goal Rather, the GCA requires that the PAs develop energy-efficiency plans that will "provide for the acquisition of all available energy efficiency and demand reduction resources that are cost effective or less expensive than supply." The PAs are required to develop three-year energy-efficiency plans in coordination with the Energy Efficiency Advisory Council (EEAC), and the plans are submitted to the Massachusetts Department of Public Utilities (DPU) for approval. In addition, the legislation includes provisions to encourage investment in renewable energy, make Massachusetts a leader in clean energy technology, and provide at least 20 percent of electric load is to be supplied by renewable and alternative power facilities by 2020.[59]

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[54] http://www.efficiencymaine.com/docs/other/EMT_Final_Tri_Plan.pdf
[55] http://www.efficiencymaine.com/docs/board_meeting_documents/Maine-Residential-TRM-02-04-09.pdf
[56] "Chapter 169: An Act Relative to the Green Communities Act." http://www.malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter169. Accessed March 1, 2012.
[57] "D.P.U. 09-121 through D.P.U. 09-128." http://www.ma-eeac.org/docs/DPU-filing/1-28-10%20DPU%20Order%20Gas%20PAs.pdf. "D.P.U. 09-116 through D.P.U. 09-120." http://www.ma-eeac.org/docs/DPU-filing/1-28-10%20DPU%20Order%20Electric%20PAs.pdf. Accessed March 3, 2012. http://www.ma-eeac.org/docs/DPU-filing/ElectricPlanFinalOct09.pdf http://www.ma-eeac.org/docs/4.10.12/Gas%20and%20Electric%20PAs%20April%2030th%20Plan%20Final.pdf
[58] "Massachusetts Clean Energy and Climate Plan for 2020." December 29, 2010. http://www.mass.gov/eea/docs/eea/energy/2020-clean-energy-plan.pdf.Accessed March 8, 2012.
[59] "Chapter 169: An Act Relative to the Green Communities Act." http://www.malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter169. Accessed March 1, 2012.

The Massachusetts DPU electric and gas orders pertain to the 2010-2012 three-year plans to meet the requirements of the Green Communities Act to provide for acquisition of all cost-effective energy-efficiency resources. The orders target $3.9 billion in net energy savings, new jobs, lower energy bills, and carbon savings.[60] For 2010- 2012 the cumulative 3-year goals are 2,625,600 MWh and 57,402,198 therms. The 2013-2015 interim savings targets are approximately 2.5% in electric savings (3,603,000 MWh total) and 1.0% in gas savings (66,707,515 annual therms total).[61]

In addition to the GCA, The Massachusetts Global Warming Solutions Act (GWSA) seeks to limit greenhouse gas (GHG) emissions to between 10% and 25% below 1990 levels by 2020 and an 80% reduction of 1990 emissions levels by 2050. The Massachusetts Clean Energy and Climate Plan (CECP) for 2020 is the plan to meet the requirements of GWSA and targets net energy savings valued at over $17 billion over ten years, as well as energy independence, carbon savings, job creation, and reduced air pollution.[62] The plan aims to reduce greenhouse gas (GHG) emissions by 25% below 1990 levels. As defined by the GWSA it targets an 80% reduction in GHG emissions by 2050.

In terms of net and gross savings, savings for the PAs programs designed to meet the requirements of the GCA are reported as net savings. According to our interviews, savings targets for the GWSA and CECP were set using net savings, but a decision is still pending as to whether net or gross savings will be used for reporting progress towards the savings goals.

In addition, NMR reviewed *The Department of Public Utilities Investigation into Update Energy Efficiency Guidelines* along with DPU orders and other documents filed as part of Docket 11-120.[63] The investigation is addressing multiple issues, once of which focuses on the method used to measure program net savings. A subsequent technical session examined the extent to which the existing approaches used to estimate net savings produce accurate and reliable results as well as alternate methods for determining net savings estimates that may improve upon the existing approaches. In responses, the PAs, EEAC advisors Massachusetts Department of Environmental Protection, Environment Northeast and NEEP filed a joint reply recommending a new evaluation and planning framework in which a naturally occurring energy-efficiency baseline would be established for planning purposes and evaluated gross savings would be applied retrospectively. Under the recommendations of the joint reply, evaluations of current programs would develop updated NTG values that would be incorporated prospectively into the next planning cycle. Free ridership and spillover would still be examined, but there would be an additional focus on

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[60] "D.P.U. 09-121 through D.P.U. 09-128." http://www.ma-eeac.org/docs/DPU-filing/1-28-10%20DPU%20Order%20Gas%20PAs.pdf. "D.P.U. 09-116 through D.P.U. 09-120." http://www.ma-eeac.org/docs/DPU-filing/1-28-10%20DPU%20Order%20Electric%20PAs.pdf. Accessed March 3, 2012.

[61] http://www.ma-eeac.org/docs/7.3.12/Gas%20and%20Electric%20PAs%20July%202%20Plan%207-2-12.pdf

[62] "Massachusetts Clean Energy and Climate Plan for 2020." December 29, 2010. http://www.mass.gov/eea/docs/eea/energy/2020-clean-energy-plan.pdf. Accessed March 8, 2012.

[63] http://www.mass.gov/eea/docs/dpu/energy-efficiency/energy-efficiency-legislation-and-regulations/ee-noi-dpu-11-120.pdf; other filings and orders pertaining to DPU docket 11-20 can be found here: http://www.env.state.ma.us/DPU_FileRoom/frmDocketListSP.aspx

naturally occurring energy-efficiency effects as well as the market and timing effects of energy-efficiency programs. A recent DPU order supports adopting much of the recommended approach:

> *We are also persuaded that the current approach used to determine net savings, which focuses on participants in specific programs in specific years, is unlikely to produce sufficiently reliable results for these new and innovative approaches to program design and implementation. The Department, therefore, finds that it is appropriate to consider adopting alternate approaches to determining net savings that look at effects that occur over multi-year periods and across programs … Accordingly, the Department finds that it is appropriate for Program Administrators, when calculating post-implementation program savings (gross and net), to use: (1) the most recently updated gross savings impact factors (as discussed above); and (2) the net savings impact factors that were used when the programs were designed and developed..[64]*

3.2.5 New York: New York Energy Efficiency Portfolio Standard, Initial Orders: DPS order establishing Energy Efficiency Portfolio Standard (Electric & Gas) (2008-2011); NYSERDA Clean Energy Future 2011-2014 Strategic Outlook

New York State energy policy is formulated by a number of entities, including the Governor, the Legislature, and by the NYS Public Service Commission (PSC). The PSC issued an order in June 2008 that established the Energy Efficiency Portfolio Standard (EEPS) and outlined the goal of reducing annual electric energy usage by 15% from the forecasted level in 2015. The state also has a renewable energy portfolio standard (RPS), which has a goal to obtain 30 percent of the state's energy generation from wind, solar, hydro and other renewable resources by 2015.

The New York Energy Efficiency Portfolio Standard (EEPS) was established by the NYS Public Service Commission to achieve its jurisdictional portion of NY State's 15 x 15 energy efficiency policy. The 15 x 15 policy would result in a 15% reduction in forecast statewide electricity usage by the 2015 and total cumulative electric savings of 24,927,042 MWh.[65] of which, the NYS PSC's jurisdictional goal is 10,630,583 MWh. In a separate order, issued May 19, 2009, the PSC established a gas efficiency target of 4.34 Bcf annually from 2009 through the end of 2011. Beyond 2011, the annual gas efficiency target is 3.45 Bcf. The EEPS initiative also addresses

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[64] http://www.env.state.ma.us/dpu/docs/electric/11-120/81012dpuord.pdf
[65] Savings goals are reported in terms of electricity sales. The same goal is also reported as 26,885,638 MWh in terms of generation.

other goals such as carbon savings, job creation, energy independence, and reduced air pollution.[66]

The NYSERDA 2011-2014 outlook outlines NYSERDA's portfolio of clean energy programs, including those implemented under EEPS, System Benefit Charge, American Recovery and Reinvestment Act, Green Jobs-Green New York and other portfolios, to help to reduce energy demand and increase renewable energy generation. In particular, the 2015 goal is to meet 45% of electricity needs through improved energy efficiency and clean renewable energy.[67] The plan also seeks to reduce greenhouse gas emissions 80% below levels emitted in 1990 by 2050. The primary goal is net energy savings, and other goals include renewable energy capacity, developing a clean energy economy, job creation, and emission reductions.

Energy-efficiency savings are reported as net savings in New York. The *New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs* states that a 10% estimate is used to compensate for free ridership and spillover (SO) (i.e., NTG ratio = 90%) until Staff approves the use of a program-specific NTG ratio that was developed as part of a program impact evaluation conducted by a third party. In addition, the June 2008 EEPS order includes a discussion of the Evaluation Advisory Group (EAG), which as the Evaluation Guideline[68] explains, was created to advise the Commission and Department of Public Service staff (Staff) on evaluation related issues.

3.2.6 Rhode Island: Rhode Island's 3-Year Least Cost Procurement Plan for 2009-2011 and 2012-2014 and National Grid Least Cost Procurement Report and Orders[69]

In 2006 the Rhode Island legislature passed *The Comprehensive Energy Conservation, Efficiency and Affordability Act of 2006* which requires the least cost procurement of energy resources, including energy efficiency resources that are lower than the cost of additional supply; the legislation was amended in 2010 to include natural gas.[70] The current three year plans include savings goals of 2.5% savings in electricity and 1% savings in natural gas by 2014, compared to a baseline of electric and natural gas usage in 2009. The PA (National Grid) submits annual Energy Efficiency Program Plans for Commission approval. The plans are consistent with the

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[66] "June 23, 2008 - Order Establishing Energy Efficiency Portfolio Standard and Approving Programs." http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7BD9F7E0DF-A518-4199-84CC-C2E03950A28D%7D. Accessed March 1, 2012.
"Order Establishing Targets and Standards for Natural Gas Efficiency Programs (Issued and Effective May 19, 2009)"
http://www.dps.ny.gov/07M0548/ORDER_ESTABLISHING_TARGETS_AND_STANDARDS_May_19_2009.pdf
[67] "NYSERDA 2011- 2014 Plan."
http://www.nyserda.ny.gov/en/About/~/media/Files/Publications/NYSERDA/2011-strategic-plan.ashx. Accessed March 4, 2012.
[68] http://www.dps.ny.gov/Evaluation_Guidance.pdf
[69] http://www.ripuc.org/eventsactions/docket/4284page.html
http://www.ripuc.org/eventsactions/docket/4284-NGrid-3-YearLCP(9-7-11).pdf
[70] http://www.ripuc.org/eventsactions/docket/3759-RIAct.pdf

three year plans, but contain the detailed budget, funding plan, and savings goals for Commission approval.

In terms of savings goals and reporting, net savings are reported, but NTG values are established during the planning period. New NTG values from program evaluations are applied prospectively, to the next program planning period, rather than retrospectively.

3.2.7 Vermont: Vermont Public Service Board (PSB) Order for Energy Efficiency (for Demand Resources Plan); Vermont Demand Resources Plan (2010-2011); Vermont Comprehensive Energy Plan

Vermont statutes require that the state develop budgets for the Energy Efficiency Utilities (EEUs), funded via the Energy Efficiency Charge ("EEC"), such that the EEU can realize "all reasonably available, cost-effective energy efficiency."[71] The Vermont Public Service Board (PSB) guides the process of determining the savings goals and budgets in a long term Demand Resource Plan (DRP). The recent process established energy efficiency budgets that gradually increase to achieve nearly 3% savings in annual electricity sales. From 2012 to 2014 the "stretch" target equates to approximately 344,518 MWh over the three-year time period.[72] Provisional budgets to be used for long-term planning purposes are set through 2031, to be updated triennially.

Vermont reports both net and gross savings depending on the audience. Gross savings are reported to ISO-NE for forecasting and for use in the FCM[73] Performance awards are based on net savings, with predetermined free ridership and spillover values. Beginning in 2012, if evaluation results establish new values for free ridership or spillover within a performance period, the savings goals are also adjusted so as to hold the PAs harmless from the adjustment.

The Vermont Public Service Department recently lead a multi-agency effort to develop a Comprehensive Energy Plan that addresses electricity, heating and process fuels, and energy in transportation and land use decisions.[74] The plan defines a broad set of objectives:

1. Foster economic security and independence

2. Safeguard environment

3. Drive in-state innovation and jobs creation

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[71] "Order Re: Energy Efficiency Utility Electric Budgets for Demand Resources Plan." EEU-2010-06. 8/1/2011. http://psb.vermont.gov/sites/psb/files/orders/2011/EEU-2010-06%20DRP%20and%20AttachA.pdf. Accessed March 5, 2012. "Demand Resources Plan Proceeding (2010-2011)." http://psb.vermont.gov/docketsandprojects/eeu/drp2010. Accessed March 3, 2012.

[72] The savings goal includes savings target for the energy efficiency utility (EEU) (http://psb.vermont.gov/sites/psb/files/orders/2011/2011-2/EEU-2010-06%20Order%20re%20Electric%20QPIs%20Appendix%20A.pdf) and Burlington Electric (http://psb.vermont.gov/sites/psb/files/orders/2012/2012-1/EEU-2010-06%20Order%20re%20Electric%20QPIs%20BED%20Appendix%20A.pdf)

[73] This is in contrast to Massachusetts, which indicated that they provide net savings to ISO NE.

[74] "Vermont Comprehensive Energy Plan." December 15, 2011. http://www.vtenergyplan.vermont.gov/. Accessed March 7, 2012.

4. Increase community involvement and investment

More specifically, the plan aims to attain 90% of energy across all sectors from renewable sources by mid-century, as well as other objectives such as net energy savings, development of renewable energy sources, job creation, and community involvement and investment.

3.3 Regional Transmission Planning and Wholesale Markets

3.3.1 ISO-NE Proof of Concept Forecast of New State-Sponsored Energy Efficiency 2014-2020[75] and Final Energy Efficiency Forecast in the ISO-NE Planning Process[76]

3.3.1.1 Overview

These policy documents are focused on reviewing various methods for forecasting energy-efficiency savings beyond the Forward Capacity Market (FCM) results across a full ten-year span. ISO-NE's previous ten-year Plan used only the three years of energy-efficiency resources that had *already* cleared in the annual Forward Capacity Market (FCM) auctions, and assumed no energy-efficiency growth in years four through ten. As a result, in transmission planning studies that looked up to ten years into the future, incremental energy-efficiency growth was not captured. The revised energy-efficiency forecast that ISO-NE will adopt in 2012 allows the ISO-NE to explicitly account for expected energy-efficiency resources for the full ten years of the Regional System Plan (RSP).[77]

Traditionally, ISO-NE has used an econometric forecast for the RSP that accounted for at least some future energy-efficiency resources based on energy-efficiency savings from recent energy-efficiency programs embedded in the data used for the forecast. As explained by our interviewees, the ISO-NE forecast model is based on regional economic and energy usage to estimate the energy intensity of the regional economy. This estimate can be multiplied by the forecasted level of economic output in order to forecast future energy needs. This method captures at least a portion of past programs because past programs have reduced the energy intensity of the region; in other words, the econometric model projects the effects of past programs.

However, in regards to energy efficiency, there are several shortcomings to the econometric model and to neglecting to account for energy-efficiency resources in years four through ten of the ten-year plan. While the states anticipate future years of energy-efficiency programs, the previous policy forecasted no new savings from those programs in years four through ten of the

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[75] http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/pac/mtrls/2011/nov162011/ee_forecast_update.pdf
[76] http://neep.org/uploads/EMV%20Forum/ISONE_Winkler_PPT.pdf
[77] Synapse Energy Economics, Inc. 2012. *The Road to Better System Planning: ISO-New England's Revised Energy Efficiency Forecast*. April, 26, 2012.
http://www.iso-ne.com/committees/comm_wkgrps/othr/enrgy_effncy_frcst/frcst/2012/iso_ne_ee_forecast_2015_2021.pdf

plan. Further, according to our interviewees, the econometric forecasts are not able to account for any structural changes in energy-efficiency resources. For example, any increases in funding for energy-efficiency programs will not be immediately reflected in the forecasts because forecasts are based on the past energy intensity of the region. Similarly, the forecast will not capture the impact of the adoption of new federal standards. From a resource-planning perspective, the previous approach had the advantage that it would ensure that ISO-NE never overestimated the amount of energy-efficiency resources available in its ten-year plans, thereby avoiding running the risk of having more demand than capacity. But by neglecting energy-efficiency resources and spending over so much of the planning horizon, ISO-NE's treatment of energy-efficiency was overly conservative and risked overinvestment in capacity and transmission lines at the expense of ratepayers. The purpose of the revised energy-efficiency forecast is to allow each annual plan to more accurately fulfill its goal: "to determine the resources and transmission facilities needed to maintain reliable and economic operation of New England's bulk electric power system over a ten-year horizon."[78]

3.3.1.2 The Revised Energy-efficiency Forecast

Energy Efficiency became a recognized and eligible resource to bid into ISO-New England's new FCM in 2006.[79] Energy-efficiency resource providers can now sell capacity to the region in auctions in the same fashion as supply-side resources and demand response. Once the resources have cleared at auction, they receive a capacity supply obligation, and the right to receive capacity payments during that future power year. The quantity of MW that an energy-efficiency resource bids into the FCM auction is the amount of energy reduction that needs to be available from that resource on a peak load day in the summer for the obligation year.

As previously indicated, in years four through ten of the prior resource planning period, there was the assumption that *zero* new energy-efficiency resources would become available. Since the PAs programs anticipated many future years of energy-efficiency implementation using existing funding mechanisms, the zero assumption was a shortcoming of the methodology. Further, as a result of assuming no new energy-efficiency resources or spending, forecasted capacity needs would jump dramatically in year four. When looking at a trend line of increasing demand over time, in year four the trend line would increase by the number of MW from year three, as would the rate of change.

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[78] Ibid
[79] Ibid

3.3.1.3 Forecast Assumptions

The revised forecast is based on the expected state budgets to be spent on energy efficiency during years four through ten of the ten-year forecast timeframe, and on the amount of energy savings realized in the past per dollar spent on energy efficiency (i.e., a production cost curve based on evaluated net savings, energy efficiency program budgets provided by state public utility commissions and other assumptions).[80] ISO-NE adopted the production cost model in part due to researching NYISO's production cost model and discussing the model with NYISO staff.[81] It is important to note that the forecast is more conservative than the summary implies, because the ISO-NE model makes a number of assumptions about the future market, including reductions in expected budgets in some states, anticipating that energy efficiency will become more expensive in the future, and adding inflation adjustments to the production costs.

The equation used by ISO-NE to calculate megawatts of new energy efficiency that will be available in years four through ten of the RSP timeframe is as follows:

MW = $ * %Spent * MWh/$ * Realization Rate * MW/MWh

Where the individual variables in the equation are defined below:

- $: An estimate of the dollars to be spent on energy efficiency (including adjustments for budget uncertainty)
- % Spent: Percentage of dollars that can be spent on energy-efficiency programs in that time period (developed from historical data)
- MWh/$: MWh savings per dollar spent (developed from historical data)
- Realization Rate: Comparison of observed/measured savings to estimated savings (developed from historical data)
- MW/MWh: Peak to energy ratio. This is developed from historical data[82]

The energy-efficiency forecast is also modified by state-specific adjustments.[83] As a result of the new forecast assumptions, there is a dramatic shift in forecasted annual energy usage at the conclusion of the 10 year forecast as well as an impact on transmission planning and needs. For example, including energy efficiency in the forecast essentially flattens forecasted load growth, which can affect t transmission needs. As an example, re-assessing the NH/VT Needs Assessment and Solutions Study and incorporating the new energy-efficiency forecast found that

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[80] Synapse Energy Economics, Inc. 2012. *The Road to Better System Planning: ISO-New England's Revised Energy Efficiency Forecast*. April, 26, 2012.
http://www.iso-ne.com/committees/comm_wkgrps/othr/enrgy_effncy_frcst/frcst/2012/iso_ne_ee_forecast_2015_2021.pdf
[81]http://www.iso-ne.com/committees/comm_wkgrps/othr/enrgy_effncy_frcst/frcst/2012/iso_ne_ee_forecast_2015_2021.pdf
[82] Ibid
[83] See Synapse Energy Economics, Inc. 2012. *The Road to Better System Planning: ISO-New England's Revised Energy Efficiency Forecast*. April, 26, 2012 for more details.

the reductions related to the energy-efficiency forecast contributed to the deferral of ten transmission projects that totaled $265 million.[84]

3.3.1.4 Energy-efficiency Forecast and FCM – Net vs. Gross

According to our interviews, ISO-NE does not specify whether net or gross savings should be used for resources that are bid into the wholesale Forward Capacity Market (FCM). However, a recent Massachusetts DPU order indicates that evaluated (adjusted) gross saving are used in the FCM. [85] However, with regard to long-term forecasting, ISO-NE is now incorporating energy efficiency into its long-range forecasts (i.e., ten-year forecasts, beyond the FCM period) and uses net savings for the forecast.

3.3.2 NYISO: Incorporating Energy Efficiency in Long Term System Planning

The power point presentation *Incorporating Energy Efficiency in Long Term System Planning* is focused on accurately forecasting the impacts of energy-efficiency programs through the use of a "bottom-up" approach using a production cost model. Forecasting energy-efficiency impacts is achieved by segmenting regions by geography and program administrator.[86]

The NY Public Service Commission (PSC) measures progress toward the goals of its Energy Efficiency Portfolio Standard (EEPS) based on net annualized energy savings. [87] Deemed energy savings for specific measures are set forth in the New York Department of Public Service's (DPS) Technical Manual.[88] Once measures are installed, deemed energy savings are reported periodically to the DPS by the EEPS program administrators in a standardized format. Both energy savings and peak demand savings are reported. The NYISO obtains information on cumulative program impacts from these databases.

A number of metrics are described in the NYISO's forecasting method, the most basic of which is that the system forecast will be calculated as the econometric forecast[89] less forecasted energy-efficiency impacts. Measurements of energy-efficiency impacts are at the net level, prior to impact evaluations, as recorded in the tracking databases. The method also goes into more detail on specific energy-efficiency forecast equations, given below:

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[84] Synapse Energy Economics, Inc. 2012. *The Road to Better System Planning: ISO-New England's Revised Energy Efficiency Forecast.* April, 26, 2012.

[85] The order states "For example, the Independent System Operator-New England ("ISO-NE") uses adjusted gross savings values to determine the level of energy efficiency resources that can participate in the wholesale electricity markets that it administers. See, e.g., ISO New England Manual for Measurement and Verification of Demand Reduction Value from Demand Resources Manual M-MVDR at § 8.2(3) (June 1, 2012)." See page 14 of the order for more details: http://www.env.state.ma.us/dpu/docs/electric/11-120/81012dpuord.pdf and

[86] http://neep.org/uploads/EMV%20Forum/NYISO_Maniaci_PPT.pdf

[87] http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7BD9F7E0DF-A518-4199-84CC-C2E03950A28D%7D, and

[88] http://www.dps.ny.gov/TechManualNYRevised10-15-10.pdf?bcsi_scan_13fcdd49727957d3=0&bcsi_scan_filename=TechManualNYRevised10-15-10.pdf

[89] Econometric forecasting applies statistical and mathematical models to forecast future developments in the economy – in this case those related to EE. It allows forecasters to review past economic trends and estimate how recent economic changes will alter the patterns of past trends. The process relies on the logic of the forecaster and the data provided by the economic model being used. .

- GWH per Yr = (Budget \$M/yr) * (fraction spent) / (Cost \$M /MWh) * (NTG ratio) * (1 GWh / 1000 MWh)
- MW per Yr = (GWh/Yr) / (8,760 hrs per year) / Load Factor

As with many regional transmission policies, the goal of *Incorporating Energy Efficiency in Long Term System Planning* is to forecast energy efficiency impacts as accurately as possible throughout the coming years. NYISO believes this is most successfully achieved by segmenting the policy areas by region, program, and program administrator, reasoning that although program-specific projections require more data, they are also likely to result in more realistic projections. The PSC has determined that program administrators should report net savings in their reports and databases. An initial net-to-gross ratio of .90 is assumed for all program impacts, prior to obtaining results of impact evaluations.

3.3.3 PJM Manual 18b: Energy Efficiency Measurement & Verification

For those who wish to offer energy-efficiency resources into PJM's Capacity Market, PJM Manual 18B sets forth the measurement and verification standards for those Resource Providers. The objective of a capacity market is to purchase sufficient capacity for reliable system operation for a future year at competitive prices in which all resources, both new and existing, can participate.[90] The M&V standards set forth in the manual are applied by energy-efficiency resource providers to calculate the demand reduction value of their energy-efficiency resources during specific performance hours. These same calculations are used to determine the load reduction value of the energy-efficiency resources that are offered into Reliability Pricing Model (RPM) auctions. The addition of energy-efficiency as a resource that can be bid into the FCM is a recent trend for PJM, ISO-NE and NYISO, all of which now attempt to make projections of future energy usage while factoring in the demand reduction and cost of energy-efficiency resources.

Overall, the manual has three main goals: first, to provide a foundation for an M&V plan utilizing a "best practices" approach that considers both technical accuracy and cost-effectiveness; second, to provide guidance on what is essential for a robust initial M&V plan for an energy-efficiency resource; and third, to describe the components of initial M&V plans, updated M&V plans, and post-installation report submittals. [91]

The primary metric described in the report is the nominated energy-efficiency value, defined as the expected average demand reduction, in megawatts (MW), during the defined energy-efficiency performance hours in the delivery year. As such, energy efficiency itself is central to the policy, as it focuses on calculating the demand reduction after the energy-efficiency program or measure is installed. Demand reduction during the energy-efficiency performance hours is the

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[90] Retrieved from http://www.iso-ne.com/markets/othrmkts_data/fcm/index.html. June 13, 2012.
[91] 2010 PJM Forward Market Operations. "PJM Manual 18B: Energy Efficiency Measurement and Verification." https://www.pjm.com/~/media/documents/manuals/m18b.ashx

parameter measured to value energy efficiency, and neither net nor gross savings are specified in the document. However, according to interviewees, gross savings are bid into the PJM capacity market.

3.3.4 ISO-NE VT/NH Needs Assessment; Summary of Vermont/New Hampshire Transmission System 2010 Needs Assessment

The Summary of the Vermont/New Hampshire Transmission System 2010 Needs Assessment makes the major findings of the full transmission system needs assessment available to the general public.[92] The goal of the document, and the assessment as a whole, is to identify the areas of the system in Vermont and New Hampshire that potentially fail to meet mandatory federal and regional reliability standards. The primary metrics and standards of interest are the projected level of peak electrical demand in 2020, the existing and planned generation and demand-side resources expected to be in service in 2020, and the transmission system as it exists today (plus any planned transmission upgrades expected to be in service by 2020). Essentially, the needs assessment is an attempt to make sure that the states will have enough generating capacity to meet their electrical needs in the coming years. This also points to the importance of the other resource and transmission planning policy documents reviewed here: accurately forecasting energy efficiency and energy usage is imperative to ensuring that there will be enough capacity to meet the demand.

Although energy efficiency is not the central topic of the present document (it is only mentioned briefly as a strategy that private developers may opt to pursue to address system reliability issues), it is clear that energy efficiency will play a large role in energy consumption projections in the coming years. The document does not contain a specific savings definition; instead, the report uses a statistically adjusted economic model with naturally occurring efficiency embedded into the forecast. The report forecasts load and adds back what has been bid in to the Forward Capacity Market (FCM), adding energy efficiency resources – what has been bid in as energy efficiency. There are no adjustments for free ridership or spillover as the interest is in calculating gross energy savings, thereby estimating impacts on the grid at that time.

3.3.5 Sixth Northwest Conservation and Electric Power Plan

The Northwest Power Act of 1980 directs the Northwest Power & Conservation Council (NPCC) to develop a least-cost power plan to meet future electricity needs of the Pacific Northwest. The power plan is required to be a long-term, 20-year strategy for meeting the region's electricity needs. Resources included in the plan are to be cost-effective, with system cost defined to include all costs of a resource over its useful life, including quantifiable environmental costs.[93]

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[92] http://www.iso-ne.com/pubs/spcl_rpts/2011/vt_nh_needs%20assessment_summary_021711.pdf
[93] http://www.nwcouncil.org/energy/powerplan/6/default.htm
http://www.nwcouncil.org/library/2011/2011-02.pdf
http://www.bpa.gov/energy/n/reports/evaluation/multi_sector/pdf/Market_Induced_Savings_Report.pdf

Conservation, or energy efficiency, is specified as the first priority resource, and it is given a ten percent cost advantage for planning purposes. The Act specifies additional resource priorities after efficiency. Second priority is generation from renewable resources, followed by high-efficiency generation such as combined heat and power applications, and finally other generating resources. The policy contains a number of metrics and projections, including:

- Electricity demand forecast
- Conservation supply assumptions
- Generation mix
- Transmission needs

Energy efficiency is a first priority resource. While the NPCC identifies conservation in terms of gross savings, its version of gross savings is an estimate net of naturally occurring energy efficiency, and thus attempts to take into account free ridership, spillover and other market effects. As such, although the policy itself specifies savings as gross, the definition of these savings estimates would be considered net in other regions and methodologies, including the NEEP territories.

In addition, it is worth noting that the NPCC accounts for the "naturally occurring" energy efficiency savings "up front" so that savings estimates already account for "what would happen in absence of a program." In other words, attribution occurs in setting the baseline. The NPCC forecast model captures naturally occurring energy efficiency by using data on the market penetration of energy efficient technologies and end-uses. The NPCC forecasts capture improvements in efficiency that would occur as a result of normal stock turnover, in the absence of any efficiency programs.

A distinction between the NPCC and ISO-NE, NYISO and PJM is that the NPCC forecasts future needs through a bottom-up approach rather than a top-down econometric model. The forecast for demand includes estimating energy-efficiency potential based on the market penetration of energy efficient technologies and end-uses.[94]

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[94] In addition to estimating energy-efficiency potential the NPCC uses several models in its resource planning process, including a demand analysis model, a fuel price model and other models. For more details on the NPCC planning methodology, see http://www.nwcouncil.org/library/2011/2011-02.pdf

3.4 Efforts to Quantify the Energy Savings Associated with Efficiency Actions for Air Regulations and Policies

3.4.1 RGGI Reference Case Assumptions and Results

The results and assumptions from the RGGI reference case outline state by state energy-efficiency assumptions for all RGGI states.[95] The document also presents selected projections from the latest RGGI reference case, which is based on assumptions in place as of August 2012. The goal of the reference case is to provide electricity sector projections over the next several years from RGGI states' assumptions, including energy demand assumptions.

The reference case provides a hypothetical scenario of what each state's energy demand might look like, in order to make projections about necessary capacity. It contains the following projections: generating capacity additions, generation mix, CO_2 emissions, RGGI allowance price, and wholesale electricity price. Energy-efficiency is included in each state's projected demand forecast. Future energy-efficiency savings are calculated using an approach similar to ISO-NE: for all of New England, 234 MW/year are projected. Although the type of savings reported differs by state, RGGI staff indicated that most states tend to use gross savings. Similarly, adjustments for free-ridership and spillover are state-specific.

3.4.2 US EPA – Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans

The EPA regulates emissions of pollutants from power plants, but the historical focus has been on pollution control at the source. Now, the EPA and others are beginning to look at renewable and demand-side resources as a strategy for reducing emissions in the power sector. The document *Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans* is designed to clarify existing guidance for States, tribes, and local agencies to incorporate these approaches into air quality plans.[96] The document *Linking EE & Air Quality – Opportunities for the EM&V Forum* is an attempt to help States link energy-efficiency investments to better air quality.[97]

The policies, taken as a whole, have a number of goals. The former seeks to provide a roadmap that clarifies guidance on four pathways available to states and tribes under the Clean Air Act: baseline emissions forecast pathway, control strategy pathway, emerging/voluntary measures pathway, and weight-of-evidence (WOE) pathway. The goals of the latter are to attempt to

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[95] RGGI is a cooperative effort among the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont.
http://www.rggi.org/docs/ProgramReview/August13/12_07_12_Reference_Case_Assumptions_Updated.pdf
http://www.rggi.org/docs/ProgramReview/August13/12_08_13_Reference_Case_Results.pdf
[96] The EPA's finalized position and guidance on this topic are available here:
http://www.epa.gov/airquality/eere/index.html;
a summary of the policy is available here: http://neep.org/uploads/EMV%20Forum/EPA_Moskal_PPT.pdf
[97] http://neep.org/uploads/EMV%20Forum/Dietsch%20EMV%2010.12.pdf

achieve acceptance of energy efficiency as a real and reliable energy source, to forecast energy-efficiency impacts over the compliance period, to confirm that EE/RE policies have achieved forecasted energy and peak demand impacts, to quantify the magnitudes of air emissions impacts and past EE/RE activities, and to determine when and where these air emissions impacts have occurred, consistent with policy goals.

Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans uses IPM, an Integrated Planning Model, to establish baselines, and currently incorporates existing federal energy-efficiency policies. The quantification approach is to estimate displaced Electric Generating Units (EGU) emissions from energy impacts of an energy-efficiency policy or a renewable energy program. *Linking EE & Air Quality – Opportunities for the EM&V Forum* utilizes a number of resources to provide assistance to States on energy efficiency – Air Quality integration, including the National Ambient Air Quality Standards (NAAQS), the Proposed Mercury and Air Toxics Standard, as well as training and outreach. While it is not a statute or regulation, it explores opportunities for energy efficiency to help achieve the goals laid out by the EPA. Energy efficiency is important to both policies, whether in terms of accurately quantifying energy-efficiency impacts to clarify guidance on various pathways, or using energy efficiency as a strategy to achieve State's air quality objectives.

Neither policy, however, is used to calculate savings, but instead focuses on EGU's and emissions. Emissions are what the EPA is concerned about, not savings, and energy efficiency is important to them only to the extent that it shows a cause and effect relationship with air pollution reduction. As such, adjustments for free-ridership and spillover are not assessed. Instead, according to the EPA, evaluated gross savings that can be linked to emissions from EGUs are the preferred savings measure.

3.5 Other State or Regional Policies

3.5.1 California Greenhouse Gas Regulatory Strategies

The state of California is considering regulating greenhouse gases. The California Public Utilities Commission (CPUC) and California Energy Commission have developed recommendations for a variety of strategies, including direct mandatory or regulatory requirements and a cap-and-trade system for the energy sectors. The goal would be to reduce GHG emissions from all major sources to 1990 levels by 2020.[98] NMR was unable to determine if net or gross savings would be used in the recommendations.

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[98] http://docs.cpuc.ca.gov/published/Final_decision/80150.htm

3.5.2 Pennsylvania: Implementation Order of the Energy Efficiency and Conservation Program

The state of Pennsylvania established an energy-efficiency resource standard in 2008. The Pennsylvania Public Utility Commission's (PUC) Implementation orders established total savings goals of 1% for 2011 and 3% for 2012 compared to a weather adjusted baseline of June 1, 2009 to May 31, 2010. In addition, the orders established a goal of reducing peak demand by 4.5%.[99]

Gross savings are used to measure progress towards savings goals while net savings are used to assess the cost-effectiveness of the programs.

3.5.3 United States Department of Energy (US DOE) Uniform Methods Project

The US DOE's Uniform Methods Project is a national project organized by the US DOE as an attempt to establish a set of protocols to estimate gross energy savings for commonly used, high impact measures used in PA efficiency programs.[100] The project hopes to establish best practice protocols of selected measures in order to establish a greater uniformity in the method by which the savings estimates are derived. Rather than developing uniform savings values, the project hopes to establish uniformity in terms of the algorithms and in terms of the how the inputs for the algorithms are derived. The intent of the project is to provide best practices for the PAs with well established programs as well as offer guidance to PAs that are just starting programs

The Uniform Methods project has initially focused on gross savings but there is a working group established to address for net savings, which will be addressed as part of Phase two of the project, likely later in 2012 or early 2013.

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[99] http://www.legis.state.pa.us/WU01/LI/LI/CT/HTM/66/00.028.006.001..HTM
http://www.puc.state.pa.us/electric/pdf/Act129/EEC_Implementation_Order.pdf
[100] http://www1.eere.energy.gov/deployment/ump.html

Appendix A   Summary of Policy Goals and Metrics

Table 3-2 provides a summary of the policies reviewed in this report.

Table 3-2: Summary of Policy Goals and Metrics

State / Region	Type of Policy	Policy or Document	Description	Goal	Metrics	Role of Energy Efficiency	Type of Savings Reported	Gross and Net Applied for Different Purposes?
CT	Integrated Resource Plans (IRP)	Connecticut's 2012 Integrated Resource Plan	Ten-year energy outlook and integrated resource plan to assess Connecticut's energy and capacity resources, and recommend policies to improve energy availability.	• 600 GWh of savings per year and 6,616 GWh savings from 2012 to 2022; 0.4% annual reduction • Develop strategy for Connecticut's future electricity needs • Help make electricity "cheaper, cleaner, and more reliable, while supporting in-state employment."	Primary: • Net energy savings. Secondary: • Capacity, renewable credits, reduced price of energy, carbon emissions, job creation	One of multiple recommendations	Net	No
CT	Integrated Resource Plans	Public Act 11-80 An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future)	Enabling legislation that requires an IRP. The Act has five major provisions: •Creation of an the Department of Energy and Environmental Protection •Maintenance of the core energy-efficiency system, •Promotion of increased energy efficiency • Creation of a "green bank" with an expanded vision of "clean energy" projects •Establishment of a residential solar provision and other renewables provisions	The IRP requirements of the legislation include maximizing the impact of demand side measures and the procurement of energy resources, including, but not limited to, conventional and renewable generating facilities, energy efficiency, load management, demand response, combined heat and power facilities, distributed generation and other emerging energy technologies to meet the projected requirements of their customers in a manner that minimizes the cost of such resources to customers over time and maximizes consumer benefits consistent with the state's environmental goals and standards.	• Net energy savings for energy efficiency resources	One of multiple recommendations	Net	No
DE	State Energy Efficiency Plans:	Delaware—Title 26, Energy Efficiency Resource Standards	Act defining energy efficiency as a resource and how it shall be used	• To establish the role of energy efficiency as the first source of energy price reduction and set the foundations for future energy-efficiency planning • Electricity savings goals of 2% savings by 2011 and 15% by 2015 compared to 2007 baseline. • Gas savings goals of 1% savings by 2011 and 10% savings by 2015 compared to 2007 baseline.	Primary: • Energy savings	Primary goal of the plan	Appears to be both; EM&V still in development	Not clear from policy document

State / Region	Type of Policy	Policy or Document	Description	Goal	Metrics	Role of Energy Efficiency	Type of Savings Reported	Gross and Net Applied for Different Purposes?
MA	Other state or regional policies	MA Green Communities Act (2010-2012)	Energy efficiency plans and provisions for municipalities to encourage investment in renewable energy and make Massachusetts a leader in clean energy technology	• Acquisition of all of the cost-effective energy efficiency and demand reduction resources, including: • Fifteen percent of electricity to be supplied by new renewable power facilities by 2020.	Primary metric: • Net energy savings Other metrics: • Renewable energy/clean energy technology • Job creation • Carbon savings	Primary goal of the plan	Net	No
MA	Other state or regional policies	Massachusetts Global Warming Solutions Act	Legislation mandating reductions in greenhouse gas emissions	• Limit greenhouse gas (GHG) emissions to between 10% and 25% below 1990 levels by 2020 • 80% reduction of 1990 emissions levels by 2050	Primary metric: • GHG emissions Other metrics: • Energy independence • Carbon savings • Job creation • Reduced air pollution	One of several metrics toward meeting goal of reduced GHG emissions	Original estimates were made with net, but use of net or gross for reporting has not been decided	Not determined
MA	Other state or regional policies	Massachusetts Clean Energy and Climate Plan for 2020	Plan to meet requirements of Global Warming and Solutions Act	• Reduce greenhouse gas (GHG) emissions by 20% below 1990 levels (rough mid-point of the goal of 10% and 25% below 1990 levels for 2020) • 80% reduction in GHG emissions by 2050	Primary metric: • GHG emissions Other metrics: • Energy independence • Carbon savings • Job creation • Reduced air pollution	One of several metrics toward meeting goal of reduced GHG emissions	Original estimates were made with net, but use of net or gross for reporting has not been decided	Not determined
MA	State Energy Efficiency Plans:	MA DPU orders for electric and gas and PA energy efficiency plans (2010-2012; 2013-2015)	Three-Year Plans to meet requirements of Green Communities Act to provide for acquisition of all cost-effective energy efficiency resources.	• Acquisition of all cost-effective energy efficiency resources. • 2010 - 2012 Cumulative 3-year goals of 2,626 GWh and 57,402,198 therms • 2013-2015 savings targets of approximately 2.5% electric savings (3,603 GWh) and 1% gas savings (66,707,515 annual therms)	Primary metric: • Net energy savings Other metrics: • Carbon savings • Job creation	Primary goal of the plan	Net	No

State / Region	Type of Policy	Policy or Document	Description	Goal	Metrics	Role of Energy Efficiency	Type of Savings Reported	Gross and Net Applied for Different Purposes?
MD	State Energy Efficiency Plans:	EmPower Maryland Act of 2008	Legislation that mandates energy reductions and requires utilities to develop plans to save energy.	• To reduce per-capita consumption 15% by 2015 and peak demand 15% by 2015 against 2007 baseline • Goal of 11,206 GWh of savings by 2015	Primary metric: • Energy savings. Secondary metric: • Cost effectiveness, rate impacts, jobs, environmental impacts	Primary goal of the plan	Not specified in legislation	Not specified in legislation
MD	State Energy Efficiency Plans:	Maryland PSC Order No. 84569	An order stating the PSC's determinations on utilities' three-year plans and ordering them to begin programs, start work groups, transition low income projects to the state, and also advises on tests and calculations for cost-effectiveness	• To bring utilities into the next phase of the EmPOWER Maryland Energy Efficiency Act of 2008.	Primary metric: • Energy savings. Secondary metric: • Cost effectiveness, rate impacts, jobs, environmental impacts	Primary goal of the plan	Both; Gross for reported savings, net for planning / program design and cost-effectiveness	Yes
ME	State Energy Efficiency Plans:	Triennial Plan of the Efficiency Maine Trust (2011-2013)	-Three year plan prepared in response to the Efficiency Maine Trust's enabling legislation -Three year plan for energy efficiency, alternative energy resources and conservation programs.	• Reach long-term energy savings targets of more than 3.3 trillion Btu of energy annually by the third year Legislative targets: • Reductions in electricity and natural gas consumption of 30% and fuel oil by 20% by 2020 • Weatherization of 100% of homes and 50% of businesses by 2030	Primary metric: • Energy savings Other metrics: •Cost effectiveness Carbon savings • Job creation • Leverage private investment • Increase state level economic output	Primary goal of the plan	Both; Evaluated (adjusted) gross for reported savings; net and gross for planning, program design, cost-effectiveness	Yes

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State / Region	Type of Policy	Policy or Document	Description	Goal	Metrics	Role of Energy Efficiency	Type of Savings Reported	Gross and Net Applied for Different Purposes?
NY	State Energy Efficiency Plans:	NY EE Portfolio Standard, initial orders: DPS order establishing EE Port. Standard (Electric) (2008-2011)	Sets interim targets for electric energy-efficiency savings, to be accomplished through ratepayer-funded programs	• 15% reduction in electricity usage by the 2015, compared to 2007 forecast usage in 2015 • Total annual electric savings of 24,927,042 MWh by 2015	Primary metric: • Net energy savings Other metrics: • Carbon savings • Job creation • Energy independence • Reduced air pollution	Primary goal of the plan	Net	No
NY[101]	State Energy Efficiency Plans:	Order Establishing Targets and Standards for Natural Gas Efficiency Programs[102] & NY EE Portfolio Standard, initial orders: DPS order establishing EE Port. Standard (Gas) (2008-2011) (Same document as above)	Order for short and long-term cost-effective energy efficiency	• 2009 to 2011: gas efficiency target of 4.34 Bcf annually through the end of 2011 • Beyond 2011, gas efficiency target of 3.45 Bcf annually	Primary metric: • Net energy savings Other metrics: • Carbon savings • Job creation • Energy independence • Reduced air pollution	Primary goal of the plan	Net	No

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[101] Policies pertaining to the NYISO are grouped with other regional transmission planning policies.
[102] http://www.dps.ny.gov/07M0548/ORDER_ESTABLISHING_TARGETS_AND_STANDARDS_May_19_2009.pdf

State / Region	Type of Policy	Policy or Document	Description	Goal	Metrics	Role of Energy Efficiency	Type of Savings Reported	Gross and Net Applied for Different Purposes?
NY	State Energy Efficiency Plans:	NYSERDA 2011-2014 plan	Plan to reduce the environmental impact of energy production and use. NYSERDA's portfolio of clean energy programs helps to reduce energy demand and increase renewable energy generation	• '45 by 15': By 2015, meet 45% of electricity needs through improved energy efficiency and clean renewable energy • Reduce greenhouse gas emissions 80% below levels emitted in 1990 by 2050	Primary metric: • Net energy savings Other metrics: • Diverse/Renewable energy • Clean energy economy • Job creation • Emission reductions	One of several goals	Net	No
RI	State Energy Efficiency Plans:	Rhode Island's 3-Year Least Cost Procurement Plan (for 2009-2011 and 2012-2014) & National Grid Least Cost Procurement Report and Orders	A three-year energy-efficiency procurement plan	• To set a strategy to meet the Least Cost Procurement requirements • Compared to a baseline of 2009 electric and gas load: • 1.7% savings in electricity and 0.6% gas by 2012 • 2.1% savings in electricity and 0.8% gas by 2013 • 2.5% savings in electricity and 1.0% gas by 2014	Primary: • Net energy savings	Primary goal of the plan	Net; NTG values set during planning. New NTG values used prospectively, in next program planning, rather than retrospectively	No

State / Region	Type of Policy	Policy or Document	Description	Goal	Metrics	Role of Energy Efficiency	Type of Savings Reported	Gross and Net Applied for Different Purposes?
VT	State Energy Efficiency Plans:	VT, Comprehensive Energy Plan (All Volumes)	Comprehensive plan covering electricity, heating and process fuels, and energy in transportation and land use decisions	• Attain 90% of projected energy usage from renewable sources by mid-century. • 60% of new homes ENERGY STAR rated by 2020.	Metrics: • Energy savings • Renewable energy sources • Job creation • Community involvement and investment	One of several goals	Both; Gross is used by and reported to the RTO Performance awards based on net, with predetermined free ridership and spillover values. If evaluation results adjust FR / SO values, the goals are also adjusted so as to hold the PAs harmless from the adjustment	Yes
VT	State Energy Efficiency Plans:	VT Demand Resources Plan (2010-2011) & PSB Order for Energy Efficiency Utility Budgets for Demand Resources Plan (2012 to 2014)	Short and long-term energy-efficiency budgets and savings goals as well as long term electric budgets enabling the EEUs to acquire all reasonably available, cost-effective electric energy efficiency	• Acquire all economically achievable potential through a flat budget (adjusted for inflation) over 20 years; • Acquire 3% savings relative to projected annual energy usage. • Approximately 344,518 MWh of savings over the 2012-2014 time period (statewide).	Primary metric: • Energy savings	Primary goal of the plan	Both; Gross is used by and reported to the RTO Performance awards based on net, with predetermined free ridership and spillover values. If evaluation results adjust FR / SO values, the goals are also adjusted so as to hold the PAs harmless from	Yes

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State / Region	Type of Policy	Policy or Document	Description	Goal	Metrics	Role of Energy Efficiency	Type of Savings Reported	Gross and Net Applied for Different Purposes?
							the adjustment	
New England	ISO Regional Transmission Planning:	Proposed Energy Efficiency Forecast in the ISO-New England Planning Process	Forecasting the budgeted dollars for energy efficiency and adapting historically based MWh saved per dollar spent by state sponsored energy-efficiency programs	• To forecast incremental energy-efficiency beyond last year of FCM cleared resources. This is achieved by forecasting the budgeted dollars for energy efficiency and adapting historically based MWh saved per dollar spent by state sponsored energy-efficiency programs.	Forecast energy-efficiency resources	Goal is to forecast energy-efficiency resources accurately throughout coming years	Both net and gross are reported and bid into the FCM; the FCM does not specify net or gross savings	No
New England	Regional wholesale markets for energy efficiency/ demand resources	ISO-NE Proof of Concept Forecast of New State-Sponsored Energy Efficiency 2014-2020	• A review of various methods for forecasting energy-efficiency savings beyond the Forward Capacity Market (FCM) results across a 10 year horizon • Determine the method that is most likely to give accurate predictions. Previous forecasts assumed zero new energy-efficiency resources in years four through ten of the ten year forecast.	• Forecast incremental energy efficiency beyond the last year of the FCM. • Energy-efficiency forecast would be used in studies looking beyond the FCM timeframe (i.e. economic planning studies).	Primary metric: • Forecasted incremental energy efficiency defined in policy document as: • Gross MW = $ * %Spent * MWh/$ * Realization Rate * MW/MWh Other metrics: • Budgets of energy-efficiency programs • Forecasted production costs	Accurately forecasting energy efficiency is central to the policy, as they attempt to assess whether energy efficiency can be relied upon and bid into FCM.	Both net and gross are reported and bid into the FCM; the FCM does not specify net or gross savings	No

State / Region	Type of Policy	Policy or Document	Description	Goal	Metrics	Role of Energy Efficiency	Type of Savings Reported	Gross and Net Applied for Different Purposes?
NY	ISO Regional Transmission Planning:	Incorporating Energy Efficiency in Long Term System Planning	Forecasting energy-efficiency impacts using a "bottom-up" approach Segment by geography and program administrator	• Accurately forecasting energy-efficiency impacts by segmenting by geography and PA.	System forecast = Econometric forecast less forecasted energy-efficiency impacts Energy Efficiency Forecast Equations: GWH per Yr = (Budget $M/yr) * (fraction spent) / (Cost $M /MWh) * (Net to Gross ratio) * (1 GWh / 1000 MWh)	Goal is to forecast energy-efficiency accurately throughout coming years	Net	No
VT / NH	ISO Regional Transmission Planning:	ISO NE VT/NH Needs Assessment; Summary of Vermont/New Hampshire Transmission System 2010 Needs Assessment	Summary of the major findings of the Vermont/New Hampshire Transmission System 2010 Needs Assessment,	• Identify the areas of the system in Vermont and New Hampshire that potentially fail to meet mandatory federal and regional reliability standards.	Projected level of peak electrical demand in 2020, the existing and planned generation and demand-side resources expected to be in service in 2020, and the transmission system as it exists today plus any planned transmission upgrades expected to be in service by 2020.	A strategy that private developers may opt to pursue to address system reliability issues.	Gross	No
PJM Territory	ISO Regional Transmission Planning:	PJM Manual 18b: Energy Efficiency Measurement & Verification	This manual focuses on the measurement and verification of the Nominated Energy Efficiency Value (i.e., the demand reduction value) of Energy Efficiency (EE) Resources.	• Provide a foundation for an M&V plan utilizing a "best practice" approach, which considers technical accuracy and cost-effectiveness. • Provide guidance on what is essential for a robust Initial M&V Plan for an energy-efficiency resource. • Describe the components of Initial M&V Plans, Updated M&V Plans and Post-Installation M&V Report Submittals.	The Nominated EE Value is the expected average demand (MW) reduction during the defined EE Performance Hours in the Delivery Year	Central to policy. Manual defines methods of calculating demand reduction after the installation of an EE program/measure	Appears to be net savings because the demand reduction is defined as that which is directly attributable to the EE resource or measure. There is, however, no mention of free-ridership	No

State / Region	Type of Policy	Policy or Document	Description	Goal	Metrics	Role of Energy Efficiency	Type of Savings Reported	Gross and Net Applied for Different Purposes?
							or spillover.	
PJM Territory	ISO Regional Transmission Planning:	Integrating Energy Efficiency into System Planning	Requirements to participate in the PJM 3 year Forward Capacity Market. -Submitting an initial M&V plan (capacity based on performance over peak summer hours). -M&V protocols designed to capture load drop that would not otherwise have occurred at later date	• Find an accurate baseline in preparation for the analysis of the forward capacity market.	PJM planning studies set: Study Load = Unrestricted load –EE	Policy is based on integrating EE into proper system planning	Gross	No
RGGI states (CT, DE, ME, MD, MA, NH, NY, RI, VT	Domestic efforts to quantify the energy savings associated with efficiency actions	RGGI Draft 2012 Reference Case and Sensitivity Analyses Assumptions and Results	• Outlines statewide energy-efficiency assumptions for all New England Regions. • Presents selected projections from the latest RGGI Reference Case, based on assumptions in place as of November 1st, 2010	• Provide accurate projections of New England States demand assumptions over the next several years.	Metrics: Contains the following projections • Generating capacity additions • Generation mix • CO_2 emissions • RGGI allowance price • Wholesale electricity price	Energy efficiency is included in each State's demand forecast	Varies by State, but usually gross	Varies by state
United States (US EPA)	Domestic efforts to quantify the energy savings associated with efficiency actions	Incorporating EE/RE Policies and Programs into Air Quality Plans	• EPA regulates emissions of pollutants from power plants, but historical focus has been on pollution control. • Now, EPA and others are beginning to look at renewable and demand side resources. • Policy is designed to clarify existing guidance for states, tribes and local agencies to incorporate these approaches into air quality plans.	• Provide a roadmap that clarifies guidance on 4 pathways: • Baseline emissions forecast pathway • State Implementation Plan (SIP) control strategy pathway • Emerging/voluntary measures pathway • Weight-of-evidence (WOE) pathway	Integrated Planning Model (IPM) dispatch model to establish baseline. Currently incorporates existing Federal EE policies The quantification approach is to quantify or estimate displaced electric generating unit (EGU) emissions from energy impacts of an energy-efficiency policy or renewable energy program.	Accurately quantifying energy-efficiency impacts is central to their goal of clarifying guidance on various pathways, particularly emissions forecasting. The point is to account for	Savings are not reported, but the EPA is interested in gross savings that can be linked to Electric Generating Units (EGUs) and associated emissions	No

State / Region	Type of Policy	Policy or Document	Description	Goal	Metrics	Role of Energy Efficiency	Type of Savings Reported	Gross and Net Applied for Different Purposes?
						and encourage incorporating energy efficiency/RE into SIPs.		
United States (US EPA)	Domestic efforts to quantify the energy savings associated with efficiency actions	Linking energy efficiency & Air Quality - Opportunities for the EM&V Forum Agency position and guidance finalized at http://www.epa.gov/airquality/eere/index.html	An attempt to help States link energy-efficiency investments to better air quality	• Gain acceptance of energy efficiency as a real and reliable energy source. • Forecast energy-efficiency impacts over the compliance period. • Confirm that EE/RE policies have achieved forecasted energy and peak demand impacts. • Quantify the magnitudes of air emissions impacts and past EE/Re activities. • Determine when and where these air emissions impacts occurred, consistent with policy goals.	National Ambient Air Quality Standards (NAAQS): Roadmap for including EE/RE in State Implementation Plans (SIPs), and analysis to support baseline pathway: • Projected energy and emissions impacts of EE/RE policies, state-by-state. Cross-State Air Pollution Rule: • EE set-aside option. Proposed Mercury and Air Toxics Standard: • EE benefits analysis. Training and outreach: • Assistance to states on EE-AQ integration (including EM&V).	Policy is based on using EE as a strategy to achieve State's Air Quality objectives	Savings are not reported, but the EPA is interested in gross savings that can be linked to Electric Generating Units (EGUs) and associated emissions	No

State / Region	Type of Policy	Policy or Document	Description	Goal	Metrics	Role of Energy Efficiency	Type of Savings Reported	Gross and Net Applied for Different Purposes?
CA	Other state or regional policies	CPUC and California Energy Commission Issue Proposed Recommendations for GHG Emissions Reductions	Recommendations for direct mandatory/regulatory requirements and a cap-and-trade system for the energy sectors	• GHG emissions cap on all major sources to reduce statewide emissions of greenhouse gases to 1990 levels by 2020.	Primary metric: • Greenhouse gas (GHG) emissions reductions	Identified as best available approach to reducing GHG emissions	Could not determine	No
PA	State Energy Efficiency Plans:	Pennsylvania -- Implementation Order, EE Resources Standard	Implementation order for plans electric utilities will use to reduce consumption.	• Reduce electric consumption by at least 1% adjusted for weather and extraordinary loads by May 31, 2011 (baseline = June 1, 2009 to May 31, 2010). • Reduce electricity consumption by a minimum of 3% by May 31, 2013 (baseline = June 1, 2009 to May 31, 2010). This represents the cumulative savings of the programs by May 2013. • Peak demand reduced by a minimum of four-and-a-half percent (4.5%) of the EDC's annual system peak demand in the 100 hours of highest demand, by May 31, 2013 (baseline =EDC's peak demand during the period of June 1, 2007 through May 31, 2008.	Primary: • Weather-normalized energy savings, peak demand	Primary goal of the plan	Both; gross for reported savings, net for cost-effectiveness assessments	Yes

State / Region	Type of Policy	Policy or Document	Description	Goal	Metrics	Role of Energy Efficiency	Type of Savings Reported	Gross and Net Applied for Different Purposes?
US DOE	US DOE Uniform Methods Project	US DOE Uniform Methods Project	A national project organized by the US DOE to attempt to establish a set of protocols to estimate gross energy savings for commonly used, high impact measures used in PA efficiency programs	• Establish best practice protocols of selected measures in order to establish a greater uniformity in the method by which the savings estimates are derived. Uniformity in terms of the algorithm and in terms of the how the inputs for the algorithm are derived. • The intent is to provide best practices for the PAs with well established programs as well as offer guidance to PAs that are just starting programs.	Gross savings	Primary goal of the project	Gross for now; there is a working group for net	NA
NPCC	Regional System Planning	Sixth Northwest Conservation and Electric Power Plan	The Northwest Power Act of 1980 directs the Northwest Power & Conservation Council (NPCC) to develop a least cost power plan to meet future electricity needs of the Pacific Northwest. The power plan is required to be a long-term, 20-year strategy for meeting the region's electricity needs.	• Resources included in the plan are to be cost effective, with system cost defined to include all costs of a resource over its useful life, including quantifiable environmental costs. • Conservation, or energy efficiency, is specified as the first priority resource, and it is given a 10 percent cost advantage for planning purposes.	Metrics include: • Electricity demand forecast • Conservation supply assumptions • Generation mix • Transmission needs	First priority resource	Net savings. While the NPCC identifies conservation in terms of gross savings, their version of gross savings is an estimate net of naturally occurring energy efficiency, which takes into account free ridership, spillover and other market effects	No

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Appendix B   References

Reports Reviewed for Net and Gross Savings Definitions

Cadmus. 2011. *2010 Net-to-Gross Findings: Home Energy Assessment*. Prepared for the Electric and Gas Program Administrators of Massachusetts

Global Energy Partners. 2011. *Evaluation of the 2009 Energy Conscious Blueprint Program*. Prepared by P. Ignelzi.

Haeri, Hossein and M. Sami Khawaja. 2012. The Trouble with Freeriders. *Public Utilities Fortnightly* (March 2012). http://www.fortnightly.com/fortnightly/2012/03/trouble-freeriders

Itron, Inc. 2011. *Verification of Reported Energy and Peak Savings from the EmPOWER Maryland Energy Efficiency Programs.* Prepared for the Maryland Public Service Commission.

KEMA. 2011. *Impact Evaluation of 2008 and 2009 Custom CDA Installations: Massachusetts Energy Efficiency Programs' Large Commercial & Industrial Evaluation.* Prepared for Massachusetts Energy Efficiency Program Administrators and Massachusetts Energy Efficiency Advisory Council.

KEMA. 2011. *Impact Evaluation of 2009 Custom HVAC Installations. Massachusetts Energy Efficiency Programs' Large Commercial & Industrial Evaluation.* Prepared for Massachusetts Energy Efficiency Program Administrators and Massachusetts Energy Efficiency Advisory Council.

National Action Plan for Energy Efficiency (2007). *Model Energy Efficiency Program Impact Evaluation Guide.* Prepared by Steven R. Schiller.

Navigant. 2011. *EmPOWER Maryland 2010 Interim Evaluation Re*port. Presented to Baltimore Gas & Electric, Potomac Electric Power Company, Delmarva Power and Light, Southern Maryland Electric Cooperative, Allegheny Power

Nexant. 2011. *Home Energy Solutions Evaluation*. Submitted to the Connecticut Energy Efficiency Board.

Nexant. 2007. M*&V Evaluation: Home Performance with ENERGY STAR*. Prepared for the New York State Energy Research and Development Authority.

NMR 2011. Results of the Multistate Modeling Effort. Prepared for New York State Energy Research and Development Authority

NMR. 2009. Analysis of CFL Purchases in Vermont. Submitted to Vermont Department of Public Service and Vermont Energy Investment Corporation

NMR, Cadmus and KEMA, and TetraTech 2011. Massachusetts ENERGY STAR® Lighting Program 2010 Annual Report. Submitted to: Energy Efficiency Advisory Council Consultants, Cape Light Compact, NSTAR National Grid, Unitil Western Massachusetts Electric.

NMR and Research Into Action. 2010. *Net Savings Scoping Paper*. Submitted to Northeast Energy Efficiency Partnerships, Evaluation, Measurement, and Verification Forum.

NMR and RLW. 2004. Impact Evaluation of the Massachusetts, Rhode Island, and Vermont 2003 Residential Lighting Programs. Submitted to: The Cape Light Compact, State of Vermont Public Service Department for Efficiency Vermont, National Grid, Northeast Utilities, NSTAR Electric, Unitil Energy Systems, Inc.

NMR, RLW, and GDS. 2009. Residential Lighting Markdown Impact Evaluation. Submitted to Markdown and Buydown Program Sponsors in Connecticut, Massachusetts, Rhode Island, and Vermont.

Northeast Energy Efficiency Partnerships. (2011). *Glossary of Terms*. Prepared by Paul Horowitz.

Summit Blue Consulting. 2006. *New Construction Program (NCP) Market Characterization, Market Assessment and Causality Evaluation.* Prepared for New York State Energy Research and Development Authority.

Tetra Tech. 2011. *2010 Commercial and Industrial Electric Programs Free-ridership and Spillover Study.* Prepared for National Grid, NSTAR, Western Massachusetts Electric Company, Unitil, and Cape Light Compact.

Policy References

California

"Order Instituting Rulemaking to Implement the Commission's Procurement Incentive Framework and to Examine the Integration of Greenhouse Gas Emissions Standards into Procurement Policies" http://docs.cpuc.ca.gov/published/Final_decision/80150.htm#TopOfPage

Connecticut

"Draft 2012 Integrated Resource Plan."
http://www.dpuc.state.ct.us/DEEPEnergy.nsf/c6c6d525f7cdd1168525797d0047c5bf/63705e68f779af778525798b0051d289/$FILE/DEEP%20Draft%202012%20IRP%20Report_Issued%2001-17-2012.pdf

KEMA. 2010. *Connecticut Electric Residential, Commercial, and Industrial Energy Efficiency Potential Study*

"*Public Act 11-80 An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future*"
http://www.cga.ct.gov/2011/act/pa/2011PA-00080-R00SB-01243-PA.htm

Delaware

"An Act to Amend Title 26 of the Delaware Code Relating to Energy Efficiency Resource Standards and Energy Efficiency Planning."
http://legis.delaware.gov/LIS/lis145.nsf/vwLegislation/SB+106/$file/legis.html?open

ISO-NE

"ISO-NE Proof of Concept Forecast of New State-Sponsored Energy Efficiency 2014-2020" http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/pac/mtrls/2011/nov162011/ee_forecast_update.pdf

"Proposed Energy Efficiency Forecast in the ISO-New England Planning Process" http://neep.org/uploads/EMV%20Forum/ISONE_Winkler_PPT.pdf

Synapse Energy Economics, Inc. 2012. *The Road to Better System Planning: ISO-New England's Revised Energy Efficiency Forecast*. April, 26, 2012.

"Forward Capacity Market (FCM)" http://www.iso-ne.com/markets/othrmkts_data/fcm/index.html

"Final Energy Efficiency Forecast: 2015-2021" http://www.iso-ne.com/committees/comm_wkgrps/othr/enrgy_effncy_frcst/frcst/2012/iso_ne_ee_forecast_2015_2021.pdf

Order on Program Net Savings and Environmental Compliance Costs" Order issued August 10, 2012. ""http://www.env.state.ma.us/dpu/docs/electric/11-120/81012dpuord.pdf

ISO-NE VT/NH Needs Assessment

"Summary of Vermont/New Hampshire Transmission System 2010 Needs Assessment" http://www.iso-ne.com/pubs/spcl_rpts/2011/vt_nh_needs%20assessment_summary_021711.pdf

Maryland

"EmPower MD Guidelines: Utility Portfolio Reporting." PSC EmPower MD Guidelines

Maryland Energy Administration. 2010. Maryland Energy Outlook. http://www.energy.state.md.us/documents/MEOFINALREPORTJAN2010.pdf

"Maryland Public Service Commission Order No. 84569" http://www.c2es.org/docUploads/MD_PSC_Order_No._84569.pdf

"Maryland Energy Efficiency Resource Standard, Maryland Public Utilities Company Code §7–211http://mlis.state.md.us/asp/web_statutes.asp?gpu&7-211

Maine

"Triennial Plan of the Efficiency Maine Trust, 2011-2013." http://www.efficiencymaine.com/docs/other/EMT_Final_Tri_Plan.pdf

"Efficiency Maine Trust Act." http://www.mainelegislature.org/legis/statutes/35-a/title35-Ach97sec0.html

"Technical Reference User Manual No. 2009-01"
http://www.efficiencymaine.com/docs/board_meeting_documents/Maine-Residential-TRM-02-04-09.pdf

Massachusetts

"Chapter 169: An Act Relative to the Green Communities Act"
http://www.malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter169.

"D.P.U. 09-121 through D.P.U. 09-128."   http://www.ma-eeac.org/docs/DPU-filing/1-28-10%20DPU%20Order%20Gas%20PAs.pdf.

"D.P.U. 09-116 through D.P.U. 09-120."   http://www.ma-eeac.org/docs/DPU-filing/1-28-10%20DPU%20Order%20Electric%20PAs.pdf.

Massachusetts Joint Statewide Three-Year Electric Energy Efficiency Plan. http://www.ma-eeac.org/docs/DPU-filing/ElectricPlanFinalOct09.pdf

Massachusetts Joint Statewide Three-Year Electric and Gas Energy Efficiency Plan April 30, 2012 Submission to EEAC.   http://www.ma-eeac.org/docs/4.10.12/Gas%20and%20Electric%20PAs%20April%2030th%20Plan%20Final.pdf

"Massachusetts Clean Energy and Climate Plan for 2020." December 29, 2010.
http://www.mass.gov/eea/docs/eea/energy/2020-clean-energy-plan.pdf. Accessed March 8, 2012.

"Chapter 169: An Act Relative to the Green Communities Act."
http://www.malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter169. Accessed March 1, 2012.

"The Department of Public Utilities Investigation into Update Energy Efficiency Guidelines."
http://www.mass.gov/eea/docs/dpu/energy-efficiency/energy-efficiency-legislation-and-regulations/ee-noi-dpu-11-120.pdf

"Joint Reply Comments of the Program Administrators, Department of Energy Resources, Department of Environmental Protection, Environment Northeast, and Northeast Energy Efficiency   Partnership   on   Calculation   of   Net   Savings.   DPU   11-120"   http://www.env.state.ma.us/dpu/docs/electric/11-120/5712pajrp.pdf

Order on Program Net Savings and Environmental Compliance Costs" Order issued August 10, 2012. ""http://www.env.state.ma.us/dpu/docs/electric/11-120/81012dpuord.pdf

New York

"June 23, 2008 - Order Establishing Energy Efficiency Portfolio Standard and Approving Programs."
http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7BD9F7E0DF-A518-4199-84CC-C2E03950A28D%7D.

"Order Establishing Targets and Standards for Natural Gas Efficiency Programs (Issued and Effective May 19, 2009)"

http://www.dps.ny.gov/07M0548/ORDER_ESTABLISHING_TARGETS_AND_STANDARDS_May_19_2009.pdf

"NYSERDA 2011- 2014 Plan."
http://www.nyserda.ny.gov/en/About/~/media/Files/Publications/NYSERDA/2011-strategic-plan.ashx.

"Evaluation Plan Guidance For EEPS Program Administrators"
http://www.dps.ny.gov/Evaluation_Guidance.pdf

"New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs."
http://www.dps.ny.gov/NY_Standard_Approach_for_Estimating_Energy_Savings_12-08.pdf
and

http://www.dps.ny.gov/TechManualNYRevised10-15-10.pdf?bcsi_scan_13fcdd49727957d3=0&bcsi_scan_filename=TechManualNYRevised10-15-10.pdf

New York ISO (NYISO)

"Incorporating Energy Efficiency in Long Term System Planning"
http://neep.org/uploads/EMV%20Forum/NYISO_Maniaci_PPT.pdf

Northwest Power & Conservation Council

"Sixth Northwest Conservation and Electric Power Plan"
http://www.nwcouncil.org/energy/powerplan/6/default.htm

"An Overview of the Council's Power Planning Methods"
http://www.nwcouncil.org/library/2011/2011-02.pdf

The Cadmus Group. 2011. Methodology for Quantifying Market-Induced, Non-Programmatic Savings.
http://www.bpa.gov/energy/n/reports/evaluation/multi_sector/pdf/Market_Induced_Savings_Report.pdf

Pennsylvania

"2806.1. Energy Efficiency and Conservation Program"
http://www.legis.state.pa.us/WU01/LI/LI/CT/HTM/66/00.028.006.001..HTM

"Energy Efficiency and Conservation Program"
http://www.puc.state.pa.us/electric/pdf/Act129/EEC_Implementation_Order.pdf

PJM

2010 PJM Forward Market Operations. "PJM Manual 18B: Energy Efficiency Measurement and Verification." https://www.pjm.com/~/media/documents/manuals/m18b.ashx

Rhode Island

"The Comprehensive Energy Conservation, Efficiency and Affordability Act of 2006" http://www.ripuc.org/eventsactions/docket/3759-RIAct.pdf

"National Grid 2012-2014 Energy Efficiency and System Reliability Procurement Plan" http://www.ripuc.org/eventsactions/docket/4284-NGrid-3-YearLCP(9-7-11).pdf

Regional Greenhouse Gas Initiative (RGGI)

"RGGI DRAFT 2012 Reference Case and Sensitivity Analyses Assumptions, August 13, 2012 "

http://www.rggi.org/docs/ProgramReview/August13/12_07_12_Reference_Case_Assumptions_Updated.pdf

"DRAFT 2012 Reference Case and Sensitivity Results" http://www.rggi.org/docs/ProgramReview/August13/12_08_13_Reference_Case_Results.pdf

US Department of Energy Uniform Methods Project

http://www1.eere.energy.gov/deployment/ump.html

US Environmental Protection Agency

"Incorporating Energy Efficiency/Renewable Energy in State and Tribal Implementation Plans" http://www.epa.gov/airquality/eere/index.html

"Incorporating EE/RE Policies and Programs in Air Quality Plans" http://neep.org/uploads/EMV%20Forum/EPA_Moskal_PPT.pdf

"Linking EE & Air Quality – Opportunities for the EM&V Forum" http://neep.org/uploads/EMV%20Forum/Dietsch%20EMV%2010.12.pdf

Vermont

"Order Re: Energy Efficiency Utility Electric Budgets for Demand Resources Plan." EEU-2010-06. 8/1/2011. http://psb.vermont.gov/sites/psb/files/orders/2011/EEU-2010-06%20DRP%20and%20AttachA.pdf

"Demand Resources Plan Proceeding (2010-2011)." http://psb.vermont.gov/docketsandprojects/eeu/drp2010.

"2012-2014 Electric EEU Funds Performance Awards and Indicators" http://psb.vermont.gov/sites/psb/files/orders/2011/2011-2/EEU-2010-06%20Order%20re%20Electric%20QPIs%20Appendix%20A.pdf

"2012-2014 BED Electric EEU Funds Performance Awards and Indicators"
http://psb.vermont.gov/sites/psb/files/orders/2012/2012-1/EEU-2010-
06%20Order%20re%20Electric%20QPIs%20BED%20Appendix%20A.pdf

"Vermont Comprehensive Energy Plan." December 15, 2011.
http://www.vtenergyplan.vermont.gov/.