STATE OF MAINE
PUBLIC UTILITIES COMMISSION

Efficiency Maine Trust's Petition For Approval Of The Triennial Plan For Fiscal Years 2017-2019	)))))	**Docket No. 2015-00175**

DIRECT TESTIMONY OF TIM WOOLF ON BEHALF OF NATURAL RESOURCES COUNCIL OF MAINE AND CONSERVATION LAW FOUNDATION

February 17, 2016

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1. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name, title, and employer.

A. My name is Tim Woolf. I am the Vice-President of Synapse Energy Economics (Synapse), located at 485 Massachusetts Avenue, Cambridge, MA 02139.

Q. On whose behalf are you submitting testimony in this proceeding?

A. I am submitting testimony on behalf of the Natural Resources Council of Maine and the Conservation Law Foundation.

Q. Please describe Synapse Energy Economics.

A. Synapse Energy Economics is a research and consulting firm specializing in electricity and gas industry regulation, planning, and analysis. Our work covers a range of issues, including: economic and technical assessments of demand-side and supply-side energy resources, energy efficiency policies and programs, integrated resource planning, electricity market modeling and assessment, renewable resource technologies and policies, and climate change strategies. Synapse works for a wide range of clients, including attorneys general, offices of consumer advocates, public utility commissions, environmental advocates, the U.S. Environmental Protection Agency, U.S. Department of Energy, U.S. Department of Justice, the Federal Trade Commission and the National Association of Regulatory Utility Commissioners. Synapse has over 25 professional staff with extensive experience in the electricity industry.

Q. Please summarize your professional and educational experience.

A. Before joining Synapse Energy Economics, I was a commissioner at the Massachusetts Department of Public Utilities (DPU). In that capacity, I was responsible for overseeing a

substantial expansion of clean energy policies. This included significantly increased ratepayer-funded energy efficiency programs, an update of the DPU energy efficiency guidelines, the implementation of decoupled rates for electric and gas companies, the promulgation of net metering regulations, review and approval of smart grid pilot programs, and review and approval of long-term contracts for renewable power. I was also responsible for overseeing a variety of other dockets before the commission, including several electric and gas utility rate cases.

Prior to being a commissioner at the Massachusetts DPU, I was employed as the Vice President at Synapse Energy Economics, a Manager at Tellus Institute, the Research Director at the Association for the Conservation of Energy, a Staff Economist at the Massachusetts Department of Public Utilities, and a Policy Analyst at the Massachusetts Executive Office of Energy Resources.

I hold a Masters in Business Administration from Boston University, a Diploma in Economics from the London School of Economics, a Bachelor of Science in Mechanical Engineering and a Bachelor of Arts in English from Tufts University. My resume, attached as Schedule TW-1, presents additional details of my professional and educational experience.

Q. Please describe your professional experience as it relates to energy efficiency policies and programs.

A. Energy efficiency policies and programs have been at the core of my professional career. While at the Massachusetts DPU, I played a leading role in updating the Departmentôs energy efficiency guidelines, in reviewing and approving utility three-year energy efficiency plans, in reviewing and approving utility energy efficiency annual reports, in

convening a working group on rate and bill impacts of utility energy efficiency programs, and in advocating for market rules to enable energy efficiency to participate in the New England wholesale electricity market.

As a consultant, I have reviewed and provided recommendations concerning utility energy efficiency policies and programs throughout the United States and Canada, and I have testified on these issues in British Columbia, Colorado, Delaware, Florida, Kentucky, Massachusetts, Minnesota, Missouri, Nevada, Nova Scotia, Québec, and Rhode Island. My work has encompassed all aspects of energy efficiency program design and implementation, including cost-benefit analyses, avoided costs, efficiency potential studies, efficiency measure assessment, program delivery options, program budgeting, utility performance incentives and other relevant regulatory policies.

Additionally, I have been the lead technical consultant for the National Efficiency Screening Project, which is comprised of a team of experts and advocates dedicated to improving the techniques used to screen energy efficiency resources. I have also represented clients in several energy efficiency collaboratives, where policies and programs are discussed and negotiated among a variety of stakeholders, including utilities, commission staff, consumer advocates, and efficiency advocates.

I have worked for a variety of clients on energy efficiency issues, including consumer advocates, environmental advocates, regulatory commissions, and an efficiency program administrator.

Q. Have you ever testified before the Maine Public Utility Commission?

A. Yes. I testified before the Maine Public Utility Commission (Commission), on behalf of the Maine Office of the Public Advocate, on the Central Maine Power rate case in Docket No. 2013-168.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to review the Triennial Plan for Fiscal Years 2017-2019 (Triennial Plan or Plan) filed by the Efficiency Maine Trust (the Trust or EMT). In particular, I review the key assumptions used in the Plan, I review the efficiency potential studies used in preparing the Plan, and I assess whether the Plan is likely to reach the maximum achievable cost-effective (MACE) potential for both gas and electricity customers. I make several recommendations for how the Trust can modify the plan in order to reach the maximum achievable cost-effective potential for energy efficiency.

2. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Q. Please summarize your primary conclusions.

A. My primary conclusions are as follows:

1. The electricity and gas energy efficiency programs in the Triennial Plan are highly cost-effective, and will result in significant reductions in costs for electricity and gas customers.

2. The electricity energy efficiency market potential study (Electricity Potential Study) and the gas energy efficiency market potential study (Gas Potential Study) both contain several limitations that make the studies conservative and result in under-estimates of achievable energy efficiency potential in Maine.

3. The electricity program budgets and savings in the Plan are achievable and reasonable. However, these programs do not reach maximum achievable cost-effective energy efficiency savings because some program designs and opportunities are not included in the Plan.

4. The gas program savings and budgets in the Plan are achievable; but they are not reasonable because (a) they are based on a ñlow savingsò scenario within the Gas Potential Study, (b) some program designs and opportunities are not included, and (c) they result in significant lost opportunities.

Q. Please summarize your primary recommendations.

A. My primary recommendations are as follows:

1. The Commission should approve all elements of the electricity programs in the Triennial Plan.

2. The Commission should direct the Trust to consider the proposed electricity program budgets and savings as ñfloorsò and not ñceilings.ò The Commission should direct the Trust to pursue the maximum achievable cost-effective potential during the Triennial Plan; which should include modifying electricity program budgets and savings goals in order to (a) satisfy the on-going customer demand for electricity efficiency services; (b) incorporate new, cost-effective electricity program opportunities as they arise; and (c) minimize lost opportunities in general.

3. The Commission should direct the Trust to provide gas efficiency services sufficient to achieve MACE for the residential customers of the Summit Gas Company

(Summit). The Commission should also direct the Trust to provide gas efficiency services to large-volume gas customers throughout Maine.

4. The Commission should direct the Trust to adopt higher gas efficiency program budgets and savings than those proposed in the Triennial Plan. I recommend that the gas efficiency program budgets be increased linearly from FY2016 through FY2019, so that by FY2019 the program budgets are equal to those included in the High Case in the Gas Potential Study.

5. The Commission should direct the Trust to pursue the maximum achievable cost-effective potential during the Triennial Plan; which should include modifying gas program budgets and savings goals in order to (a) ensure that areas newly served with gas supplies receive sufficient services; (b) satisfy the on-going customer demand for gas efficiency services; (c) incorporate new, cost-effective gas program opportunities as they arise, and (d) minimize lost opportunities in general.

3. CROSS-CUTTING ELECTRICITY AND GAS ISSUES

Q. Are there certain key issues you wish to address that are relevant to both electricity and gas program planning and design?

A. Yes. I address several such issues below, including: best available inputs; avoided costs; discount rates; net-to-gross ratios; limits to efficiency potential studies; and continuity of program offerings.

Best Available Inputs

Q. Please describe what you mean when you refer to the best available inputs?

A. All energy efficiency plansð and indeed all electricity and gas resource plans in general ð contain a large number of inputs and assumptions, many of which will significantly affect the results of the analysis. It is important that each of the assumptions and inputs take advantage of the best information available at the time of the Plan, in order to properly account for those costs and benefits that are most likely to occur as a result of the program.

Q. How does this concept apply to reviewing the Trust's Triennial Plan?

A. I will address several of the specific, key input assumptions to the Plan in the subsections below. As an overarching point, I wish to emphasize the importance of using the best input available when reviewing an energy efficiency plan.

In its order on the Second Triennial Plan, the Commission intentionally adopted a cautious approach to reviewing the cost-effectiveness of the energy efficiency programs. The Commission noted that it ñmade aggressive and asymmetrical assumptions that limit the likelihood that money collected from ratepayers will be spent unnecessarily or on programs with marginal benefitò (pp. 15-16). The Commission adopted this approach with the laudable intent of protecting electricity and gas customers from ñoverspendingò on energy efficiency.

While it is important to ensure that customers do not overspend on energy efficiency programs, it is also important to recognize that there are negative consequences of ñunderspendingò on energy efficiency programs. To the extent that the Commission and the Trust err on the side of caution when setting efficiency program budgets and goalsð

and thereby do not implement all available and achievable cost-effectiveness energy efficiency programsð this will lead to overspending on supply-side resources (generation, transmission, distribution, fuels, pipelines). In other words, being asymmetrically ñcautiousò regarding energy efficiency budgets, goals, and input assumptions is more likely to cause harm to customers than it is to protect them.

Q. What do you recommend to ensure that the Trust neither overspends nor underspends on energy efficiency programs?

A. The best way to achieve this balance is to start with the best data available for all the inputs to the efficiency plan. This means using inputs that reflect the most reasonable assumptions and the most likely outcomes, and not using those that are asymmetrically cautious. If efficiency planning assumptions are intentionally skewed in one way or the other, then customers will end up bearing higher costs than necessary either from too much or too little energy efficiency. In the following subsections I address some areas where it is especially important to use the best information available.

Avoided Costs

Q. What are avoided costs, and why are they so important in energy efficiency planning?

A. The avoided costs represent the generation, transmission, distribution, and gas costs that are not incurred as a result of the savings from electricity and gas energy efficiency programs. The avoided costs, when multiplied by the efficiency savings, provide an indication of the benefits of the efficiency program, and therefore are a central element in determining the cost-effectiveness of the programs.

Q. What are the avoided costs in the Triennial Plan based on?

A. The avoided costs in the Triennial Plan are based upon the avoided costs developed in the *Avoided Energy Supply Costs in New England: 2015 Report* (AESC 2015).

Q. Please describe AESC 2015.

A. Since 1999 many stakeholders the six New England states have collaborated to prepare reports on the avoided electricity and gas costs throughout the region. This is a very logical approach because avoided costs throughout the region are largely driven by the New England wholesale electricity markets, and the benefits of energy efficiency in any one state will be based upon impacts at the regional level.

This approach is also logical because the study is overseen by a large group of stakeholders from each New England state, including many utilities. These stakeholders choose the consultant that performs the study, helps guide the scope and structure of the study, vets the methodologies and assumptions used in the study, and reviews the results of the study to ensure that they are reasonable and based upon the best information and practices available at the time. The AESC is funded by all of the efficiency program administrators in New England, including the Trust. In addition to the efficiency program administrators (who in many cases are utilities), the stakeholder group includes representatives from commissions, energy offices, consumer advocates, efficiency

councils, and environmental advocates.[1] The stakeholder group hired Tabors Caramanis Rudkevich (TCR) to prepare AESC 2015.[2]

Q. Is it appropriate for the Trust to rely upon AESC 2015 in developing its Triennial Plan?

A. Yes. This report is extremely credible, given the contributions made to the report from all of the relevant stakeholders in New England. This report is also used by all of the other energy efficiency program administrators in New England.

Q. Did the Trust use AESC 2015 to develop its estimates for avoided transmission capacity costs?

A. No. The Trust relied upon the *Maine Distributed Solar Valuation Study* for the avoided transmission costs.[3] That study developed avoided transmission costs by estimating a regional network service (RNS) rate for transmission in New England, which was assumed to be a good representation of avoided transmission capacity costs. The RNS was calculated by dividing the total New England transmission revenue requirement by total New England transmission loads. The study estimated the avoided transmission costs to be $89.80/kW-yr. [4]

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1 AESC 2015, pp. 1-2 to 1-3.

2 Synapse Energy Economics has been hired several times to prepare the AESC reports, including the 2003, 2007, 2009, 2011, and 2013 reports.

3 Maine Public Utilities Commission, Transcript for the January 19, 2016 technical conference, Docket No. 2015-00175, page 150.

4 Maine Distributed Solar Valuation Study, prepared for the Maine Public Utility Commission, prepared by Clean Power Research, May 2015, Volume II, page 83.

Q. Did the Trust use AESC 2015 to develop its estimates for avoided distribution capacity costs.

A. No. The Trust did not assume any avoided distribution costs.[5] The Trust explained that this was due to limited resources, that there may be distribution benefits of energy efficiency, and that assuming no avoided distribution costs is conservative.[6]

Q. Why did the Trust not use the AESC for estimates of avoided transmission and distribution (T&D) costs?

A. Avoided T&D costs are not estimated in the AESC, because they tend to be specific to each particular utility and program administrator. The AESC does provide some guidance on methodologies for estimating avoided T&D costs, but each program administrator is required to develop their own estimates of these costs. Table 1 presents the avoided T&D costs used by other New England states, along with the assumptions used by the Trust.

[5] Triennial Plan, p. 2-17.

[6] January 19 technical conference transcript, page 150.

Table 1. Electric Utility Transmission and Distribution Avoided Costs, from AESC2015[7]

Company	Transmission	Distribution	Total T&D
Connecticut Light & Power	$1.25	$32.19	$33.44
National Grid MA	$23.01	$124.28	$147.29
National Grid RI	$37.89	$162.47	$200.33
United Illuminating	$2.74	$49.75	$52.49
Vermont	$50.45	$113.51	$163.96
Efficiency Maine	**$89.80**	**$0**	**$89.80**

Q. Do you agree with the Trusts' methodology for estimating transmission and distribution avoided costs?

A. In general, I do not have any concerns with the approach of using the *Maine Distributed Solar Valuation Study* as a source for estimating avoided transmission costs. I am concerned that the Trust did not assume any avoided distribution capacity costs, especially because these costs tend to be higher than avoided transmission costs.

The avoided T&D estimates used in the other states provide a high-level reality check on the assumptions used by the Trust. As indicated in Table 1, the Trustôs estimate of avoided transmission costs is high relative to other program administrators, but the Trustôs approach of assuming no avoided distribution costs is very low and inconsistent with all other program administrators.

The total T&D costs assumed by the Trust is within the range total T&D costs of other program administrators, but in the low end of the range. From this high-level perspective,

[7] Entries for Efficiency Maine Trust are from the Maine Distributed Solar Valuation Study. All other entries are from AESC 2015, Appendix G, p. G-1.

it appears that the avoided transmission cost used by the Trust is not unreasonable, and may be conservative.

Q. Did the Trust perform a sensitivity using different avoided costs?

A. Yes. The Trust performed a sensitivity assuming lower wholesale energy costs in Maine.[8]

Q. What were the results of this sensitivity?

A. As one would expect, the benefit-cost ratios for all electricity programs were reduced slightly with the lower avoided wholesale energy costs. The impacts on the benefit-cost ratios were fairly modest, reducing them by roughly 0.13. The resulting benefit-cost ratios remain fairly high, with average ratios on the order of 2:1 and with all programs having a ratio of 1.87:1 or higher.

Q. What do you conclude from this sensitivity analysis?

A. This analysis confirms the Trustôs findings that the electricity efficiency programs are highly cost-effective and will continue to be so even if wholesale energy prices were to be lower than expected.

Discount Rates

Q. What discount rate did the Trust use to estimate the present value of the costs and benefits of the energy efficiency programs?

A. The Trust used the long-term discount rate developed in the AESC 2015 study. That study developed a nominal discount rate of 4.36 percent, which includes a long-term inflation rate of 1.88 percent and a real discount rate of 2.43 percent. The long-term

[8] Triennial Plan, Appendix B, pp. 1 to 3.

nominal rate is based upon Congressional Budget Office forecasts of 10-year U.S. Treasury rates. The long-term inflation rate is based upon estimates from the U.S. Congressional Budget Office and the U.S. Energy Information Administrationôs *Annual Energy Outlook*. (Trustôs Response to ODR-001-029)

Q. Is this an appropriate discount rate to use for the Triennial Plan?

A. Yes, it is. This approach is consistent with the Trustôs rules that require that discount rates be based on the yield of long-term U.S. Treasury securities. The Trust has used this method for developing a discount rate for its previous efficiency plans, and several states in New England use this approach as well. (Response to ODR-001-029)

Q. Would it be appropriate to use a utility's weighted average cost of capital (WACC) for a discount rate for the Triennial Plan?

A. No. The utility WACC represents the costs to the utility for raising funds to make capital investments. The energy efficiency programs are not capital investments; they are primarily funded through a system benefits charge, which is collected directly from customers throughout each year. There is no cost of capital associated with the energy efficiency funding, and very little carrying costs. Any such carrying costs are well below the utility WACC. Using the utility WACC as a discount rate for energy efficiency planning would significantly undervalue the future benefits of energy efficiency, and result in customers paying higher electricity costs over the long-term.

Q. Would it be appropriate to use a discount rate reflecting electricity and gas customers' time value of money?

A. No. Efficiency programs represent electricity and gas resources that are implemented by program administrators on behalf of customers. Therefore, the appropriate time value of

money (or, more accurately, ñtime preferenceò) to use in choosing a discount rate is the time preference for all customers as a whole. In other words, the discount rate should depend upon how much weight is given to future costs and benefits, from the perspective of planning the system for all customers, and from the regulatory perspective of balancing current and future costs and benefits. [9] The discount rate should not be based on any one customerôs discount rate, which is based upon a very different perspective and therefore a very different time preference.

Net and Gross Savings

Q. Please describe the differences between gross and net efficiency savings.

A. Both measure an amount of energy efficiency savings. Net savings are equal to the gross savings after adjusting for free-riders and spillover. Free-riders are program participants who would have installed the same efficiency measures at the same point in time even in the absence of the program. Spillover includes the efficiency measures that are adopted by customers as a result of the efficiency programs, but without participating in the programs themselves. The two measures of efficiency savings tell you different thingsð they are both useful in different ways and both should be measured by energy efficiency program administrators. Free-rider-ship and spillover effects are typically estimated through evaluation, measurement and verification studies that use a variety of counterfactual survey questions answered by program participants and non-participants.[10]

[9] Northeast Energy Efficiency Partnerships, Cost-Effectiveness Screening Principles and Guidelines, Prepared by Synapse Energy Economics for the Regional Evaluation, Measurement and Verification Forum, November 2014, pages 45-46.

[10] Energy Futures Group, *Benchmarking Maine's Energy Efficiency Performance*, prepared for the Maine Public Utility Commission, October 23, 2015, p. 8.

Net-to-gross ratios are a common way of expressing the difference between gross and net energy savings. The net-to-gross ratio (in percentage terms) is equal to one minus the product of the free-ridership rate and the spillover rate (both in percentage terms).

Q. How has the Trust accounted for differences between gross and net efficiency savings?

A. The Trust has applied net-to-gross ratios to its estimates of energy and capacity savings from the efficiency programs. These savings are then used to estimate the benefits of the programs, and therefore the cost-effectiveness of the programs. For example, an efficiency program with a net-to-gross ratio of 0.85 will be assumed to have 85 percent of the gross energy savings, for the purposes of identifying the amount of net energy saved by the program and the cost-effectiveness of the program. The remaining 15 percent of energy savings did occur (in a physical sense), but are not attributable to the program.

Q. Is the Trust's methodology for treating net-to-gross savings appropriate?

A. Yes, in general. The Trustôs methodology is consistent with that of other efficiency program administrators, and properly accounts for free-ridership in estimating the savings and the cost-effectiveness of the energy efficiency programs. I have not reviewed in detail the specific assumptions used for free-ridership, but they appear to be roughly in line with the assumptions used by other program administrators in New England.[11]

There is one aspect of the net-to-gross ratio that should be improved in the future. The Trust does not account for the spillover impacts of its energy efficiency programs. These

[11] Energy Futures Group. 2015. *Benchmarking Maine's Energy Efficiency Performance*. Prepared for the Maine Public Utility Commission. Appendix, pp. 63-69.

impacts are widely recognized and accounted for by other efficiency program administrators, and can have a significant effect on program savings and cost-effectiveness results.

Q. What do you recommend with regard to spillover effects?

A. I recommend that the Commission recognize that the estimates of efficiency savings and cost-effectiveness in the current Plan are conservative, due to the fact that spillover effects are not accounted for. I also recommend that the Commission direct the Trust to develop estimates of spillover effects in future evaluation, measurement, and verification studies.

Q. Should the net-to-gross ratios be used to determine or modify the efficiency program budgets?

A. Not in any direct way. The net-to-gross ratios should be used in designing programs, in estimating the savings from the programs, and in determining whether or not programs are cost-effective. The program budgets should be designed to enable the Trust to implement the maximum achievable cost-effective efficiency savings. Reducing the energy efficiency program budgets to address free-ridership concerns does not reduce free-ridership, and only serves to deprive customers of cost-effective efficiency savings. (Program choices with regard to free-ridership can affect budgets indirectly. For example, when the Trust excluded some energy efficiency measures entirely from estimations of achievable potential because of free-ridership concerns.)

Limits of Efficiency Potential Studies

Q. Are you aware of any limitations to energy efficiency potential studies in general?

A. Yes. Energy efficiency potential studies in general tend to be conservative, due to the nature and the methodologies used in the studies.[12] While there are several ways that efficiency potential studies tend to understate the potential for efficiency, I focus on two in particular. First, efficiency potential studies tend to dramatically understate the estimates of achievable energy efficiency. Second, potential studies have a tendency to use static assumptions regarding efficiency measure performance and costs.

Q. Please describe how potential studies tend to understate the amount of achievable energy efficiency.

A. Estimating the amount of efficiency savings that is ñachievableò is one of the more challenging aspects of any efficiency potential study. This is partly because the achievable amount of efficiency savings depends upon many different elements of program design, such as customer incentives, customer education, technical assistance, contractor training, program marketing, program delivery, and market transformation approaches. Many of these program design elements are not accounted for in the efficiency potential study, because these studies typically present savings estimates *without regard to efficiency programs*. Potential studies typically estimate technical, economic, and achievable efficiency by assessing the impacts of individual efficiency measures, without considering how those measures are combined into programs or how those programs are marketed and delivered to customers. Therefore, many of the factors

[12] ACEEE (2014). Cracking the TEAPOT: Technical, Economic, and Achievable Energy Efficiency Potential Studies, p.vii

that will critically affect the level of achievable savings are not even accounted for in the potential study.

Also, it is important to recognize that many of the factors that will influence customer adoption rates are within the control of the efficiency program administer, because they can design programs in different ways to influence customer adoption of efficiency measures. The amount of achievable potential is actually a very dynamic value, which can be modified considerably depending upon a stateôs energy efficiency initiatives. Most efficiency potential studies do not account for this very important point.

Q. How do efficiency potential studies typically develop estimates of achievable efficiency potential?

A. Potential studies typically use estimates of ñcustomer adoption ratesò to indicate the amount of savings that can be achieved through efficiency programs. These customer adoption rates are sometimes based on the experience of the program administrator, the experience of other program administrators, a model of relationships between customer incentives and customer adoption rates, or some other method.

Q. Are there any limitations to using historical information for estimating customer adoption rates?

A. Yes. While there is some logic to using historical customer adoption rates to estimate future adoption rates, these are often limited in that they do not include opportunities to achieve higher adoption rates than in the past. Maine does not have a long history of energy efficiency budgets that achieve all cost-effective energy efficiency resources, making a historic basis particularly limiting. (The full statutory framework for achieving

this savings level has been in place for less than one Triennial Plan period, and whether the approved budgets were set to achieve this level is debatable.)

In other words, using historical customer adoption rates does not address the questions of what the customer adoption rates would be if the program administrator applied different program designs or delivery mechanisms to reach higher numbers of customers. Using historical customer adoption rates leads to achievable potential estimates that are limited by past program designs and opportunities. This method does not account for the variety of alternative designs and opportunities that can be used to promote customer adoption.

Q. Please describe how some potential studies use a model of the relationship between customer financial incentives and customer adoption rates.

A. Many potential studies use an algorithm based on the amount of financial incentives offered to a customer and the amount of customer adoption that is likely to result from those incentives. In general, higher financial incentives are expected to achieve higher adoption rates.

Q. Are there limitations to this approach of modeling customer adoption rates?

A. Yes. This modeling approach is very limited in that it only accounts for one way to influence customer adoption rates: through financial incentives. There are many other ways to influence customer adoption rates that are not accounted for in this methodology. For example:

- Many program administrators deliver efficiency measures through upstream buydown programs, where agreements are made with manufacturers and distributors of efficiency products to reduce the prices before they arrive at retail stores. These types of programs have proven to dramatically increase customer participation, yet they are

not accounted for when estimating measure adoption rates based on customer incentives alone.

- Many program administrators offer customer behavioral programs, in which customers are not offered any incentive but are provided with information about consumption patterns and opportunities to reduce consumption. These behavioral programs can result in significant program participation, sometimes greater participation than all other programs, without offering any financial incentive at all.

- Some energy efficiency programs provide a suite of techniques to encourage customers to implement efficiency measures, including technical assistance, contractor training, benchmarking analyses, technical assessments and audits, retro-commissioning, and more. These additional techniques will have a dramatic impact on customer adoption of efficiency measures, but they are not accounted for at all if customer incentives are the only factor used to estimate adoption rates.

- Customers often adopt efficiency measures because they are bundled together in programs, even if some of those measures might not otherwise be adopted based on the financial incentives alone. It is common for customers participating in a program to adopt several measures once they learn of all the opportunities available, and some program administrators encourage this through ñwhole homeò and ñwhole building approaches.ò It is also common for customers to participate in additional efficiency programs as a result of being referred to them by other programs. This type of interactive effect between measures and programs is often not captured by assessing financial incentives alone.

- The Strategic Energy Management (SEM) program is one example of a holistic approach targeted to large commercial and industrial customers. This program helps large customers develop a more systematic, strategic approach to energy management, and enables them to achieve greater energy savings through operations and maintenance improvements as well as increasing the number of capital projects.[13] The U.S. Department of Energy promotes the SEM in its Superior Energy Performance Program where it helps interested companies to meet international energy management standards through a variety of capital improvements and operational measures.[14]

- Many program administrators are applying innovative ways to encourage increased customer participation with reduced financial incentives. This is achieved through low-interest loans or on-bill financing programs that make it much easier for customers to install efficiency measures with less funding provided by the program administrator.[15]

- Efficiency program administrators can undertake initiatives to upgrade and enforce building codes and appliance standards, leading to significant long-term energy savings at very low cost.[16]

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[13] Southwest Energy Efficiency Project (2013). Utility Strategic Energy Management Programs.

[14] More information on the Superior Energy Performance program is available at http://www.energy.gov/eere/amo/superior-energy-performance.

[15] The State and Local Energy Efficiency Action Network (2014). *Energy Efficiency Financing Program Implementation Primer*.

[16] Institute for Electric Efficiency (2011). *Integrating Codes and Standards into Electric Utility Energy Efficiency Portfolios*.

If achievable potential estimates are based solely on the potential for financial incentives to influence customer adoption rates, then all of these important opportunities for increasing customer adoption rates are overlooked. Ironically, the Trust utilizes some of these approaches in its efficiency programs (including a lighting buydown program, a residential behavioral program, audits and technical assessments, and a whole building approach for residential homes), but the potential studies prepared for the Trust do not directly or fully recognize these opportunities for promoting increased customer adoption. Consequently, the potential studies prepared for the Trust will naturally result in under-estimates of achievable efficiency potential. (The Electricity and Gas Potential Studies are discussed in more detail in Sections 4 and 5.)

Q. Please describe how potential studies tend to rely upon static efficiency measure assumptions.

A. Many potential studies assume a set of efficiency measures based on the availability, performance, and cost of the measures at the time the study was performed. This is sometimes referred to as assuming ñfrozenò technology assumptions, because they do not change over time. This approach is often used because it is challenging to estimate how the cost and performance of existing efficiency products might change over time, and it is even more challenging to predict what types of new efficiency products might emerge over time.

Historically, new and emerging efficiency technologies have experienced reduced prices as they become more widely available, a phenomenon known as the technologyôs

ñexperience curve.ò[17] This effect has been modeled by fairly robust empirical experience, and there are ways to incorporate experience curves in modeling energy efficiency potential.[18]

Q. Are there any limitations to using static efficiency measure assumptions?

A. Yes. Static efficiency measure assumptions can dramatically understate the technical and economic efficiency potential over time. Empirical evidence demonstrates that efficiency measure performance and costs tend to improve over time. I am not aware of any evidence of technologies whose costs and performance have worsened over time. Therefore, using static assumptions of energy efficiency measures will most certainly lead to under-estimates of energy efficiency potential.

Q. Do these limitations suggest that efficiency potential studies provide little or no value?

A. No. The limitations described above simply mean that all efficiency potential studies should be interpreted thoughtfully and cautiously. Their limitations, strengths, and weaknesses must be recognized and accounted for when interpreting the results of the studies. Most importantly, the estimates of the achievable energy efficiency potential should not be considered as ñlimits,ò ñceilings,ò or ñmaximumò amounts of energy efficiency that is cost-effective and achievable. Instead, they should be viewed as conservative estimates of achievable potential due to the limits described above.

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[17] U.S. Department of Energy. (2011). *Using the Experience Curve Approach for Appliance Price Forecasting*.

[18] Lawrence Berkeley National Laboratory. 2011. *Incorporating Experience Curves in Appliance Standards Analysis.* Available at http://efticiency.lbl.gov/drupal.files/ees/ExperienceApylianceStds LBNLreport.pdf. See also, Navigant Consulting (2014). 2013 California Energy Efficiency Potential and Goals Study Appendix A, February 5, 2014.

Continuity of Program Offerings

Q. Please describe what you mean by continuity of program offerings?

A. It is important that energy efficiency programs do not change too dramatically over time. This applies especially within a single year, but also across multiple years. Successful efficiency programs develop a certain momentum over time, in terms of engaging the many different actors involved in the programs such as the staff at the Trust, the Trustôs vendors, contractors who install efficiency measures, architects, engineers, and, most importantly, the customers themselves. It is important that all of these actors receive relatively consistent information, messages, and incentives over time to ensure they stay engaged in energy efficiency activities and take advantages of economies of scope and scale over time.

It is especially important that programs do not have to be cancelled or put on hold part way through the year due to a lack of sufficient funding. This can create inefficiencies and confusion across the many market actors. It can also lead to dissatisfied customers, which in turn can jeopardize participation in and support for future efficiency programs.

It is also important to ensure that program budgets do not swing wildly from one year to the next. This can also create inefficiencies in the program delivery process, as well as uncertainties among some of the program vendors and contractors whose business models might depend upon program continuity.

Q. Do you have any concerns about continuity of the Trust's programs?

A. In general, I think this is an issue for the Commission to be aware of and monitor over time. In recent years, it appears as though there have been a few instances where an efficiency program ran out of funds mid-year, and therefore suspended the financial

incentives.[19] This type of discontinuity should be prevented by providing the Trust with more flexibility regarding program budgets within years and within a plan period.

In addition, it appears as though the Trustôs efficiency program budgets have been somewhat volatile over the past few years, as described in Section 4 below. This type of volatility can be mitigated by providing the Trust with more flexibility regarding program budgets across years.

Q. What do you recommend to help maintain continuity of the Trust's programs?

A. The Commission should ensure that the Trust has sufficient funds to meet the demand for efficiency products throughout the year. The Commission should direct the Trust to ensure continuity of program delivery by re-allocating efficiency funds from programs that are experiencing low demand to programs that are experiencing high customer demand.

The Commission should also provide the Trust with the flexibility to recover fund deficits for one year from the following year or to roll any excess funds from one year to the next, in order to maintain program continuity within a year and across years. Finally, the Commission should consider the benefits of continuity, and the inefficiencies of discontinuity, when approving budgets for future year electricity and gas efficiency programs. Overly cautious and limited budgets are more likely to result in continuity problems than budgets that recognize the full extent of achievable efficiency savings.

[19] Energy Futures Group, *Benchmarking Maine's Energy Efficiency Performance*, prepared for the Maine Public Utility Commission, October 23, 2015, p. 6.

4. ELECTRICITY ENERGY EFFICIENCY PROGRAMS

Summary of the Electricity Efficiency Programs

Q. Please summarize the electricity programs budgets and savings proposed in the Triennial Plan.

A. Table 2 presents a summary of the electricity program budgets in the Triennial Plan. The total budget starts at about $49 million for FY2017 and increases to $56 million for FY2019. These budget levels are higher than historical budget levels, but close to the Trustôs FY2015 actual electric program expenditures of $45 million.[20]

Table 2. FY17-19 Electric Program Budget ($ million)[21]

Program Year	Residential	C&I	Administration	Total Budget
FY 2017	$23.8	$20.4	$5.1	$49.2
FY 2018	$23.5	$21.5	$5.2	$50.1
FY 2019	$24.7	$25.6	$5.8	$56.1
Total				**$155.5**

The residential budget is slightly higher than the C&I budget except FY2019. These budgets include incentive payments for CHP under the C&I Custom program. The budget for CHP ranges from $2.3 million to $3.3 million depending on the year, and accounts for about 10 percent of the C&I budget.

[20] Efficiency Maine (2015). FY2015 Annual Report of the Efficiency Maine Trust, Appendix A.

[21] Developed based on ñEMT Summary Tables ï Costs & Benefitsò workbook, obtained from the Trust.

Table 3. Trust's Historical Electric Energy Savings (MWh)[22]

	All Sector (MWh)
FY2011	173,536
FY2012	226,244
FY2013	134,555
FY2014	161,570
FY2015	224,341

Table 3 presents historical energy savings from the electricity programs. Tables 4 and 5 present the savings projected in the Triennial Plan, and identify the energy savings both with and without CHP savings. Table 4 also presents the energy savings in terms of percent of retail electricity sales, which is a useful metric for comparing efficiency savings across years, across program administrators, and across states.

Table 4. FY17-19 Projected Electricity Program Savings with and without CHP

Program Year	MWh Savings with CHP	% of 2014 Sales	MWh Savings w/o CHP	% of 2014 Sales
FY 2017	260,144	2.2%	217,276	1.8%
FY 2018	278,256	2.3%	224,671	1.9%
FY 2019	311,750	2.6%	247,448	2.1%

Table 5. Electricity Savings Breakdown by Sector and CHP for FY17-19

Program Year	Residential	C&I w/o CHP	CHP	Total
FY 2017	144,789	72,487	42,868	260,144
FY 2018	150,535	74,136	53,585	278,256
FY 2019	159,778	87,670	64,302	311,750

[22] Based on Trustôs annual reports available at http://www.efficiencymaine.com/about/library/reports/

Q. Why do you present the CHP savings separately in Tables 4 and 5?

A. The efficiency savings from CHP programs represent a significant portion of the total savings in the Triennial Plan, thus it is useful to illuminate their impact. As indicated in Tables 4 and 5, CHP accounts for about 20 percent of the total savings or 40 percent of the C&I sector savings. Without CHP the total projected savings range from 1.8 percent to 2.1 percent of the 2014 retail sales, and with CHP they are considerably higher.

Q. Please summarize the Electricity Potential Study methodology.

A. The Trust commissioned GDS Associates to estimate electric energy efficiency potential for 10 years beginning July 1, 2016. The study considered measures and practices that are currently commercially available, but excluded measures that are not commercially available, were already at current code, or were not applicable to Maine.[23] GDS also conducted a potential study separately for CHP. The types of potential estimates include technical, economic, and maximum achievable cost-effective potential. The study defines these potential types as follows:

- Technical potential: the theoretical maximum amount of energy use that could be displaced by efficiency, disregarding all non-engineering constraints such as cost-effectiveness. This potential is only constrained by factors such as technical feasibly and applicability of measures.

- Economic potential: economic potential is a subset of the technical potential that is economically cost-effective based on the Total Resource Cost

[23] Exhibit EMT-1 Triennial Plan, page 2-9 and 2-16.

screening. This estimate takes into account adjusted gross savings of each measure, which takes into account, where available, historical realization rates based on prior evaluations.

- Maximum achievable cost-effective (MACE) potential: MACE potential is a subset of the economic potential and is the cost-effective savings that can realistically be achieved given market barriers.

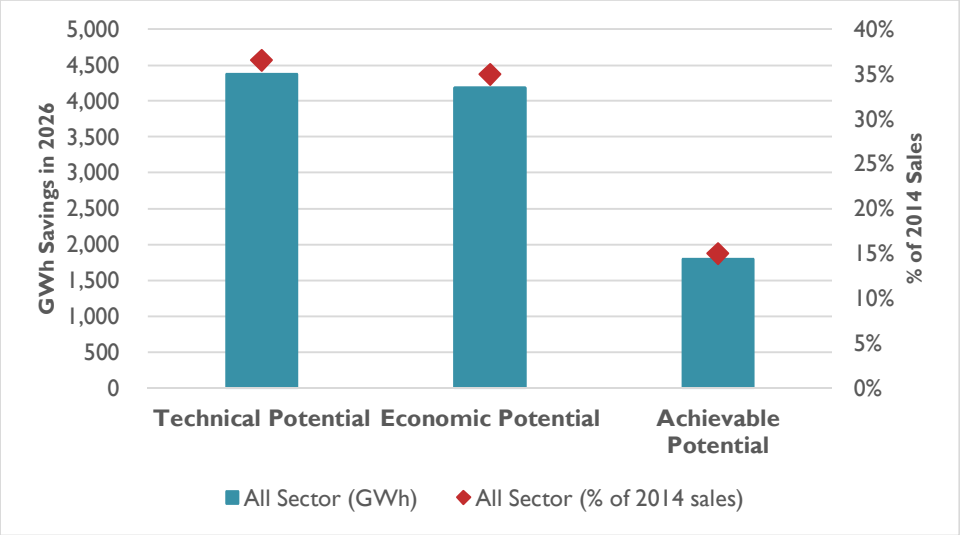
For MACE potential, the study also ñscreens out certain measures that, while cost-effective, have an incidence and magnitude of free-ridership that cannot be mitigated and, when factored into estimates of future net savings, would render the measure not cost-effective.ò For estimating customer adoption rates, the study also assumed ñcontinuation of current program incentive levels.ò[24]

Q. Please provide the results of the electric energy efficiency potential study.

A. Figure 1 shows GDSôs cumulative electric potential estimates in 2026 for technical, economic, and maximum achievable cost-effective estimates in GWh on the left y-axis and as a percentage of 2014 retail sales on the right y-axis. These estimates exclude electricity savings potential from CHP. The economic potential is estimated to be slightly lower than the technical potential, while the achievable potential is significantly lower than the economic potential.

[24] Ibid. p. 2-18.

Figure 1. Comparison of GDS Electric Technical, Economic, and Achievable Potential Estimates excluding CHP[25]



Review of the Electricity Efficiency Programs

Q. Are the electricity program budgets and savings reasonable?

A. Yes. The electricity program budgets and savings proposed in the Plan represent a sensible progression from the budgets and savings in recent years. In addition, as indicated in Table 4, the Triennial Plan electricity savings without CHP are on the order of 2 percent of retail sales, and are considerably higher when CHP is accounted for. While the leading states in the Northeast and the nation are implementing higher levels of cost-effective efficiency savings, I believe that the budgets and savings proposed in the Plan are reasonable for the Trust at this time.

[25] Developed based on Excel files titiled "ODR-001-012_(C&I_Electric)" and "ODR-001-012_(Residential_Electric)" obtained from the Trust.

Q. Are the Trust's requested electric budget amounts adequate for capturing all cost-effective, reliable, and achievable energy efficiency?

A. No. While the electricity efficiency programs in the Triennial Plan are reasonable, they are not adequate for capturing all efficiency resources that are cost-effective, reliable and achievable over time. The Electricity Potential Study suffers from some important limitations, and the Triennial Plan overlooks some important program opportunities.

Q. Given that the electricity program budgets and savings in the Triennial Plan will not achieve MACE, why do you conclude that they are reasonable?

A. As noted above, the electricity program budgets and savings represent a reasonable progression beyond those of recent years, and the savings are reasonably close to those of other leading efficiency program administrators in the region. For these reasons, I recommend that the Commission approve the electricity programs proposed in the Triennial Plan.

However, the Commission and the Trust should always be mindful of the goal to implement the maximum achievable amount of efficiency, and should seek for opportunities to achieve this goal above and beyond those opportunities identified in the Plan. For this reason, I recommend that the Commission and the Trust treat the electricity program budgets and savings proposed in the Plan as ñfloors,ò and not as ñceilings.ò The Commission should direct the Trust to modify electricity program budgets and savings goals during the course of the three-year plan in order to (a) satisfy the on-going customer demand for electricity efficiency services; (b) incorporate new, cost-effective electricity program opportunities as they arise; and (c) minimize lost opportunities in general.

Q. Please explain how the Electricity Potential Study suffers from some important limitations and overlooks some important program opportunities.

A. I highlight several major concerns with the Electricity Potential Study:

- The study suffers from the limitations described in Section 3 regarding customer adoption rates used to estimate achievable potential. The Electricity Potential Study assumes short-term market adoption rates based upon recent experience and incentives offered by the Trust, and long-term market adoption rates based upon industry data regarding financial incentive levels and customer adoption rates.[26] As a result, the Potential Study does not account for the many ways that customers can be encouraged to adopt efficiency measures, including: higher financial incentives, upstream buydown programs, technical assistance, contractor training, benchmarking analyses, community-based social marketing, technical assessments and audits, and whole-building approaches.

- The study does not include several efficiency measures that are sometimes included in efficiency programs, such as linear and troffer LEDs, strip curtains, early retirement of HVAC, and Wi-Fi thermostats for commercial buildings.

- The study does not consider the potential for installing measures through several program designs such as residential new construction, low-income new construction, behavioral programs, upstream buydowns, strategic energy management, and retro-commissioning programs.

[26] Triennial Plan, pp. 2-17 to 2-19.

- The study assumes static efficiency measure costs and performance characteristics throughout the 10-year study period for all technologies except lighting measures.

Combined, these issues indicate that the MACE estimates in the Electricity Potential Study do not reflect the maximum achievable cost-effective efficiency available, but are instead a conservative estimate of the amount of cost-effective efficiency potential available in Maine.

Q. In addition to these limitations in the Electricity Potential Study, are there other reasons why the electricity programs in the Triennial Plan do not account for all cost-effective program opportunities?

A. Yes. The Plan does not include some key energy efficiency programs that could significantly increase the amount of cost-effective efficiency savings. These include the following types of programs: low-income new construction, residential new construction, residential behavioral, commercial behavioral, multi-family, commercial upstream buydown, commercial and industrial retro-commissioning, and strategic energy management.[27] These programs have been found to be cost-effective by other program administrators, can significantly lower customer electricity costs, and can help avoid significant lost opportunities.

Q. What is your general conclusion regarding the electricity efficiency programs in the Triennial Plan?

A. My general conclusion is that the proposed electricity programs are very cost-effective, and will achieve reasonable levels of efficiency savings with significant benefits for

[27] See also: Energy Futures Group, *Benchmarking Maine's Energy Efficiency Performance*, prepared for the Maine Public Utility Commission, October 23, 2015, p. 5.

customers. However, they do not represent the maximum level of achievable cost-effective efficiency savings due to the limitations of the potential study and the Plan itself.

Q. What are your recommendations regarding the electricity efficiency programs in the Triennial Plan?

A. I recommend that the Commission approve the electricity efficiency programs included in the Triennial Plan. I also recommend that the Commission direct the Trust to continue seeking opportunities to achieve higher efficiency savings during the course of the three-year plan, and provide the Trust with sufficient funding to enable it to capture those additional savings.

5. GAS ENERGY EFFICIENCY PROGRAMS

Summary of the Gas Energy Efficiency Programs

Q. Please provide relevant background for the Trust's Gas Energy Efficiency programs.

A. Since the establishment of the Trust in 2009, it has promoted all-fuel energy efficiency programs using various funding sources, such as the American Recovery and Reinvestment Act (ARRA) stimulus funding, the Regional Greenhouse Gas Initiative (RGGI), and the heating fuel savings charge.

Unitil (formally known as Northern Utilities) has historically operated the natural gas programs within its service territory. In fiscal year 2011, the Trust and Unitil agreed to integrate Unitil's programs into the Trust's gas programs that specifically target Unitil's

customers.[28] Unitil was the only utility that contributed system benefit charges to the Trust because it was the only utility that has exceeded the prior limit of statutory applicability to those utilities serving more than 5,000 residential customers.[29]

In June 2013, the bill LD1559, ñAn Act to Reduce Energy Costs, Increase Energy Efficiency, Promote Electric System Reliability and Protect the Environmentò became law. This new law removed the prior 5,000 residential customer limit and expanded the applicability of the Trustôs natural gas conservation programs to all utility territories in Maine. It is also important to note that the Trustôs FY2016 filing was the first filing that incorporated natural gas efficiency program services to customers under all gas local distribution companies (LGCs) beyond Unitilôs service territory in Maine.

Q. Please describe the gas program budgets in the Triennial Plan.

A. The gas program budgets are based on the results of the Gas Potential Study. This study was originally conducted in 2014 and updated narrowly on October 19, 2015 for the Triennial Plan. This 2015 update adjusted one of the achievable potential scenarios called the Low Case by excluding savings potential for the Summit Natural Gasôs residential customers and large volume customers, as requested by the Trust. The gas efficiency program budgets and savings in the Triennial Plan are based on this adjusted Low Case scenario.

[28] Efficiency Maine (2011). 2011 Annual Report of the Efficiency Maine Trust, December 1, 2011, available at http://www.efficiencymaine.com/about/library/reports/

[29] Title 35-A, Part 8, Section 10111, Subsection 1.

Table 6 presents the gas efficiency program budgets. The total budget starts at about $3.6 million for FY2017 and increases to $4.3 million for FY2019. These budget levels are higher than the FY16 budget level of $2.3 million.[30]

Table 6. Summary of FY17-19 Natural Gas Program Budget ($ million)[31]

Program Year	Residential	C&I	Administration	Total Budget
FY 2017	$1.09	$2.13	$0.37	$3.6
FY 2018	$1.20	$2.29	$0.40	$3.9
FY 2019	$1.31	$2.52	$0.44	$4.3
Total				**$11.8**

Similarly, the Plan projects higher annual gas efficiency savings over recent years. Table 7 presents the proposed natural gas savings, by sector and as a percent of retail sales. The gas savings in the Plan are higher than the 86,000 MMBtu savings for FY2016.[32]

Table 7. Summary of FY17-19 Natural Gas Savings[33]

Program Year	Residential (MMBtu)	C&I (MMBtu)	All (MMBtu)	All (% of 2014 Sales)
FY 2017	20,612	93,816	114,428	0.32%
FY 2018	22,604	100,681	123,284	0.35%
FY 2019	24,645	110,977	135,623	0.38%

30 Efficiency Maine (2015). FY2015 Annual Report of the Efficiency Maine Trust, Appendix A.

31 Developed based on ñEMT Summary Tables ï Costs & Benefitsò workbook, obtained from the Trust.

32 Efficiency Maine Trust (2014). Triennial Plan For Fiscal Years 2014-2016 - Natural Gas Program Addendum, September 12, 2014

33 Developed based on ñEMT Summary Tables ï Costs & Benefitsò workbook, obtained from the Trust. The 2014 natural gas sales data were obtained from U.S. Energy Information Administrationôs EIA-176 Data, available at http://www.eia.gov/cfapps/ngqs/ngqs.cfm?f_report=RP1

Q. Please briefly describe the Gas Potential Study.

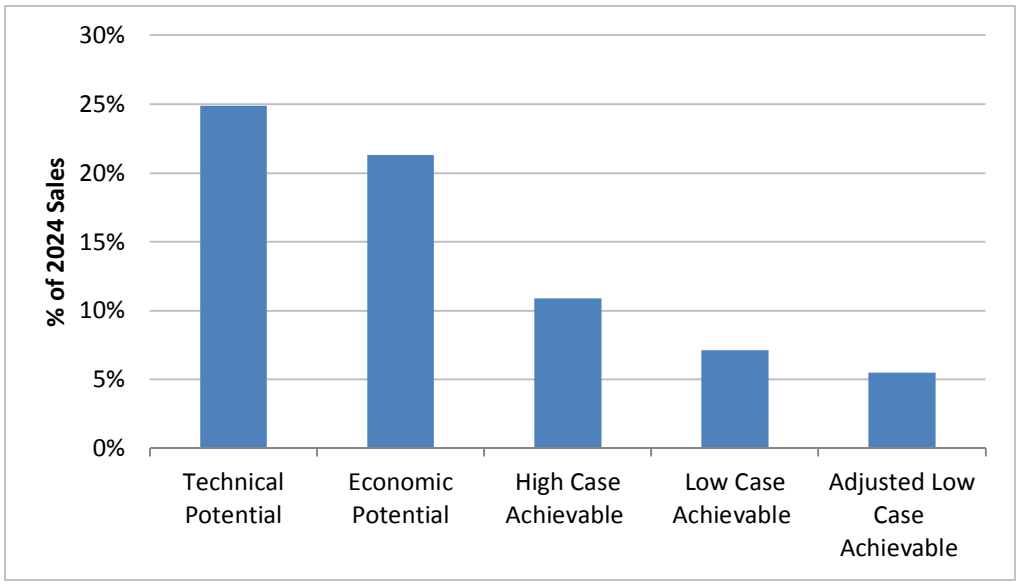
A. The Gas Potential Study estimated natural gas energy savings potential for all natural gas LDCs in Maine for the next 10 years from 2015 to 2024. The study examined and estimated savings from available efficiency measures to develop estimates for the technical, economic, and achievable potential.

The results are estimated and presented by end-use, customer type (e.g., existing, new construction, and pipeline expansion), and sector (e.g., residential, commercial, and industrial). The study also took a scenario approach and estimated the results for a Low Case and a High Case for achievable potential. The Low Case assumes a lower incentive level (50 percent of the measure incremental cost) and thus produced a lower savings result. The High Case assumes a higher incentive level (75 percent of the incremental cost) and thus produced a higher savings estimate.

Q. Please summarize the results of the Gas Potential Study.

A. The study presents savings results in terms of 2024 savings as a percentage of forecasted 2024 sales (Figure 2 below). The economic potential estimates are relatively close to the technical potential estimates, but the achievable potential estimates are much lower than the economic potential estimates. The High Case achievable potential is roughly one-half of the economic potential, and the Low Case is roughly one-third of the economic potential. The adjusted Low Case represents the 2015 Gas Potential Study update that excludes Summit residential customers and large-volume customers.

Figure 2. Gas Potential Study Results for 2024 by Potential Type (% of 2024 sales forecast) [34]



Review of the Gas Efficiency Potential Study

Q Do you have any concerns about the Gas Potential Study?

A. Yes. The Gas Potential Study contains several limitations that result in conservative estimates of the efficiency potential.

- The economic potential estimates are based on static assumptions for efficiency measure performance and cost.[35]
- The achievable potential estimates are based on customer adoption rates that suffer from several limitations.

[34] Savings are based on Table ES-1 in the GDS 2014 study. The 2024 sales forecasts are based on ñNRCM-002-005_Attachment_1ò file, provided by the Trust in response to NRCM-002-005 data request under ñ*Natural Gas Potential Study and Natural Gas Addendum to the Triennial Plan"* case for the Second Triennial Plan, Docket No. 2012-00449.

[35] Note that any factor that affects economic potential also affects achievable potential.

- The Low Case estimates assume that the Trust does not serve gas efficiency programs to large-volume customers or to Summitôs residential customers.

Q. Please explain your concern regarding the assumptions of efficiency measure performance and cost in the economic potential estimates.

A. The Gas Potential Study applies static assumptions for the energy efficiency measures, where measure performance and costs are assumed to remain fixed throughout the study period. These assumptions were used because ñ[i]t would have required extensive and costly research across hundreds of energy efficiency measures to develop forecasts of incremental measure costsò and ñit is likely that the range of uncertainty around any such forecasts would be significant and difficult to quantify.ò[36]

As described in Section 3, using static assumptions in this way will naturally lead to understated performance, overstated costs, and understated economic and achievable potential estimates.

Q. Please explain your concern regarding market adoption rates associated with the achievable potential estimates?

A. The Gas Potential Study uses a very simplistic approach to estimate customer adoption rates. For the High Case, the study assumes that customer incentives equal to 75 percent of incremental efficiency costs will result in 80 percent market penetration by the end of the study period. For the Low case, the study assumes that customer incentives equal to 50 percent of incremental costs will result in 50 percent market penetration by the end of the study period. For both cases, the initial (first year) market penetration rates are

[36] The Trustôs data request response under the *Natural Gas Potential Study and Natural Gas Addendum to the Triennial Plan* case for the Second Triennial Plan, Docket No. 2012-00449.

assumed to be half of the final market penetration rates. Table 8 summarizes these assumptions.

Table 8. Achievable Potential Modeling Parameters - High Case and Low Case Scenarios[37]

SCENARIO	Level of Incentives	Initial Market Penetration Rate	Final Market Penetration Rate
High Case	75%	40%	80%
Low Case	50%	25%	50%

The Gas Potential Study assumes that both cases have ñwell-designed programs and aggressive, marketing, education, and outreach.ò[38] Thus, the only difference between the two cases is the level of incentives provided to customers.

Q. What are the problems with using this methodology to determine customer adoption rates and achievable potential estimates?

A. This methodology is very simplistic and does not account for the empirical evidence or the real-world factors that can significantly affect customer adoption of energy efficiency measures. Given that customer adoption rates are the primary factor determining the achievable potential estimates, such a simplistic approach implies that the specific results of the Gas Potential Study should not be given too much weight.

Q. Why do you say that this methodology to determine customer adoption rates is simplistic?

A. There are two ways in which this approach is very simplistic. First, the primary factor affecting the estimate of achievable gas savings (in MMBtu) is the difference between the

[37] 2014 Gas Potential Study, Table 5-2, page 35.
[38] 2014 Gas Potential Study, page 35.

initial and the final market penetration rates. If the actual initial market penetration rates are much lower than assumed, then the difference between the initial rate and the final rate would be much greater, and the estimate of achievable potential would also be much greater. Similarly, if the actual initial market penetration rates are much higher than assumed, then the estimate of achievable potential would be much lower.

The Trust explains that the final market penetration rates are based upon several data sources on electric and gas efficiency programs conducted during the past three decades where high penetration has been achieved.[39] Such data sources include U.S. Environmental Protection Agencyôs Energy Star product market data and efficiency program evaluation studies. In contrast, the Gas Potential Study does not provide any evidence as to why the initial penetration rates are likely to be half of the final rates.[40] Also, this study applies the same initial and final penetration rates to all gas measures in the study, which is clearly a very simplistic approach because different efficiency measures will naturally have different penetration rates, especially initial penetration rates.

It is not clear whether this simplistic approach to assuming initial and final market penetration rates is likely to overstate or understate the gas efficiency potential in Maine. Either way, it is clear that the results of the Gas Potential Study should not be given too much weight, given how approximate the estimates of initial and final market penetration rates are.

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[39] *Natural Gas Potential Study and Natural Gas Addendum to the Triennial Plan,* filed with the Second Triennial Plan, Docket No. 2012-00449, provided in this docket as Attachment One to the Trustôs response to data request NRCM-003-008.

[40] Ibid.

Q. What is the second problem with using this methodology?

Even if the Gas Potential Study did rely upon reasonable input assumptions for customer incentives and penetration rates, it would still suffer from the overly simplistic assumption that customer adoption rates can only be influenced by customer incentives. As described in more detail in Section 3, there are many program design and delivery techniques that can significantly increase customer adoption without increasing customer financial incentives, and in some cases without any financial incentive at all. These include: upstream buydown programs, customer behavior programs, whole-building approaches, programs targeted to building codes and appliance efficiency standards, and creative financing programs. In fact, the Trust currently uses some of these techniques for promoting its efficiency programs, but the Gas Potential Study does not account for them in determining the achievable potential estimates.

Q. What is your general conclusion regarding the Gas Potential Study?

A. In general, the study uses some simplistic estimates and conservative assumptions that will understate the actual potential of gas efficiency savings in Maine. Most importantly, the estimates of achievable potential suffer from some significant limitations, and therefore do not reflect the maximum amount of cost-effective achievable potential in Maine.

Q. What is your general recommendation regarding the Gas Potential Study?

A. I recommend that the Commission and the Trust recognize these limitations of the Gas Potential Study. Since this study is used to help define the gas program savings and budgets in the Triennial Plan, it is important that Commission and the Trust recognize that the study does not reflect the maximum amount of cost-effective achievable

potential. Given the limitations and conservative nature of the potential study as a whole, I recommend that basing budgets more closely on the high savings scenario is a more reasonable approach for meeting that standard.

Review of the Gas Efficiency Programs

Q. Do you have concerns with the gas efficiency programs in the Triennial Plan?

A. Yes. First and foremost, the gas efficiency programs in the Triennial Plan are based on budgets and savings estimates of the Low Case from the Gas Potential Study, instead of the High Case. Consequently, the gas efficiency programs will not capture all cost-effective energy efficiency that is achievable and reliable; will result in significantly higher costs than necessary; will not serve large-volume customers and Summit residential customers; and will result in significant lost opportunities for cost-effective efficiency savings.

Q. Why is it important that the gas efficiency program seek to capture all cost effective energy efficiency that is achievable and reliable?

A. The Omnibus Energy Bill L.D. 1559 modified the funding level for natural gas conservation programs from the amount ñthat is no less than 3% of the gas utility's delivery revenuesò to the new amount ñnecessary to capture all cost-effective energy efficiency that is achievable and reliable.ò[41] As described above, the Low Case in the Gas Potential Study does not identify all cost-effective efficiency savings that are achievable and reliable, because the study suffers from several methodological limitations, and does not include potential savings from large-volume and Summit residential customers. In

[41] 35-A MRSA 10111(2); Section A-25 of LD 1559.

addition to not complying with this language, not capturing MACE will result in significantly higher costs for gas customers.

Q. Please explain why the gas efficiency programs in the Triennial Plan will result in significantly higher costs for gas customers?

A. Table 9 summarizes the economic results from the original (2014) Gas Potential Study. As indicated, both the High Case and the Low Case are very cost-effective, with benefit-cost ratios of 3:1. This table also indicates that the Low Case would result $211 million of net savings to customers, and the High Case would result in $331 million of net savings to customers, thus the High Case would result in additional savings of $119.6 million relative to the Low Case. This means that by selecting the Low Case over the High Case, the Trust will be foregoing the opportunity to reduce customer gas costs by $119.6 million.

Table 9. Achievable Potential Benefits and Costs

	NPV Benefits	NPV Costs	NPV Savings	TRC BC Ratio
High Case	$491,896,706	$160,472,427	$331,424,279	3.1
Low Case	$315,642,713	$103,800,552	$211,842,162	3.0
Difference	**$176,253,993**	**$56,671,875**	**$119,582,117**	

Furthermore, 2014 Gas Potential Study assumes that the Trust would serve large-volume and Summit residential customers. Not serving these customers means that the Trust will be foregoing the opportunity to save an additional $33 million in gas costs from Summitôs residential customers and an additional $12 million in gas costs from large-

volume customers according to EMT-6 Exhibit provided along with the Triennial plan.[42] This means that in total the gas efficiency programs in the Triennial Plan will be forgoing the opportunity to save approximately $164.6 million in future gas costs.[43]

Q. Are there additional economic benefits not accounted for in these results?

A. Yes. Energy efficiency resources can help mitigate the risks associated with gas and electricity prices. This can occur in two ways. First, efficiency programs provide a very low-cost, fixed price resource for the life of the efficiency measures. This provides a potentially valuable hedge against the volatility of future natural gas prices. In many cases, a fixed price resource contract acting as a hedge will cost more than alternative resources. In the case of energy efficiency, however, this hedge value is provided at a lower cost than the alternative.

Second, electricity prices in New England have been subject to severe price spikes in recent winters due to high demand for natural gas for heating needs, combined with high demand for natural gas for electricity generation in peak hours. Increased efficiency savings from gas (and electricity) programs can reduce the risk of these high price spikes; resulting in significant cost savings for all gas and electricity customers.

[42] Exhibit EMT-6 titled ñMemo for Natural Gas Energy Efficiency Potential Study ï Update.ò

[43] These results are for the entire ten-years included in the Gas Potential Study.

Q. Why are you concerned that gas efficiency programs will not serve Summit residential customers and large customers?

A. The exclusion of Summit Natural Gas residential customers and large-volume customers by the Trust appears to be based on a July 31, 2015 order by the Commission regarding an amendment to the Trustôs Second Triennial Plan.[44]

The Trust has the responsibility to ensure that natural gas energy efficiency services are provided to all state territories and that they achieve maximum, cost-effective energy efficiency potential. Thus, I believe Summitôs residential program should be seamlessly integrated in the Plan so as to ensure that programs in Summit's jurisdictions are on track to achieve MACE along with programs in other jurisdictions. If Summitôs residential assessment is lower than the Trust would charge under this plan, the Trust should collect additional assessment to make up for the difference, and coordinate with Summit to enhance the existing efficiency service.

Secondly, the Commission in the same order mentioned above concluded that large-volume customers are exempted based on a legislation enacted in 2015.[45] This law in fact was only effective during a moratorium period of one year, and ends as the new Triennial Plan will take effect. As of the date of this testimony, we are aware that the legislatureôs joint committee on energy, utilities and technology has voted to extend the moratorium for large-volume gas customers by one more year. This moratorium should only affect FY17 in the plan and not be applied to FY18 or FY19.

[44] Order on Trustôs proposed addendum to amend its natural gas conservation program, Docket No. 2012-00449, July 13, 2015.

[45] A Resolve, To Establish a Moratorium on the Assessment of Large Volume Customers by Gas Utilities and To Evaluate Cost-Effective Natural Gas Conservation and Efficiency Improvements for Large Volume Consumers. Resolves, 2015, ch. 39 (Resolve).

Q. Why do you think that the gas efficiency programs in the Triennial Plan will result in significant lost opportunities?

A. Lost opportunities occur when efficiency measures are not installed when it is most cost-effective to do so. They typically include opportunities like the construction of a new building or facility, building renovations, and the purchase of new appliances or equipment, but also include opportunities like when a gas company is assisting new customers to switch from other fuels such as oil and propane to new natural gas HVAC equipment. Avoiding lost opportunities is important because customers are likely to install standard, less efficient gas equipment, which locks in higher levels of gas consumption for the life of the equipment. And because gas equipment tends to last a long time (e.g., 15 to 30 years for space heating), the impact of missing these savings opportunities is substantial.

This issue is especially important for the gas LDCs in Maine because many of them, especially Summit, are expanding their territories to serve new customers. Also, the Gas Potential Study identified significant amounts of savings potential from new customers. As indicated in Table 10, roughly 38 percent of the achievable gas efficiency potential is from expansion customers across the state. In Summitôs territory, roughly 75 percent of the achievable gas efficiency potential is from expansion customers. If these customers are not provided with efficiency services at the time they are first connected with gas services, then there will be significant lost opportunities, to the detriment of the state.

Table 10. Achievable Potential High Case, by Customer Type, per LDC (% of total LDC potential)

	EXISTING CUSTOMERS[46]	EXPANSION CUSTOMERS
Maine Natural Gas	60%	40%
Summit Natural Gas	25%	75%
Northern Utilities	90%	10%
Bangor Gas	50%	50%
All LDCs	62%	38%

Q. What reasons does the Trust provide for adopting the Low Case from the Gas Potential Study?

A. The Trust apparently set its program budgets conservatively because (a) it will be entering new jurisdictions to offer natural gas efficiency services, and (b) it is considering offering lower incentives in the beginning to make sure that customers make a contribution of sufficient size to ensure that they are committed to the efficiency measure.[47]

Q. Do you agree that it is appropriate for the Trust to adopt the Low Case because it is entering new jurisdictions to provide gas efficiency services?

A. No. First, it is not entirely accurate to say that the Trust is not entering new jurisdictions to offer natural gas efficiency services. The Trust has been operating various all-fuel programs throughout the state funded by the federal American Recovery and Reinvestment Act (ARRA) funding and the Regional Greenhouse Gas Initiative proceeds

[46] New Construction is included under existing customers.

[47] Maine Public Utilities Commission, Transcript for the January 19, 2016 technical conference, Docket No. 2015-00175, page 216.

since around 2010.[48] Many natural gas conservation measures are similar or identical to measures currently promoted under those statewide programs, such as in the Home Energy Savings Program. Further, the Trust has been operating its electricity programs across all jurisdictions since its inception, and expanding these to include gas services is not as difficult as offering entirely new programs.

Second, over the course of the three years from 2012 to 2014, the Trust expanded its natural gas efficiency programs rapidly under Unitilôs jurisdiction from 1,800 MMBtu in 2012 (about 0.02 percent of retail sales)[49] to approximately 31,000 MMBtu in 2014 (about 0.33 percent of retail sales).[50] This experience indicates that the Trust has the capability of expanding its natural gas efficiency services smoothly and rapidly to ñnewò service territories.

Third, In light of the overall budget for the Trustôs activities, the gas program budgets and savings in the High Case would not represent a dramatic increase. Table 11 presents a summary of the recent expenditures for FY2012 through FY2015, and proposed budgets for 2016 through 2019. As indicated, the proposed gas budgets are a relatively small portion of the total budget. The Trust should have capability to increase its natural gas budget much more rapidly than in the proposed plan.

[48] Efficiency Maine Trust (20110). 2010 Annual Report, available at http://www.efficiencymaine.com/docs/EMO16444_AnnualReport_2010.pdf

[49] Based on the reported lifetime savings of 36,890 MBtu in the FY2012 Annual Report by the Trust and a 20 year measure life.

[50] Based on the Trustôs Annual Reports and Unitilôs annual retail sales obtained from EIA-176 data.

Table 11. Summary of EMT's Historical Expenditures and Proposed Budgets

	Expenditure				Budget			
	FY2012	FY2013	FY2014	FY2015	FY2016[51]	FY2017	FY2018	FY2019
All fuel	$2.7	$11.4	$14.5	$13.0	$22.6	$19.5	$20.9	$23.9
Other fuel	$2.6	$11.1	$13.6	$12.3	$20.3	$15.9	$17.0	$19.6
Gas	$0.1	$0.4	$0.8	$0.6	$2.3	$3.6	$3.9	$4.3
Electric	$23.9	$24.3	$22.0	$45.5	$35.1	$48.2	$49.1	$55.1
Total	**$26.7**	**$35.7**	**$36.4**	**$58.4**	**$57.7**	**$67.7**	**$70.0**	**$79.0**

Q. Do you agree that it is appropriate for the Trust to adopt the Low Case because it prefers offering lower incentives to customers?

A. No. While the Low Case assumes lower incentives than the High Case, it is important to recognize that the incentive assumptions in both those cases are rough approximations for modeling purposes. They do not necessarily correspond to the incentives currently used by the Trust or the incentives needed to achieve higher gas savings. As described in Section 3, higher gas savings than those assumed in the Low Case of Gas Potential Study can be achieved without increased customer financial incentives through a variety of program design options, many of which the Trust is already applying.

Furthermore, the Trust can increase efficiency savings without increasing customer financial incentives at all, by serving more customers under the current and proposed gas programs. This would simply be a matter of increasing the gas program budgets to serving a greater portion of customer demand for the current and proposed programs. The main point I wish to make here is that the Trust, and the Commission, do not need to be

[51] Based on FY16 budget information in FY15 annual reports by the Trust. A few other budget categories such as MPRS were omitted because it is not clear how to allocate them among electricity and fuel types.

tied to, or limited by, the simplistic and conservative assumptions and results of the Gas Potential Study.

Q. What do you recommend with regard to the gas efficiency programs in the Triennial Plan?

A. First, the Commission should direct the Trust to provide gas efficiency services to Summit residential customers sufficient to capture MACE and large-volume gas customers throughout Maine starting in FY18.

Second, the Commission should direct the Trust to adopt higher gas efficiency program budgets and savings than those proposed in the Triennial Plan. I recommend that the gas efficiency program budgets be increased linearly in each of the three years, so that by 2019 the program budgets are equal to those included in the High Case in the Gas Potential Study. This would represent a reasonable and feasible expansion of the gas programs and would result in gas savings that are much closer to the maximum achievable potential.

Third, the Commission should direct the Trust, during the course of the three-year plan, to (a) ensure that areas newly served with gas supplies receive sufficient services, (b) incorporate new, cost-effective gas program opportunities as they arise, and (c) minimize lost opportunities in general.

Q. Does this conclude your pre-filed testimony?

A. Yes, it does.