The Rhode Island Energy Efficiency and Resource Management Council (EERMC)

September 1, 2013

Public Utilities Commission
89 Jefferson Boulevard
Warwick, RI 02888

RE: Energy Efficiency Savings Targets, 2015-2017

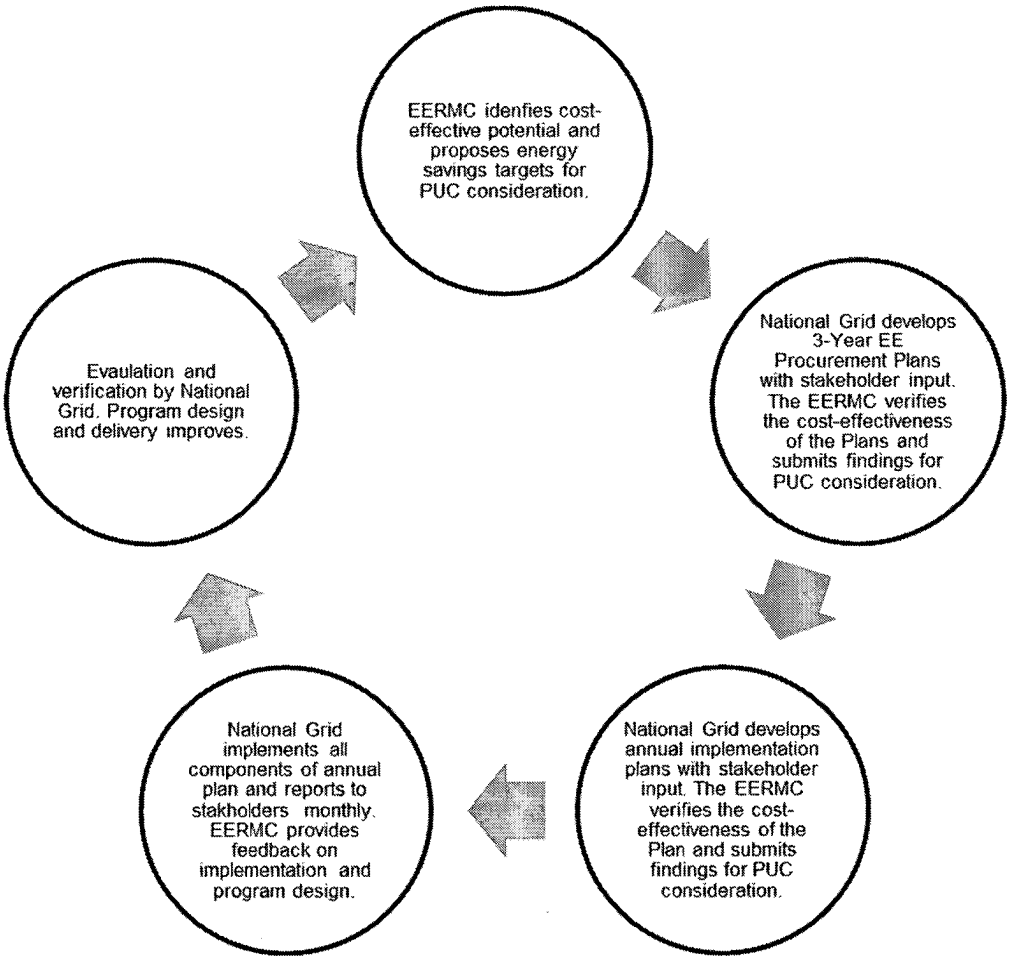
Dear Chair Curran, Commissioner Roberti, and Commissioner DeSimone,

As was undertaken in 2010, the Energy Efficiency and Resource Management Council ("the Council" or "EERMC") conducted in-depth analysis and research to establish achievable, cost-effective levels of energy efficiency to inform proposed energy savings targets to support development of a triennial energy efficiency plan. By way of this letter and its attachments, the Council respectfully submits to the Commission for review and consideration high-level electric and natural gas energy efficiency savings targets for National Grid's energy efficiency procurement through 2017, consistent with Least Cost Procurement ("LCP").

Introduction and Legal Context

In 2010, the legislature adopted the ratemaking concept of revenue decoupling in R.I. Gen. Laws § 39-1-27.7.1. Pursuant to § 39-1-27.7.1(f), the Council was required to submit proposed energy savings targets to the Public Utilities Commission ("PUC" or "Commission") by September 1, 2010. The purpose of these targets was to give the utility guidance on the potentially available cost-effective efficiency resources in the state that would feed into the normal Least Cost Procurement ("LCP") 3-Year and annual efficiency program planning processes under § 39-1-27.7. During these normal planning processes required by Rhode Island law, the efficiency programs and budgets are developed by the utility and the cost-effectiveness of the budgets and programs is reviewed and approved by the Council before being filed with the Commission. In

addition, the parties receive crucial and substantial input and contributions from diverse stakeholders during the development of the 3-Year efficiency procurement and annual efficiency program plans. The following diagram illustrates the energy efficiency planning process – showing that implementation, oversight and feedback all flow from the initial target-setting step.

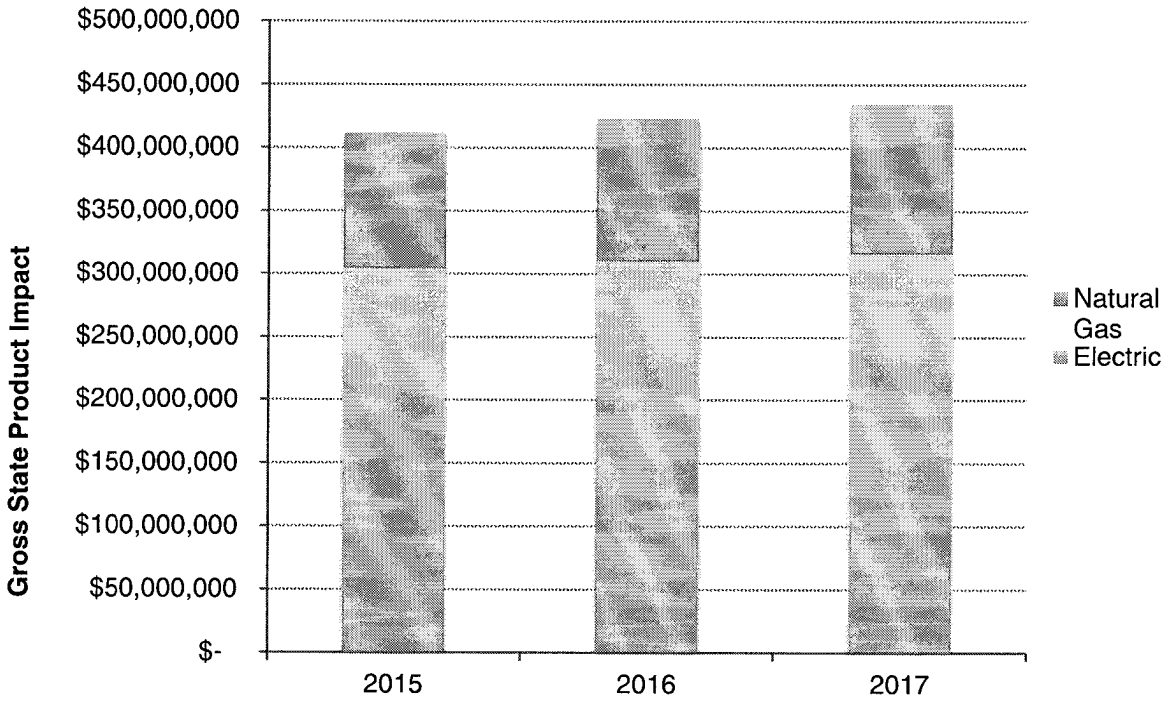


While Rhode Island Law § 39-1-27.7.1(f) only required one specific filing date for targets (September 1, 2010), it is understood as a responsibility of the Commission, and by extension the Council, under § 39-1-27.7(e)(4), that "the commission shall review and approve with any necessary amendments to performance-based energy savings targets developed and submitted by the Rhode Island energy efficiency and resources management council." Since the LCP process is legislatively mandated to continue through 2020, and the submittal for approval of savings targets has in the past served to support the LCP 3-Year planning process, the Council decided that its analysis and resulting proposed targets would be of assistance to the distribution utility, the stakeholders, and the Commission in their development and evaluation of the LCP plan for the period 2015 – 2017.

The successful procurement of the efficiency savings targets included in this filing will achieve tremendous economic results for the state. Between 2009 and 2012, Rhode

Island invested $130 million and $26 million in electric and natural gas energy efficiency, respectively. These investments have yielded $550 million and $107 million, respectively, in net energy benefits to customers, communities and the State of Rhode Island.[1] Electric energy savings have been procured at a cost of approximately 2-5¢ per lifetime kWh saved.[2] The proposed targets for 2015 – 2017 will build on and expand these impressive results. These efficiency savings targets submitted to the PUC by the Council will accomplish roughly comparable levels of economic benefit while complying with the Least Cost Procurement provisions of Rhode Island law that require the procurement of all electric and natural gas efficiency that is less costly than supply (*i.e.*, R.I.G.L.§ 39-1-27.7.2, which states *"least-cost procurement, which shall include procurement of energy efficiency and energy conservation measures that are prudent and reliable and when such measures are lower cost than acquisition of additional supply, including supply for periods of high demand"*). A reflection of these benefits is shown in the following two charts.

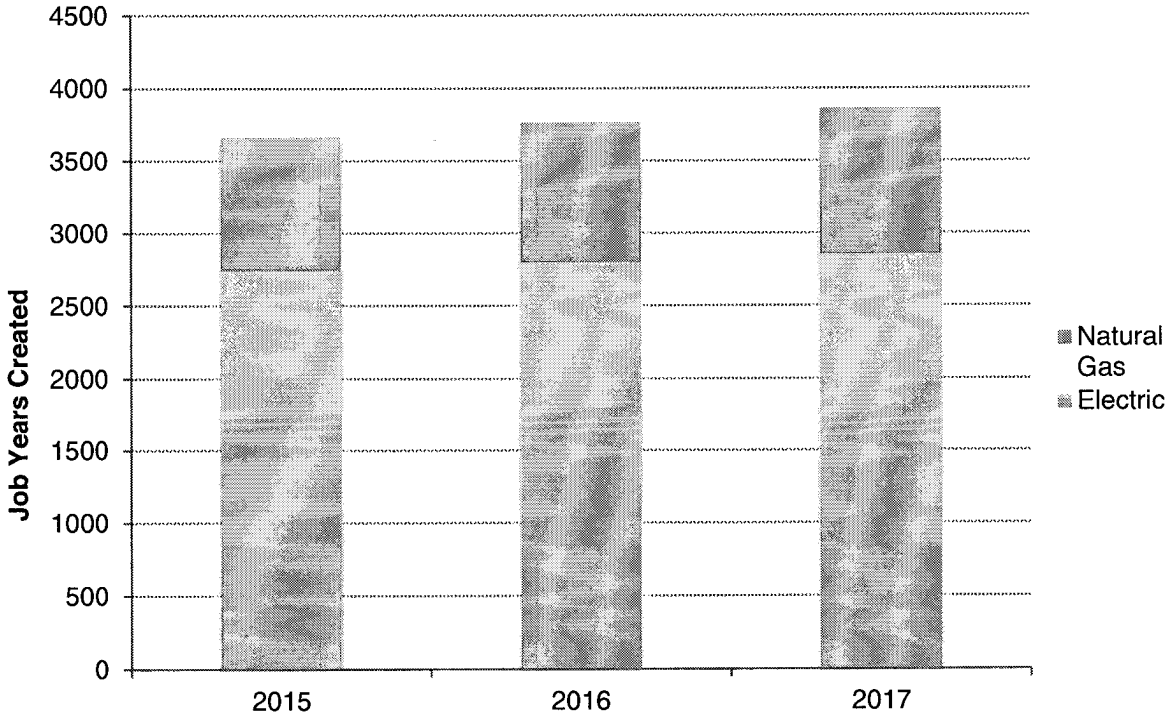
Chart 1. Approximate calculation of Rhode Island Gross State Product impact from proposed electric and natural gas savings goals:



Source: ENE, 2009. Energy Efficiency: Engine of Economic Growth. Synapse Energy Economics, 2007 and 2011 Avoided Energy Supply Costs in New England. Macroeconomic multipliers are adjusted for the change in avoided electricity and natural gas supply costs from 2007 to 2011.

[1] EERMC 2013 Annual Report. Tables 1 and 2.
[2] Id. Table 1.

Approximate calculation of job-years created resulting from proposed electric and natural gas savings goals:



Source: ENE, 2009. Energy Efficiency: Engine of Economic Growth. Synapse Energy Economics, 2007 and 2011 Avoided Energy Supply Costs in New England. Macroeconomic multipliers are adjusted for the change in avoided electricity and natural gas supply costs from 2007 to 2011.

In order to be of service to the Commission and the electric and natural gas consumers of the state, as well as meet its legal requirements under Least Cost Procurement, the Council and its Consultant Team devoted substantial time and resources to researching and developing efficiency savings targets that are cost-effective and that cost less than supply. The Council recommends the adoption of these savings targets to ensure that National Grid's efficiency procurement and programs generate hundreds of millions of dollars of bill savings for its customers by investing in significant quantities of efficiency resources that are lower cost than supply as required by R.I.G.L.§ 39-1-27.7(a)(2).

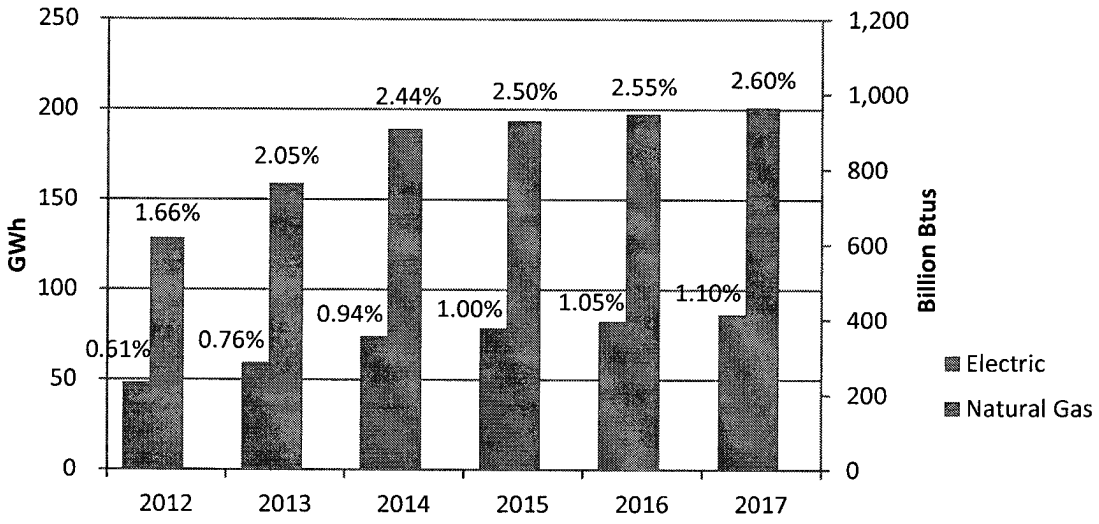
The Council respectfully requests that the PUC review and consider these high-level electric and natural gas least cost procurement efficiency savings targets for the years 2015-2017. In addition to complying with the LCP provisions of RI law, PUC approval will provide National Grid and the Council with the direction needed to start planning and preparing its upcoming detailed third 3-year LCP plan, which is required to be submitted to the PUC next year, September 1, 2014.

Summary of the Electric and Natural Gas Energy Efficiency LCP Savings Targets

The Council's proposed annual and cumulative energy efficiency saving targets for the period of 2015 – 2017 are:

Targets	2015	2016	2017
% of 2012 Electric Sales	*2.50%*	*2.55%*	*2.60%*
Electric (MWh)	193,603	197,475	201,347
Summer Demand (kW)	27,268	27,813	28,359
Winter Demand (kW)	27,658	28,211	28,764
% of 2012 Natural Gas Sales	*1.00%*	*1.05%*	*1.10%*
Natural Gas (MMBtu)	376,915	395,760	414,606

The figure below illustrates these targets relative to the targets for the current 2012-2014 3-year plan. All savings targets are shown as a percent of 2012 sales.[3]



Basis for Electric Energy Efficiency Savings Targets

To determine the potential for cost-effective electric energy efficiency savings that is cheaper than the cost of supply, the Council directed its Consultant Team to review and analyze the 2010 KEMA Opportunity Report ("the KEMA report"), which informed the 2012 – 2014 targets. The KEMA report identified levels of technical, economic, and achievable energy efficiency potential in Rhode Island over the years 2011 through

[3] The savings targets for 2012 – 2014 were set using 2009 sales as the baseline. This chart resets those targets against a baseline of 2012 sales for appropriate comparison with new targets. The original targets for 2012 – 2014 in terms of the 2009 sales baseline were 1.7%, 2.1% and 2.5% for electric, and 0.6%, 0.8% and 1.0% for gas.

2020 using the Total Resource Cost (TRC) test.[4] This offered the opportunity to improve assumptions and measurements using three years of practical experience in the field as well as bring forward new information and data.

The Consultant Team, in collaboration with a Council subcommittee, identified various adjustments (both positive and negative) deemed large enough to have a measurable effect on KEMA's original estimate of achievable potential. (See Attachment A.) While individual adjustments may either increase or decrease the potential, the net effect was a slight increase relative to the level originally identified in the KEMA report.[5] This suggests that there continues to be ample potential for cost-effective energy efficiency savings in Rhode Island, a finding that is reflected in our recommendation of gradually increasing targets from 2.5 percent to 2.6 percent of 2012 sales over the 2015-2017 time period.

While the cumulative savings (7.65 percent of 2012 sales) represented by these targets does not represent all *theoretically cost-effective* efficiency as identified by the analysis, the Council believes it complies with the intent of the law, which states that the targets need to be *prudent and reliable* as well as *lower cost than acquisition of additional supply*. We are confident the savings associated with these targets are lower cost than supply because they are cost effective under the TRC test. As noted in the Council's 2013 Energy Efficiency Program Plan Cost-Effectiveness memo, "The TRC test takes account of the costs and benefits of energy efficiency for both the utility and the customer. The benefits are calculated based on the avoided costs of electric energy and demand, and fossil fuels, and it takes account of measure costs (both utility incentive and customer contribution) thus it inherently compares the costs of efficiency to the total cost of energy supply. When an efficiency measure or program passes the TRC cost-effectiveness test, it is lower cost than supply as defined by the TRC in Rhode Island pursuant to the Standards and TRC definition."[6]

Basis for Natural Gas Energy Efficiency Savings Targets

Pursuant to recent revisions to R.I.G.L. § 39-1-27.7, Least Cost Procurement was expanded to natural gas in 2011, affording gas consumers in Rhode Island the opportunity to realize greater financial savings.

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[4] The development of the targets in the 2010 filing relied upon the in-depth, lengthy study commissioned by the EERMC and conducted by KEMA – *Phase II of the Opportunity Report* – which included more than 450 surveys and on-site visits with Rhode Island electric and natural gas customers over the course of 18 months in order to identify the size of the cost-effective efficiency resource that is cheaper than supply that exists in Rhode Island.

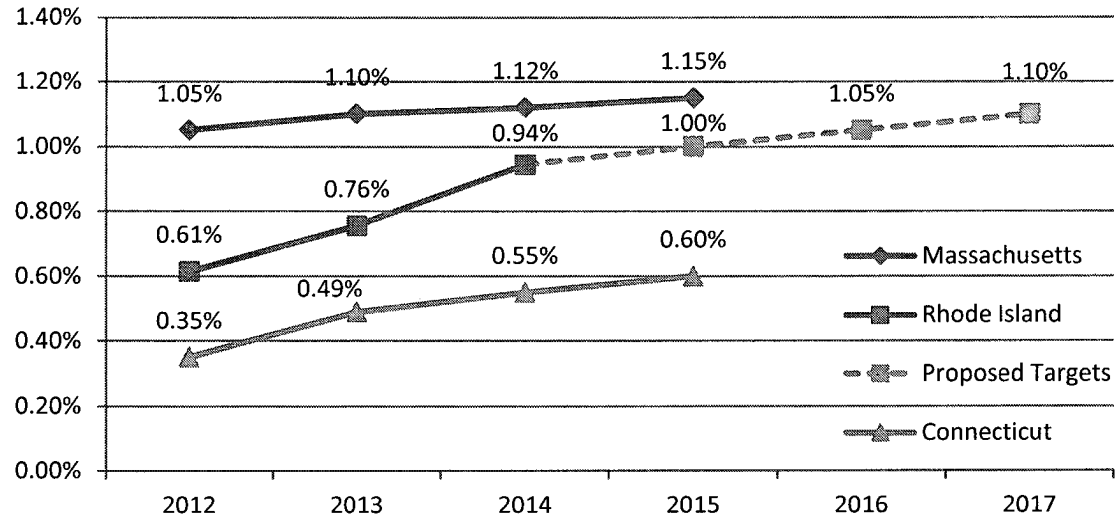
[5] The original KEMA report finds that 8.3% of 2012 sales can be met through cost-effective energy efficiency over the 2015-2017 time period (equivalent to annual electric energy savings targets of 2.8%, 2.7%, and 2.8%, respectively). The recent review of the KEMA report revises that finding to 8.5% of 2012 sales, or 2.9%, 2.9%, and 2.7% of 2012 sales in 2015, 2016, and 2017, respectively.

[6] R.I. Public Utilities Commission Docket No. 4366, 2013 Energy efficiency Program Plan Cost-Effectiveness Report. Available from: http://www.ripuc.org/eventsactions/docket/4366-EERMC-CEReport(11-20-12).pdf pp. 19-20

Because the state lacks a potential study for natural gas, the Council's Consultant Team reviewed the most recent and regionally appropriate natural gas efficiency potential studies to develop an estimate of the level of achievable cost effective savings.

The proposed targets also reflect a review of current Rhode Island performance relative to the approved saving target levels for 2012 - 2014, as well as the current and forecasted targets of efficiency programs in neighboring jurisdictions (see figure below). The actual and planned levels for Rhode Island and neighboring jurisdictions reflect a reasonable range of targets with steady ramp-ups. In addition, the Consultant Team drew upon the results of a Natural Gas Opportunity Report it prepared for the Council in 2012, which revealed a wide range of new potential measures and opportunities to accelerate current efforts.

In light of these factors, and taking into account the integrated nature of the gas and electric efficiency programs, our recommended targets mirror the gradual rise in targets proposed on the electric side.



Conclusion

The Council is excited to work with the Commission on behalf of the state's electric and natural gas consumers to bring significant energy cost savings by ensuring that all efficiency resources cheaper than supply are realized. As was undertaken in 2010, the target setting effort will provide tremendous value for the development of National Grid's procurement planning and program activities for the upcoming 3-Year Plan. These efficiency savings targets set a clear direction toward attaining the objectives and requirements of the Least Cost Procurement mandate of Rhode Island's 2006 Comprehensive Energy Bill and will provide high-level guidance to National Grid's development of their third 3-year plan for 2015-21017 over the upcoming year. Rhode Island's least cost procurement strategy and the energy efficiency planning process established by statute have resulted in high levels of customer savings and economic

benefits due to strategic investments in cost-effective energy efficiency and high-quality energy efficiency offerings and programs.

The proposed energy savings targets are based on thorough research and analysis of the cost-effective energy efficiency potential in Rhode Island and an assessment of the efficiency programs to date. This proposal is also the product of significant discussions and negotiation between the Council and National Grid and is broadly supported by both parties. The Council, National Grid, and the Office of Energy Resources support this proposal because our research and analysis show that these levels of energy savings are cost-effective and lower cost than supply and represent a prudent and reliable path for reducing Rhode Island's energy costs.

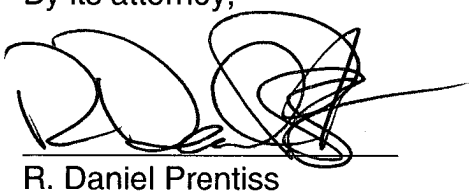
The proposed energy savings targets will be updated annually as needed, in concert with the annual and three-year program planning and budgeting cycle for Least Cost Procurement. In preparation for the 2015-2017 planning period, National Grid, in collaboration with the Council and the members of the Collaborative Subcommittee, will develop detailed program plans and budgets for electric and natural gas efficiency. National Grid's 2015-2017 Least Cost Procurement plan for electric and natural gas efficiency will be filed with the PUC on September 1, 2014 pursuant to R.I.G.L. § 39-1-27.7. Future updates to the targets will be considered annually, based on updated savings potential estimates, performance data, evaluation studies, and budget considerations, as appropriate. As the Consultant Team noted in its report to the Council, there are levels of uncertainty and potential variation in the numbers it compiled to support this filing. These uncertainties include the cost to acquire savings, market conditions, and results from the study of the performance of installed equipment that would be used to inform future plan development. The targets reflect a balance that the Council believes is appropriate for Rhode Island and consistent with the law.

It is the Council's hope that the Commission will review and consider the proposed high-level energy savings goals filed today so that the Council will have the clear direction it needs to engage with National Grid over the course of the coming year to prepare a detailed Energy Efficiency Procurement Plan for 2015-2017 required to be filed with Commission by September 1, 2014.

The Council and its expert consultants are always available to answer any questions the Commission may have and provide assistance in any manner that would be helpful to achieve the shared goals of reducing electric and natural gas consumers' bills through efficiency investments that are lower cost than supply.

Respectfully Submitted,
THE RHODE ISLAND ENERGY EFFICIENCY AND RESOURCE MANAGEMENT COUNCIL

By its attorney,



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CERTIFICATE OF SERVICE I hereby certify that on the Xst day of September, 2013, I delivered a true copy of the foregoing document either by first class mail or by electronic mail to the Rhode Island Public Utilities Commission as required by R.I.G.L.§ 39-1-27.7.1(f).

/s/ R. Daniel Prentiss

R. Daniel Prentiss

VERMONT ENERGY INVESTMENT CORPORATION || Optimal ENERGY Integrated Energy Resources Consultant Team

Attachment A

Energy Efficiency in Rhode Island: 2015-2017 Achievable Potential Assessment

Prepared for

The Energy Efficiency and Resource Management Council of Rhode Island

Prepared by

The Rhode Island Energy Efficiency and Resource Management Council Consultant Team

Lead Authors: Sam Huntington, Mike Guerard, Scudder Parker

August 5, 2013

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Electric

Natural Gas

Summary of Electric Targets and Development Process

This section presents the Consultant Team's estimate of cost-effective electric efficiency potential that National Grid could achieve through ratepayer-funded efficiency programs in Rhode Island. The intent of this assessment is to inform the process of setting savings targets for the state's next 3-year Plan, and is therefore focused on the years 2015 through 2017. As an exercise strictly aimed at quantifying savings potential, this assessment does not offer any program detail on the costs that would be required to achieve that potential.

Our estimate of electric potential was developed by reassessing the 2010 KEMA potential study for Rhode Island ("the KEMA report"), with a focus on evaluating what had changed since the study's completion. We concentrated our efforts on reasonably-quantifiable "dial turners" – adjustments of sufficient magnitude that, when corrected, would have a significant impact on the original potential estimate. The Consultant Team reviewed a variety of sources to inform these adjustments. They include:

- The 2010 KEMA study – *The Opportunity for Energy Efficiency that is Cheaper than Supply*
- Completed EM&V studies for Rhode Island and neighboring states
- Recent and planned program performance in Rhode Island and neighboring states
- National Grid's savings forecasts for select initiatives
- The 2013 Avoided Energy Supply Cost study
- Other relevant information from other jurisdictions

The Consultant Team, after conducting a detailed analysis informed by a broad cross section of available information, finds that the available potential for the years 2015 through 2017, as identified in the 2010 KEMA report, has not degraded, and in fact may have increased. We suggest a revised estimate of 656 GWh of cumulative potential for the years 2015 through 2017, as shown in the table below:

Achievable Potential Estimate	2015	2016	2017	3-Year Total
2010 KEMA Report (GWh)	217	209	215	642
% of 2012 Sales	*2.8%*	*2.7%*	*2.8%*	*8.3%*
Consultant Team Revised Estimate (GWh)	225	225	206	656
% of 2012 Sales	*2.9%*	*2.9%*	*2.7%*	*8.5%*

The rest of the report is organized into three sections: Overview of Methodology and Results, Base Potential Estimate, and Adjustments to Base Potential.

Overview of Methodology and Results

Table 1 summarizes the available quantitative estimates of potential using the consistent metric of "annual savings as a percent of load" for the entire state. Briefly, the data were generated as follows:

- The *Base Potential Estimate* is the estimate of achievable potential identified in the KEMA report. Since the intent of this exercise is to inform target recommendations for the next 3-year Plan, we have elected to look at the specific years in question – 2015 through 2017 as they were estimated by KEMA.
- *Adjustments to potential* refer to those factors identified by the Consultant Team as having changed sufficiently since KEMA's initial analysis to warrant closer reassessment. In some cases, they represent components of potential that were either overlooked or inaccurately included in KEMA's analysis and are now being factored in based on current knowledge.
- The *Revised Potential Estimate* represents the base potential estimate plus/minus the adjustments

Table 1 summarizes the results in terms of percent of 2012 sales. The base potential estimate is listed at the top, with the four "segments" of potential that make up the base listed immediately below. Adjustments to potential are either positive, negative, or zero – zero indicating that we found insufficient justification for making an adjustment in either direction based on factors netting out.

Table 1 | Consultant Team Revised Electric Potential Estimate

Potential Estimate (% of 2012 retail sales)	2015	2016	2017	Total
Base Potential Estimate				
KEMA Opportunity Report (2010)				
Existing Programs	1.7%	1.4%	1.3%	4.4%
Behavioral	0.5%	0.6%	0.7%	1.8%
Price Response	0.1%	0.2%	0.3%	0.5%
New Technologies	0.5%	0.5%	0.5%	1.6%
Total	**2.8%**	**2.7%**	**2.8%**	**8.3%**
Adjustments to Base Potential				
Codes and Standards	0.1%	0.1%	0.0%	0.2%
Combined Heat and Power	0.2%	0.2%	0.2%	0.5%
Residential Behavioral	-0.1%	-0.2%	-0.3%	-0.5%
Residential CFLs	0.2%	0.2%	0.1%	0.5%
Residential LEDs	0.0%	0.2%	0.2%	0.5%
LED Street Lighting	0.1%	0.1%	0.1%	0.2%
Avoided Energy Supply Costs	-0.1%	-0.1%	-0.1%	-0.2%
Price Response	-0.1%	-0.2%	-0.3%	-0.5%
New Technologies	0.0%	0.0%	0.0%	0.0%
Net-to-Gross Factors	-0.2%	-0.2%	-0.2%	-0.5%
Revised Potential Estimate				
Base Potential Estimate + Adjustments	**2.9%**	**2.9%**	**2.7%**	**8.5%**

Note: Totals may not equal the sum of their respective pieces due to rounding

Base Potential Study Estimates

The KEMA report – *The Opportunity for Energy Efficiency that is Cheaper than Supply* – is an energy efficiency potential study. This section describes some general limitations associated with potential studies, providing a lens through which to view the base estimate identified in the KEMA report.

Potential studies in and of themselves are ***estimates*** of energy efficiency potential. The methodology for conducting a study and the amount of money available to provide site-specific data on the state or region being assessed can change the outcome considerably. Furthermore, we note that potential studies generally *underestimate* the true potential for many reasons.

- Studies may be arbitrarily constrained in scope either by design of the study or due to limited time and resources. Therefore, they must be simplified through exclusion of measures, building types, or end-uses.
- Studies may ignore technology advancement. A look at the potential for LED lighting in 2005 would have indicated that most replacement opportunities were not cost effective, yet today Rhode Island's programs are realizing large amounts of cost-effective savings from this technology.
- The supporting economic analyses are unable to capture the full extent of benefits from efficiency. Project-level screening may not even include all of the energy benefits available in some instances, because comprehensive project screening requires consistent technical assistance support that is simply not available from all Program Administrators.
- Potential studies do not necessarily discuss the programs required to collect the potential savings. Rather, the study typically uses business-as-usual scenarios that will underestimate savings that could be acquired using cutting-edge program ideas.
- Synergies that magnify opportunities and systems that treat whole buildings comprehensively are often ignored.
- Studies stretch out early replacement opportunities throughout the full analysis period, rather than front-loading them to augment savings opportunities in the near-term.

There are several other constraints on the estimation methodology used in the KEMA report that the Consultant Team feels further reduce the reported potential estimate. The report caps incentives at 50 percent of incremental cost, which reduces the potential by limiting program penetrations. When incentives are not used as the driver of program penetration, the study assumes a maximum penetration of 80 percent, which amounts to reducing the economic potential by 20 percent. The study also fails to recognize "intelligent efficiency" – energy efficiency attained through optimization of whole systems. All of this leads the Consultant Team to conclude that these potential estimates are conservative and could reasonably be increased.

The KEMA report did take into consideration that Rhode Island had been offering efficiency programs for many years and that there was significant program penetration. The fact that KEMA still found deep savings opportunities indicates that efficiency potential tends to replenish itself over time. This reinforces the Consultant Team's belief that one should not view efficiency potential as a finite resource that goes away once captured. Indeed, experience has shown that technologies have

generally at least kept pace with past improvements in codes and standards, public efficiency program investments, and naturally adopted efficiency. For example, in 1989 the American Council for an Energy Efficient Economy (ACEEE) estimated the economic potential in New York to be approximately 30% of forecast load. After more than two decades of significant electric DSM program delivery in NY, a team led by Optimal Energy in 2003 (which included ACEEE) re-estimated the economic efficiency potential at 32.7% of forecast load, or approximately the same level. The result of this experience is that in a state that had been a leader in efficiency programs throughout the 1990s and 2000s, roughly the same proportional electric efficiency opportunities exist now as did when programs began. In light of this history it is reasonable to conclude that studies with longer time horizons tend to result in conservative implied annual achievable potential estimates.

Adjustments to Base Potential

Codes and Standards

The achievable potential estimate in the KEMA report did not include the electric savings opportunity from Codes and Standards (C&S) support. Energy savings from C&S require a considerable effort to implement, are complex to estimate, and can take years to occur. Nevertheless, their large impacts and cost-effectiveness justify engaging in such efforts.

In 2012, a statewide energy code compliance baseline study found overall code compliance to be only 70 percent.[1] Since the start of 2013 National Grid has pursued a C&S Initiative that utilizes a variety of innovative approaches to achieve code compliance and support standards development, with the goal of raising compliance to 90 percent by 2016. The most recent forecast for this initiative projects cumulative savings for 2015 and 2016 of 13.8 GWh. It is worth noting that this estimate is in line with other estimates of savings from C&S support that could be attributed to utility program efforts.[2] Savings for 2017 are estimated at 10 percent of 2016 levels based on input from National Grid. Combined, the savings from 2015 through 2017 add up to roughly 14.6 GWh, equal to roughly 0.2 percent of 2012 retail sales

We find this estimate to be conservative in that it assumes the current initiative achieves full market transformation. That is, the savings will not erode and National Grid would only be able to claim minimal savings from continued code support efforts once 90 percent compliance is reached.

Combined Heat and Power

The KEMA report did not include the electric savings opportunity from Combined Heat & Power systems (CHP). In Rhode Island, CHP has been an important contributor to National Grid's existing programs and will continue to be in the future. A 2008 potential study by NESCAUM identified a

[1] DNV KEMA, et al. *Rhode Island Energy Code Compliance Baseline Study*. July 23, 2012. pp. 1-3.
[2] Lee, Allen, et al. *Utility Codes and Standards Programs: How Much Energy Do They Save?* ACEEE Summer Study, 2008.

range of 200-330 MW of economic CHP in the state.[3] However, the report stopped short of estimating the amount that could be achieved through efficiency program activity – i.e. the achievable potential. It is worth noting that the achievable potential for CHP is generally much smaller as a subset of economic potential than that of energy efficiency. So, for example, while the KEMA report found achievable potential for energy efficiency to be about 95 percent of the economic potential, we would expect achievable potential for CHP to be a much smaller subset of the range identified by NESCAUM.

To create a realistic estimate of Rhode Island potential, we have instead relied on the recent program performance of Rhode Island's closest neighbors, combined with information from ACEEE's latest "CHP Scorecard".[4] The scorecard ranks states based on financial, technical, policy, and regulatory factors. A state can earn up to five points based upon its adoption of regulations and policies that encourage the deployment of CHP. These scores provide a way of comparing the achievements of different states by accounting for differences in the various factors that affect CHP installation. Table 2 below summarizes the available information on CHP achievements in Massachusetts and Connecticut, as well as the latest results from ACEEE's annual CHP scorecard.

Table 2 | CHP Program Performance and Scaling Factors

	Installed MW	Years to Install	2012 Annual Sales (TWh)	ACEEE Score (1-5)[5]
Massachusetts	27	2	47.3	4.5
Connecticut	186	5	29.9	3
Rhode Island			7.6	2.5

Averaging Massachusetts' and Connecticut's installed capacity, and scaling to Rhode Island using annual energy sales and ACEEE scores, we find annual achievable potential of roughly 3.8 MW. However, recognizing that Connecticut's installed CHP capacity is particularly high compared to other states and may be an outlier, the Consultant Team feels that a more reasonable and conservative estimate of 2 MW is appropriate. Assuming 2 MW of CHP could be installed annually, and assuming a conservative 7,000 annual run hours, we find cumulative energy savings potential of roughly 35.6 GWh over 2015-2017.[6] This is equal to roughly 0.5 percent of 2012 retail sales.

[3] NESCAUM with Pace Energy. July, 2008. *The Potential for Cost-Effective Combined Heat and Power in Rhode Island.*

[4] ACEEE. *The 2012 State Energy Efficiency Scorecard*. October 2012.

[5] The scorecard for CHP awards states points based on financial, technical, policy, and regulatory factors. A state can earn up to five points based upon its adoption of regulations and policies that encourage the deployment of CHP.

[6] Typically, the full load operating hours of a CHP unit must meet or exceed about 7,000 hours per year to be cost effective. The actual threshold varies by installation.

Residential Behavioral Program

KEMA's forecast of energy savings from residential behavioral initiatives overstates the potential compared to current industry best practices. Rhode Island's programs are at the forefront of this emerging opportunity, incorporating home energy reports, an online platform, and on-bill messaging into a suite of behavioral measures that save energy by encouraging participants to take actions like turning off the lights and adjusting the set point on their thermostat.

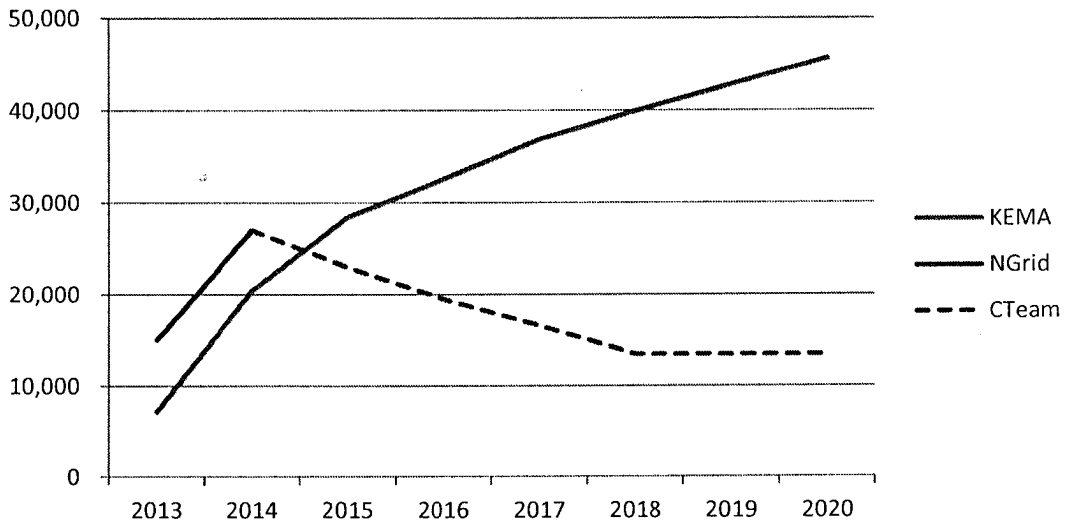
National Grid's 2013 annual plan estimates savings of roughly 15 GWh, with another 27 GWh projected in 2014. While they have yet to make estimates beyond 2014, they expect the level of savings to decrease due to opt-outs and decreases in baseline usage.[7] Furthermore, with behavior-based programs being a relatively new phenomenon, questions remain about the persistence of the energy savings. Will participants eventually become numb to the messaging? Will the initial observed energy savings disappear? If savings degradation materializes to the extent that some fear, the cost-effectiveness of the entire program could be called into question.

Recent evaluations of a similar program in Massachusetts, supported by a growing body of academic research, suggest that the savings will persist if the 'treatment' is continued – that is, if participants continue to receive the messaging year after year.[8] While we agree that the total program savings may decrease, we find it unreasonable to assume that the program will be discontinued altogether. As a middle ground between these two very different scenarios – a discontinued program or persistence of 2014 levels – we assume the savings will steadily decline from a peak of 27 GWh in 2014 to roughly half that level by 2018, at which point the savings would stabilize. Figure 1 shows this 'middle' scenario contrasted with KEMA's original estimate.

[7] Opt-outs refer to programs where customers have the choice to discontinue participation, but are not directly asked if they want to participate before receiving treatment. The OPOWER Home Energy Report program is the most common behavioral program in this model.

[8] Opinion Dynamics Corp. et al. June 2013. *Massachusetts Cross-Cutting Behavioral Program Evaluation Integrated Report.*

Figure 1 | Savings Potential of Residential Behavioral Program (MWh)



Based on the above analysis, the Consultant Team finds KEMA's original forecast to have overstated potential by a cumulative 38 GWh over the years 2015-2017. This is equivalent to roughly 0.5 percent of 2012 retail sales.

Residential CFLs

Compact Fluorescent Lamps (CFLs) have been a cornerstone product for energy efficiency programs, especially in the residential sector where they can account for as much as 50 percent of total savings. The KEMA report assumed that the Energy Independence and Security Act ("EISA") of 2007, which raised minimum efficacy requirements for general service lighting, would result in CFLs becoming the baseline residential lighting technology by 2014. Developments in the lighting industry, combined with loopholes in the legislation, have resulted in a gradual shift in the baseline to a blend of technologies, composed predominantly of EISA-compliant halogen bulbs. This development is markedly different from the sudden shift to CFLs that KEMA had anticipated and means that CFLs can continue to provide energy savings. Furthermore, recent evaluation studies have shown that residential socket saturation of efficient lighting may not be growing as quickly as anticipated despite prolonged and aggressive program activity.[9] This suggests that there continues to be considerable potential for savings in the residential lighting market.

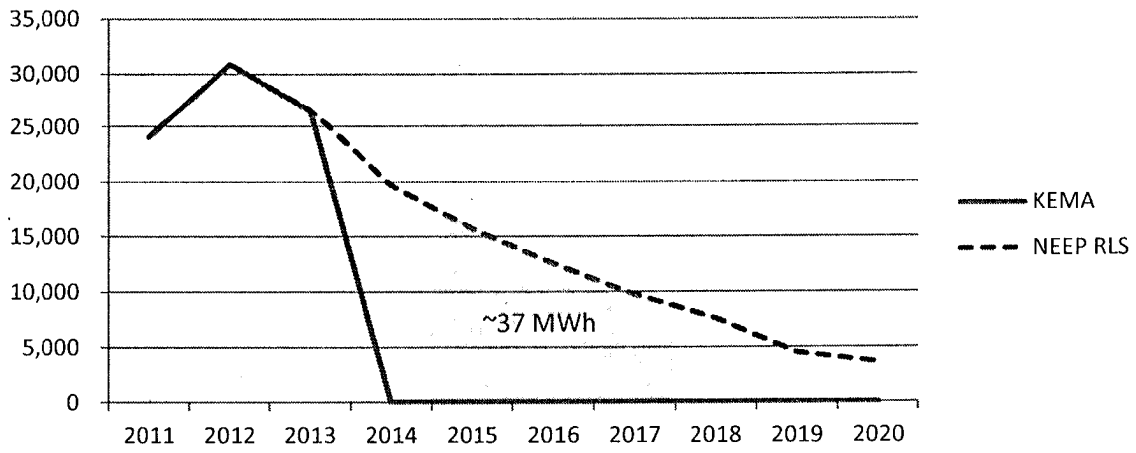
In an effort to develop strategies related to the issues identified above, the Northeast Energy Efficiency Partnerships ("NEEP") created a leadership advisory group composed of efficiency program staff, lighting manufacturers, retailers, distributors, and state and federal policy and regulatory interests. The output of this group is captured in the Northeast Residential Lighting Strategy ("RLS"), a roadmap document that identifies lighting barriers and solutions and provides strategy

[9] NMR Group, Inc. 2013. *Results of the Massachusetts Onsite Lighting Inventory.*

recommendations.[10] A core finding of the RLS is that CFLs will continue to offer significant, cost-effective and cost-efficient savings in the near to midterm. This finding is supported by a forecast of the regional savings potential that could be contributed by CFLs if the Northeast were to achieve 90 percent socket saturation of efficient lighting by 2020.

For the purposes of this analysis, we apply the CFL savings forecast from the NEEP RLS to the pre-EISA potential for CFLs identified in the KEMA report. The results of this approach are shown below in Figure 2.

Figure 2 | Savings Potential of Residential CFLs (MWh)



Based on the above analysis, the Consultant Team finds an additional amount of cumulative potential, beyond KEMA's original forecast, of roughly 37 MWh over the years 2015-2017. This is equivalent to 0.5 percent of 2012 retail sales.

Residential LEDs

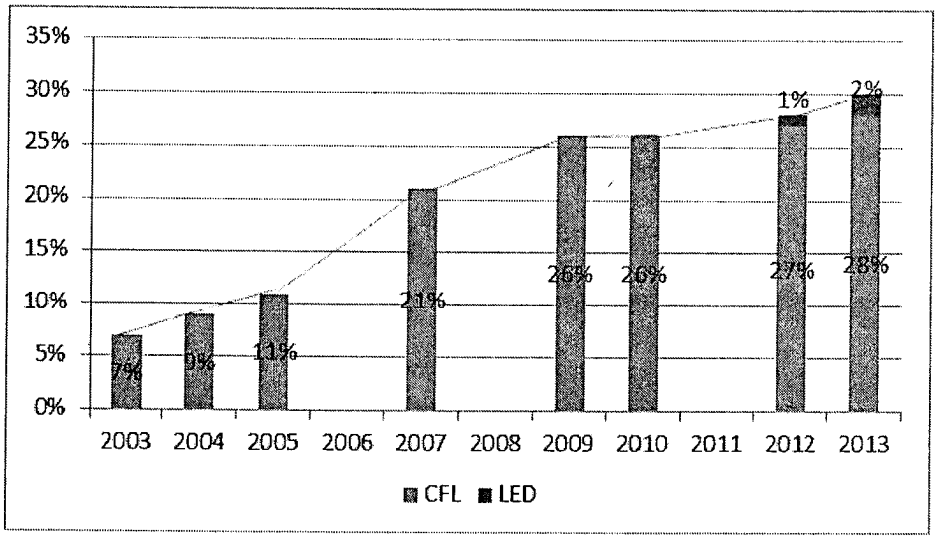
The past few years have seen LED replacement lamps entering the residential lighting market much faster than expected due to increasing efficacy and decreasing cost. This trend is expected to continue with utility-run efficiency programs playing a pivotal role in accelerating market adoption. The KEMA report assumed residential LEDs would offer significant savings potential in the two years following implementation of the EISA standards, but that savings would drop off sharply after 2015.

While it is not clear exactly what assumptions precipitated the decline in savings in KEMA's forecast, we suspect it was due to assumptions about market saturation for efficient lighting reaching its peak in 2015. If this were to happen, it would effectively eliminate the retrofit market as a source of savings and leave only the new construction and replace-on-burnout markets, which have much smaller annual potential. This would explain the continued, though much reduced, savings from LEDs post 2015.

[10] NEEP. December 2012. *Northeast Residential Lighting Strategy: 2012-2013 Update* http://www.neep.org/Assets/uploads/files/market-strategies/RLS%20Update_FINAL_1-7-13.pdf

Recent evaluation reports in Massachusetts have shown residential socket saturation for efficient lighting effectively plateauing despite years of aggressive program activity. Figure 3 shows the results of socket saturation evaluations over the past 10 years.

Figure 3 | CFL and LED Socket Saturation 2003 through 2013 (% of available sockets) [11]

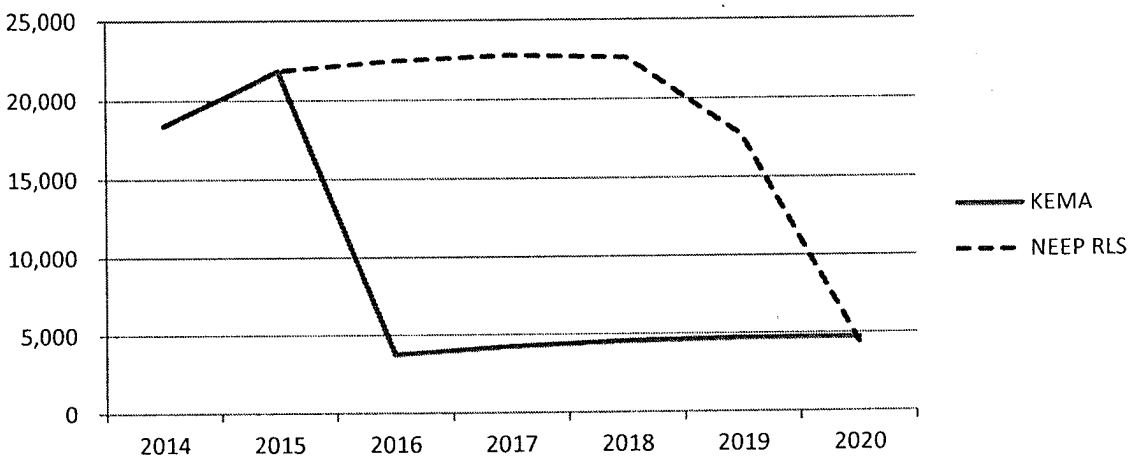


This finding suggests that since the lamps flowing through the program are not reaching new sockets, they must be replacing other burned-out efficient lamps. It also suggests that there remains significant opportunity for efficient lighting programs to generate energy savings.

As with CFLs, we consider the forecast in NEEP's Residential Lighting Strategy (RLS) a reasonable estimate for the level of achievable savings National Grid can expect from LED replacement lamps in the residential sector. To estimate the additional potential, we apply the LED savings forecast in the RLS to the level forecasted by KEMA prior to the drop-off. The results of this approach are shown below in Figure 4.

[11] NMR Group, Inc. 2013. *Results of the Massachusetts Onsite Lighting Inventory.*

Figure 4 | Annual Residential LED Savings Potential (MWh)



Based on the above analysis, the Consultant Team finds an additional amount of cumulative potential from LED lighting, beyond KEMA's original forecast, of roughly 37 MWh over the years 2015-2017. This is equivalent to 0.5 percent of 2012 retail sales.

LED Street Lighting

The advent of LED technology for street lighting applications provides a significant opportunity for energy efficiency savings. Furthermore, with successful demonstrations being completed across the country in recent years, this can now be considered a proven source of energy savings potential. Vermont is on track to convert nearly two-thirds of its street lights to LEDs by 2014, while Massachusetts has plans in place for a similar statewide initiative.[12]

KEMA modeled LED street lighting as part of National Grid's existing programs, finding 30 GWh of economic potential. While it is unclear how much of the 30 GWh was carried forward into the achievable scenario, for the purposes of this analysis we are assuming all of it was included.

Based on experience in Vermont and Massachusetts, we estimate roughly 400 kWh could be saved per fixture.[13] Combined with an estimated 123,000 National Grid-owned street lights, we find potential energy savings from upgrading street lights to LED technology to be approximately 48 GWh – equal to roughly 0.2 percent of 2012 retail sales.

[12] Arnold, et al. 2012. *A Win-Win-Win for Municipal Street Lighting: Converting Two Thirds of Vermont's Street Lights to LED by 2014*

[13] Conservatively assumes 90 watts of savings from replacing a 150W HPS with LED equivalent, at 4,380 annual operating hours. This equates to 47% savings – very conservative compared to the 70%-80% savings that have been demonstrated in some case studies.

This estimate is conservative in that it assumes no additional savings from lighting controls – a key provision of the recent legislation that could increase our estimate by another 10 GWh with widespread adoption.[14]

Electric Avoided Energy Supply Costs

Avoided energy supply costs ("AESC") are a critical component of cost-effectiveness screening because they are used to calculate the benefits of reduced energy usage associated with energy efficiency measures.[15] Changes in avoided costs will result in changes to a measure's benefits, making previously cost-effective measures not cost-effective, or vice versa. Since energy efficiency potential studies assess the total amount of cost-effective energy savings by adding up the savings potential associated with individual cost-effective measures, changes to avoided costs that result in an increase or a decrease in the number of cost-effective measures will ultimately affect the amount of efficiency potential a study finds.

Every two years, program administrators throughout New England jointly fund an avoided cost study – the *Avoided Energy Supply Costs in New England* ("AESC") – to support both their internal decision making and their regulatory filings for program cost-effectiveness analyses. The KEMA report relied on the 2009 version of this study. The latest version of AESC, published on July 12 of this year, shows lower overall projections for future avoided electric costs, as summarized, by component, in Table 3.

Table 3 | Comparison of Levelized Costs of Electrical Energy Supply Components

	15 year Levelized Costs (¢/kWh) (2013$)[16]			
Report	Energy	Capacity	DRIPE	Total
AESC 2009	9.97	0.61	3.13	13.71
AESC 2011	9.36	1.11	4.55	15.02
AESC 2013	7.64	2.01	3.44	13.09
% Change (2009 to 2013)	-23%	+229%	+10%	-5%

While the effects would differ by measure, in general we could expect to see a 5 percent reduction in electric benefits if the measures in the KEMA report were screened using the 2013 avoided costs. Lacking enough information to make a more precise revision, we have elected to simply reduce the base potential by 5 percent to account for the lower avoided costs. The amounts to a cumulative reduction of 17 GWh, equal to roughly 0.2 percent of 2012 retail sales.

This approach almost certainly overstates the impact of the lower avoided costs, and should be viewed as a significant conservatism.

[14] 10 GWh assumes 90 percent of fixtures are equipped with controls that dim light output by 50% between the hours of 12am and 5am.

[15] While often the primary benefit, they are not the only benefit in the cost-effectiveness equation. Depending on the test, others benefits may include: savings due to operations and maintenance, water, non-energy benefits, environmental externalities, and the deferred replacement credit

[16] Relative magnitude of each component based on the summer on-peak costing period for the WCMA zone. Assumes a 55% load factor and 100% of capacity bid into the Forward Capacity Market

Price Response

The Consultant Team believes that including price response as a component of efficiency potential is inappropriate because it depends on the PUC enacting real-time pricing across all rate classes, and is thus out of the control of the program.

Though we believe that, if price responsive rates were implemented, utility-run efficiency programs could play a role in advancing technology that helps ratepayers use the rates to conserve energy, at this point in time it remains outside of the bounds of achievable potential. Removing this component of potential results in a cumulative reduction of 37 GWh over the years 2015 through 2017, which is equal to roughly 0.5 percent of 2012 retail sales.

New Technologies

Forecasting energy savings from new technologies in potential studies is a notoriously difficult task. It requires making a considerable number of assumptions about the future costs, savings, and market penetrations of technologies that, by definition, have yet to become commercially viable. However, historical experience tells us that new technologies

- are constantly entering the market,
- generally keep pace with rising codes and standards, and
- contribute significant savings opportunities to utility-run efficiency programs.

Thus, despite the uncertainty, forecasting some level of savings attributable to future technologies is critical if potential studies are to be used to set long term policy.

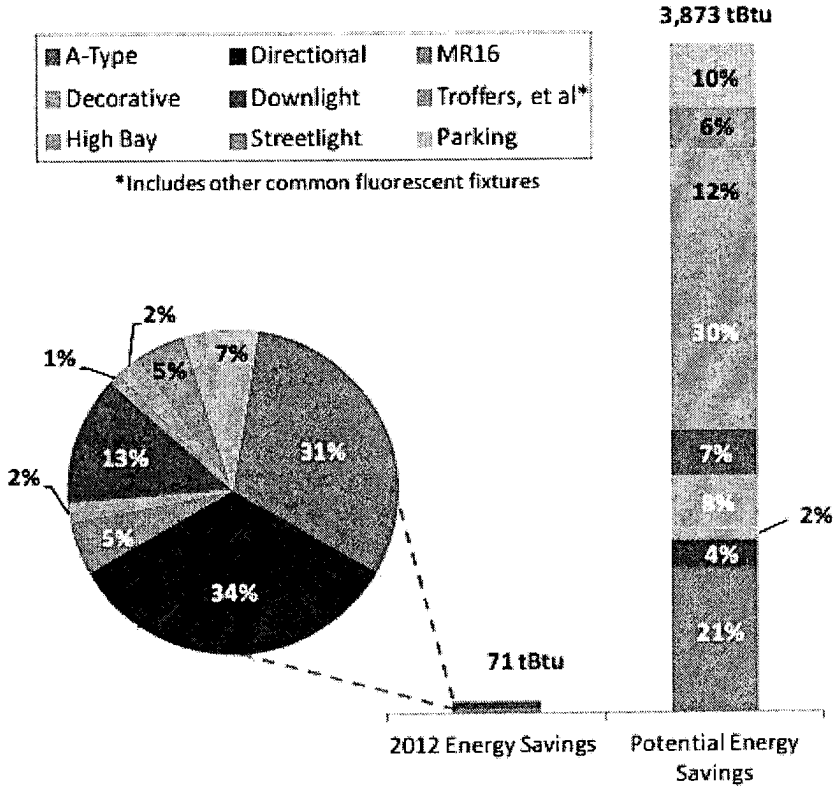
Some studies invest considerable time and effort trying to predict the future costs and efficiency levels of particular products or end uses, while others, recognizing the inherent uncertainty, attempt simpler approaches based on a few general assumptions. The KEMA report took the latter approach, as summed up in this quote from an appendix:

> *"We ultimately decided to use a generic, simplistic and conservative approach and estimated new technologies to grow to approximately three percent of total energy and demand by 2020."*

The result of this approach was a forecast of about 41 GWh each year over the 2015 through 2017 period. To determine whether this approach was at least "in the ballpark," we looked at an area of new technology that is widely accepted as demonstrating the potential to provide significant savings to efficiency portfolios, and whose potential can actually be reasonably forecasted given predictable trends in pricing and efficacy: LED lighting.

A recent report by the U.S. Department of Energy (DOE) estimated the technical potential for LED lighting in common applications. The estimate assumed *currently available* LED products and looked at the potential of converting the entire stock of lighting in the selected applications. The results are summarized in Figure 5 below.

Figure 5 | Comparison of Current and Potential Source Energy Savings



If we exclude Street lighting, A-Lamps, and Decorative applications (all treated separately in other sections of this report), and scale the results to Rhode Island, we find technical potential of 576 GWh. Applying KEMA's finding that roughly 80% of technical potential is achievable over ten years, we arrive at 46 GWh of annual achievable potential – slightly higher than KEMA's prediction of 41 GWh.

Clearly, this is a very high-level and simplistic approach. Our estimate is not the product of detailed modeling involving cost-effectiveness screening, market adoption rates, or program design considerations. However, we consider only a single technology, ignoring the potential of the many other promising technologies arriving on the market, including heat pump water heaters, cold climate heat pumps, and virtual building commissioning to name a few. So despite the many limitations, we think our estimate provides a reasonable check on KEMA's original forecast, suggesting that, at the very least, KEMA was "in the ballpark." Given that conclusion, and the many uncertainties inherent in this exercise, we think it would be inappropriate to adjust, either up or down, KEMA's original potential estimate for new technologies.

Net-to-Gross Impacts

Net to gross impacts refer to factors identified by evaluation studies that get applied to program savings to determine the net impacts attributable to the program. The primary, though not exclusive, considerations that account for the difference between net and gross savings are free-ridership and

spillover.[17] In recent evaluations free-ridership has generally been outweighing spillover resulting in negative net-to-gross impacts. Thus, programs are experiencing declining savings for the same level of effort. This is a somewhat natural trend for mature programs that have achieved significant market penetration – as the market becomes saturated it gets more difficult to acquire the next marginal unit of savings.

Since the KEMA report was initially published, the overall net-to-gross impacts on National Grid's portfolio have decreased from 88 percent to 77 percent – a 12 percent decline. To adjust for this difference, we have decreased the potential KEMA identified for "existing programs" by 12 percent. The net effect of this adjustment is a decrease of 41 GWh, equal to roughly 0.5 percent of 2012 sales.

[17] Free-ridership refers to program participants who would have implemented the same or similar efficiency projects without the program now or in the near future. Spillover refers to additional energy efficiency actions taken by either participants or non-participants as a result of program influence.

Summary of Natural Gas Targets and Development Process

This section summarizes the Consultant Team's process for developing natural gas savings targets for National Grid's next Rhode Island 3-year Plan. In contrast to the electric sector, there is no state-specific potential study that estimates the level of cost-effective natural gas efficiency – the threshold for savings targets mandated by Rhode Island's Least Cost Procurement law. As an alternative, the Consultant Team has relied upon estimates from regional studies combined with past and projected performance of Rhode Island's and neighboring states' efficiency programs to inform our recommended targets.

As a result of these efforts, the Consultant Team finds that a continued upward trajectory of savings targets is both reasonable, in light of regional program performance, and appropriate, given the mandate of Least Cost Procurement. The recommended savings targets are summarized in the table below.

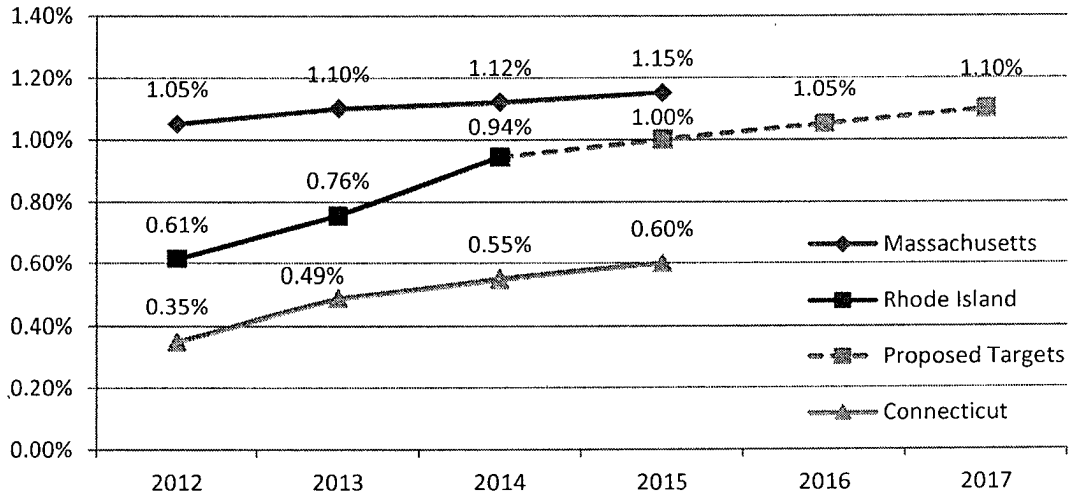
Targets	2015	2016	2017
Annual MMBtus	376,915	395,760	414,606
% of 2012 Sales	*1.00%*	*1.05%*	*1.10%*

It is worth noting that we are not identifying a specific level of cost-effective energy efficiency potential due to various reservations including the studies' age, modeling limitations, and especially the changes in avoided costs that have occurred since the studies were published. That being said, we do feel that the proposed targets are well within the bounds of achievable potential.

Regional Context

In the process of developing appropriate savings targets it is useful to consider the experience of Rhode Island's neighbors. Figure 1 below summarizes the recent achievements and future targets in Massachusetts, Connecticut, and Rhode Island, and compares them to the Consultant Team's recommendations. The comparison is made in the common term 'percent-of-sales'.

Figure 1 | Regional Natural Gas Savings Targets (% of Sales)



As Figure 1 demonstrates, our recommended targets are consistent with the trajectory of those in neighboring states.

Potential Study Review

The Consultant Team's first step in the targets development process was to review the most recent and regionally appropriate natural gas potential studies. These efforts are summarized in Table 1 below.

Table 1 | Summary of Natural Gas Potential Study Findings

			Energy Savings Potential (% of Sales)			
State	Year	Period (yrs)	Tech.	Econ.	Ach.	Annual
NH	2009	10	29.2%	16.9%	8.3%	0.83%
CT	2009	10	28.8%	25.2%	16.6%	1.66%
MA	2009	10	44.0%	36.3%	25.5%	2.55%
NY	2008	10			13.5%	1.35%
	Average		34.0%	26.1%	16.0%	1.60%

While we believe the reviewed studies are a useful reference point, we note that they suffer from the same limitations discussed in the electric section – notably that the methodology for conducting a study and the amount of money available to provide site-specific data on the state or region being assessed can change the outcome considerably.

In contrast to the above-described limitations that depress potential study findings, the higher avoided costs used by the reviewed studies inflate the results compared to what they would find today. Today's lower avoided costs mean the benefits associated with natural gas efficiency are lower, and thus so is the future potential. The differences in avoided costs are summarized in Table 2 below.

Table 2 | Summary of Avoided Energy Supply Cost (AESC) Study Findings

	15 yr Levelized Cost ($/MMBtu) (2013$)		
Report	Residential	Commercial	Total
AESC 2009	$14.95	$12.40	$13.31
AESC 2011	$9.43	$8.74	$9.04
AESC 2013	$8.11	$7.45	$7.79
% Change (2009 to 2013)	-46%	-40%	-41%
% Change (2011 to 2013)	-14%	-15%	-14%

As the above table shows, the avoided cost of natural gas has decreased by roughly 41% since the most recent potential studies were published and by roughly 14% since Rhode Island's last 3-year Plan.

Another point of reference for interpreting the results of potential studies is the 2012 Natural Gas Opportunities report developed by the Consultant Team. The report reviewed various new technologies, practices and program designs that could increase gas savings. While the report stopped short of providing achievable potential estimates, it demonstrated that there are many new promising opportunities for enhancing current natural gas efficiency programs.

Given the combined effects of study limitations, lower avoided costs, and new gas opportunities, the Consultant Team does not feel comfortable identifying a specific level of achievable potential. However, we do feel that the true level is above the proposed targets, and thus our recommendations are reasonable and in compliance with Least Cost Procurement.