

**Cost-Effectiveness Report:
National Grid's 2018 Energy Efficiency and
System Reliability Procurement Plan**

**An Assessment and Report by
The VEIC/Optimal Energy Consultant Team**



Working on Behalf of the



**STATE OF RHODE ISLAND
ENERGY EFFICIENCY &
RESOURCE MANAGEMENT COUNCIL**

Submitted to the Rhode Island Public Utilities Commission

November 17, 2017

Summary of Consultant Team Findings

The Energy Efficiency and Resource Management Council (EERMC) Consultant Team finds that the *Annual Energy Efficiency Plan for 2018* (the "EE Plan"), filed on November 1, 2017 by National Grid, is cost-effective according to both the recently adopted "Rhode Island Test" (RI Test) and the historically referenced Total Resource Cost (TRC) test. The new RI test was created by the revised Least Cost Procurement Standards approved by the Public Utilities Commission ("the Commission") on July 28, 2017.¹ Furthermore, the energy savings are projected to cost less than the acquisition of additional supply, which is a further requirement of LCP and R.I. Gen. Laws § 39-1-27.7 (a)(2).

We also find that the implementation strategies outlined in the Plan will support a reasonable and credible sustained implementation of National Grid's energy efficiency program delivery efforts, and align with the savings targets and revised Least Cost Procurement Standards proposed by the EERMC in its December 22, 2016 filing and approved by the PUC at its Open Meeting held on April 27, 2017.

Last, we find that the proposed investment in grid reliability described in the SRP is cost-effective, and will defer a substation upgrade for four years, generating substantial benefits for ratepayers.

These findings and the remainder of this report were distributed to the EERMC on November 9, 2017 and presented to the EERMC by the EERMC Consultant Team at its November 16, 2017 meeting, and were approved and adopted in a vote of the EERMC.

Because the EE Plan and the SRP Report have been approved by the EERMC and meet the cost-effectiveness requirements of R.I.G.L. § 39-1-27.7(c)(5), the EERMC recommends that they also be approved by the Commission based on the Consultant Team's analysis and report.

¹ Section 1.2.B., http://www.ripuc.org/eventsactions/docket/4684-LCP-Standards_7-27-17.pdf

I. Introduction

This report was prepared by the Consultant Team and the EERMC to help fulfill the requirements of R.I.G.L. § 39-1-27.7(c)(5) related to the Public Utility Commission's approval of National Grid's three-year procurement plan and related annual energy efficiency plans. Since 2010, the EERMC has directed the Consultant Team to prepare this report for all three-year and annual plans filed with the Commission. This version addresses National Grid's proposed *Annual Energy Efficiency* ("the EE Plan") and *System Reliability Procurement Report* ("the SRP Report"), reviewed by the Council at its October 19, 2017 meeting. The Council voted to approve this report at its November 16 Council meeting.

This report submits our finding that the EE Plan and SRP Report are cost-effective as evidence to the Commission. It also describes the nature and process of the review and documents the professional experience and qualifications of the Consultant Team that performed the review.

In order to assess the cost-effectiveness of the EE Plan and SRP Report, the EERMC Consultant Team engaged in the following plan development and review processes:

1. Consistent and on-going oversight of actual National Grid energy efficiency planning and implementation activities through direct interactions with National Grid staff and participation in the Collaborative Subcommittee process (documented in Section II).
2. Reviewing the details of National's Grid Benefit-Cost Models ("BC Models") to ensure that they accurately reflect the proposed program designs in the Plan, recent evaluation results, and relevant TRM inputs (Section III)
3. Reviewing additional inputs to the cost-effectiveness calculations, including new components resulting from the revised Least Cost Procurement Standards approved by the PUC on April 27, 2017 (Section IV).

Appendices to this report provide additional information on the relevant regulatory and legal framework for this report as well as the qualifications of the Consultant Team to perform this review.

II. Oversight of Planning and Implementation Activities

The EERMC, consistent with its statutory obligations under the 2006 Comprehensive Energy Act, continues to play an involved and active role with National Grid to guide, facilitate, and support public and independent expert participation in the review, oversight, and evolution of utility energy efficiency procurement and program implementation. The EERMC believes this input is critical to having the energy efficiency programs and new cost saving mechanisms evolve into resource acquisition tools that can effectively implement the Rhode Island law to procure all cost-effective natural gas and electric energy efficiency. The updated Standards in

Docket No. 4684 require a consistent and effective process to guide the development and submission of National Grid's Plan to the Commission.

The EERMC has met its review and input requirements both at its regularly scheduled meetings with National Grid and through Collaborative meetings and phone calls. The Collaborative is comprised of EERMC members; the EERMC Consultant Team; RI Office of Energy Resources (OER); Acadia Center; the Division of Public Utilities and Carriers with representation from the Attorney General's Office and support from its consultant; People's Power and Light; and TEC-RI. National Grid coordinates and hosts the meetings, and has energy efficiency and system reliability representatives in attendance at all meetings.

For the EE Plan, the Consultant Team reviewed and commented on two drafts of the Plan in September and October of 2017. This included attending or participating in presentations by the Company and providing comment in both written form and through in-person and telephone conversations with the Company and EERMC members.

III. EE Plan Program Design and Evaluation Review

The Consultant Team reviewed the draft and final Plans to assess the proposed program designs and the extent to which they and the associated cost-effectiveness analyses reflect recent evaluation results and relevant TRM inputs. This included the following:

- Reviewing updates to the 2017 TRM to assess the measures and assumptions used in the calculations of energy and capacity savings proposed programs, and to ensure that these are accurately reflected in the BC models.
- Reviewing assumptions regarding program activity, in the form of measure quantities, to ensure they are appropriate and reflect the program design and descriptions in the Plan.
- Reviewing the mix of measures and net-to-gross values used in the BC Models to ensure they reflect the latest evaluations available.
- Comparing the BC Models to the proposed targets adopted by the Council in Docket 4684 and noting any differences, which were raised to the Company for explanation and resolution.

As a result of these activities, the Consultant Team communicated with National Grid analysts and sector managers to address pertinent issues and questions related to both program design and cost effectiveness. In some cases, this resulted in revisions to the Plan. Overall, our findings are that:

- The overwhelming majority of the modeling and cost-effectiveness assumptions reviewed were reasonable and well-supported. Any issues identified in the BC Models or in the Plan were addressed at the portfolio and program level by National Grid's analyst team.

- National Grid appropriately used new results from both Rhode Island and relevant Massachusetts evaluations that were recently completed to update multiple measure baselines, net-to-gross ratios, measure lives, and other measure assumptions.
- The objectives of the Least Cost Procurement Standards were followed to ensure that program designs and the resulting implementation secure cost-effective energy efficiency resources that are lower than the cost of supply, are prudent and reliable, and deliver hundreds of millions of dollars in bill savings to Rhode Island customers

In general, the Consultant Team found National Grid's processes for revising their cost-effectiveness inputs and assumptions to be thorough and comprehensive. National Grid appropriately adjusts baselines for new building codes and federal standards, and incorporates the latest findings from evaluation studies. In addition, the Company updates anticipated program costs based on recent experience and new market information.

IV. SRP Report Project Screening Review

The Consultant Team also reviewed the 2018 System Reliability Procurement Report filed by National Grid to determine if the proposed projects are cost-effective and to develop a qualitative understanding of the proposed investments. The Report describes a number of initiatives the Company will take in 2018 to support future investments in system reliability through non-wires alternatives (NWA). These include developing maps showing distribution system loading constraints and areas where distributed generation may have the most value from a reliability standpoint.

These initiatives were developed through close collaboration and negotiation between National Grid, the Collaborative, and the Consultant Team. Although they will not directly result in reductions in demand or increased reliability, this group of stakeholders agreed that they are important to ensuring that NWA are adequately considered to meet reliability needs identified in the coming years. Discussion in this group also addressed the reasons why over 40 distribution system upgrades did not meet the screening criteria for a possible NWA solution. Most of these projects are needed to replace aging assets or are expansions of energy management systems, rather than to increase the capacity of the distribution system. With better information, the stakeholders hope that more locations for NWA can be identified in the next few years.

Our assessment of the cost-effectiveness of the SRP battery storage project appears below.

V. Cost-Effectiveness Review

Defining Cost-Effectiveness

Cost-effectiveness tests for energy efficiency measures and programs compare the net present value of a stream of benefits to the net present value of a corresponding stream of costs, whether they occur at the time of implementation or over several years. When the benefits exceed the costs, the measure or program is said to be “cost-effective.”² Several tests exist, each of which assesses cost-effectiveness from a different perspective. The Total Resource Cost (TRC) has been widely accepted and used by regulators and policy-makers to evaluate demand-side management programs because it takes an expansive view of the effects of these programs, including all of the costs borne by consumers (whether directly or indirectly through utility rates) and all of the benefits that accrue to those consumers. Historically, Rhode Island relied on the TRC test to assess whether the benefits of an efficiency measure or program outweighed the costs for Rhode Island consumers.

More recently, the Rhode Island Public Utilities Commission ordered National Grid to develop a benefit-cost test that “more fully reflects the policy objectives of the State.” The Commission did not specify the components of the new “Rhode Island Test” (or “RI Test”) in detail, but provided a number of principles to follow, including symmetry, transparency, and the importance of accounting for all relevant impacts, even those that are difficult to quantify or monetize.

National Grid subsequently proposed two additional categories of benefits to include in the new RI Test in addition to those already included in the TRC. These were discussed among the EERMC Consultant Team, the Division, the Collaborative, and National Grid. Based on general agreement, these benefits have been included in the cost-effectiveness analysis presented in the Plan. They are:

- **The benefits associated with reduction in greenhouse gas (GHG) emissions** – The TRC test used in previous Plans accounted for the costs of mitigating CO₂ emissions imposed by the Regional Greenhouse Gas Initiative and the costs of reasonably anticipated future GHG regulations.³ The revised Standards provide for inclusion of additional value related to GHG emissions reductions.

² The results of this analysis can be expressed as either the net benefits (i.e., total benefits minus total costs), where cost-effective is defined as positive net benefits, or as the benefit-to-cost ratio (total benefits divided by total costs), where cost-effective is defined as a ratio of greater than or equal to 1.

³ The cost of mitigating emissions becomes a benefit in the cost-effectiveness analysis, because energy efficiency results in lower emissions, and thus avoids some of these costs. Rather than account for them as a negative cost, they are considered a positive benefit.

- The benefits associated with economic development resulting from investment in energy efficiency** – Changes in how consumers and other entities spend money in the Rhode Island economy can result in changes in overall economic activity. For example, shifting spending from goods or services produced outside of the state to those produced within the state with increase in-state economic activity. Because investing in energy efficiency in part replaces spending on energy, the Plan may result in such a shift. The economic impacts of investing in one type of energy efficiency measure (combined heat and power, or CHP) were included in previous cost-effectiveness analyses; the new RI Test extends this to capture these impacts for all Plan activity.

Assessing the Cost-Effectiveness of the 2018 EE Plan

The final Plan presents the cost-effectiveness of the proposed 2018 programs using both the TRC and the RI test. The table below summarizes the results in terms of benefit-cost ratio. Considering just the TRC, both the electric and gas portfolios are robustly cost-effective in every year; electric portfolio benefits are nearly twice the total costs of the investments, while gas portfolio benefits exceed costs by 50%.

BCR	TRC Test	RI Test
Electric	1.7	2.8
Gas	1.7	2.8

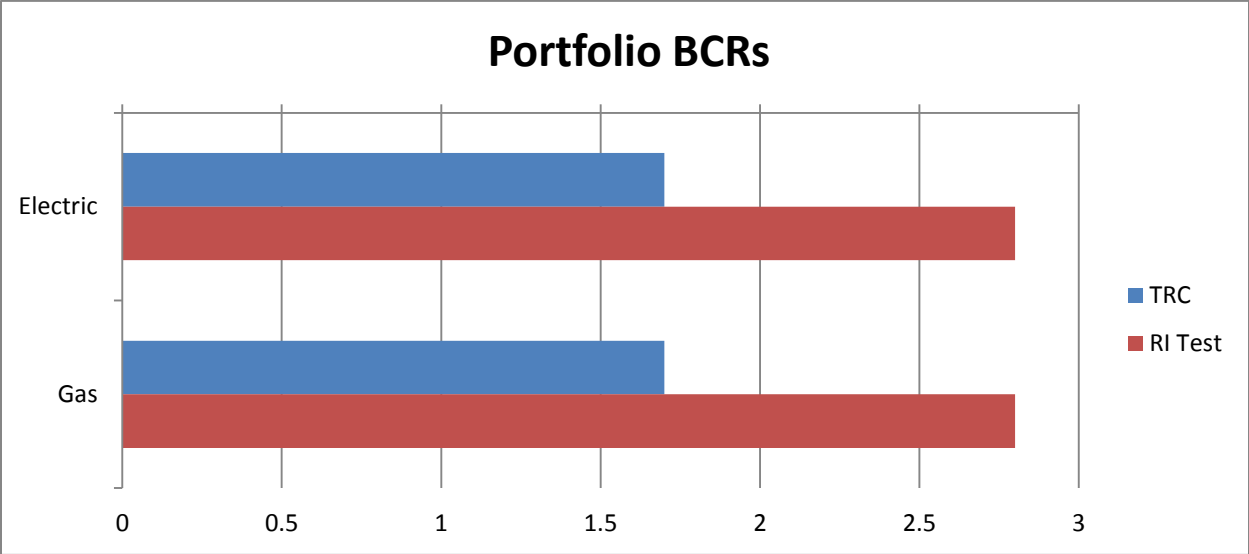
As described above, the RI Test seeks to include a more complete set of benefits that better reflects state policy. The benefits associated with reductions in greenhouse gas (GHG) emissions have been included by relying on the 2015 version of the *Avoided Energy Supply Costs in New England* report (AESC). This report projects a long-term value of reductions in carbon emission of \$100 per short ton. A small portion of this value – representing the near-term value of carbon reductions given current and likely future carbon regulation – is already included or “embedded” in the avoided energy costs that compose a portion of the benefits under the TRC Test. Therefore, the RI Test includes the remaining value of carbon emissions up to the full \$100 per ton value.⁴

It is generally acknowledged that increased spending from installing energy efficiency measures creates jobs in the local economy. Participant and program spending on efficiency often has positive benefits to the local economy as a greater portion of total energy costs are spent

⁴ Values for non-embedded CO₂ are presented in several tables in the 2015 AESC: Exhibit 4-5 for electric savings, Exhibit 4-14 for gas savings, and Exhibit 4-18 for oil savings.

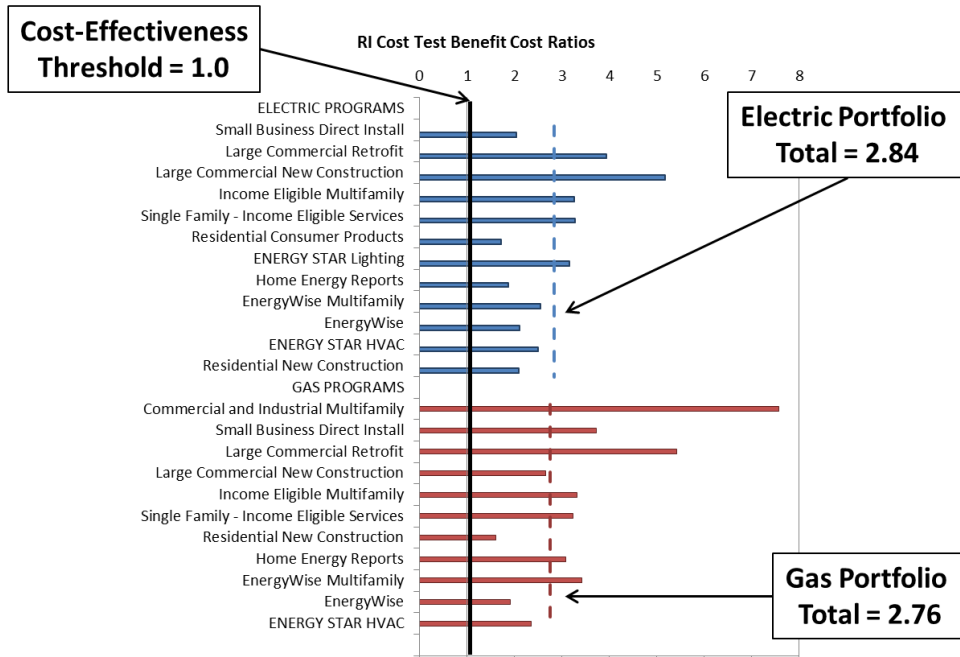
locally. Yet these benefits are typically not included in TRC benefit calculations because they are difficult to quantify, requiring a regional economic model. Such an analysis was conducted for National Grid in 2014, the results of which form the basis for the economic benefits included in the RI Test.⁵ Depending on the sector, fuel, and source of spending (i.e., participant or program), the study found economic benefits (above and beyond the value of avoided energy and capacity) of between \$0.56 and \$0.75 for each dollar spent. These factors were used to calculate the economic benefits in the RI Test results.

The Consultant Team has reviewed the quantification of the GHG reduction and economic benefits in the RI Test and finds them to be appropriate and in keeping with the Commission's direction. Returning to the table above, the inclusion of the more complete set of benefits in the RI Test results in a 66% and 62% increase in BCR for the electric and gas portfolios, respectively. The figure below presents the results of the RI Test in graphical form and again demonstrates that both the electric and natural gas efficiency programs have a BCR greater than 1.0, as required by the Commission-approved Least Cost Procurement Standards and R.I.G.L. § 39-1-27.7 (c)(5).

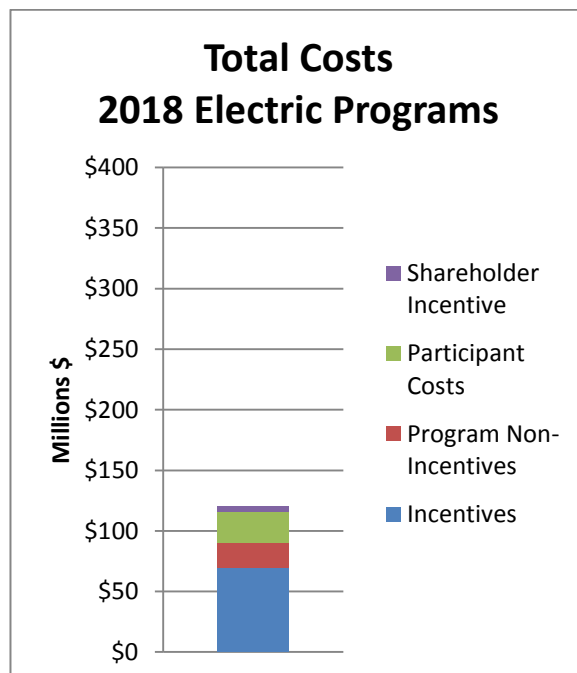
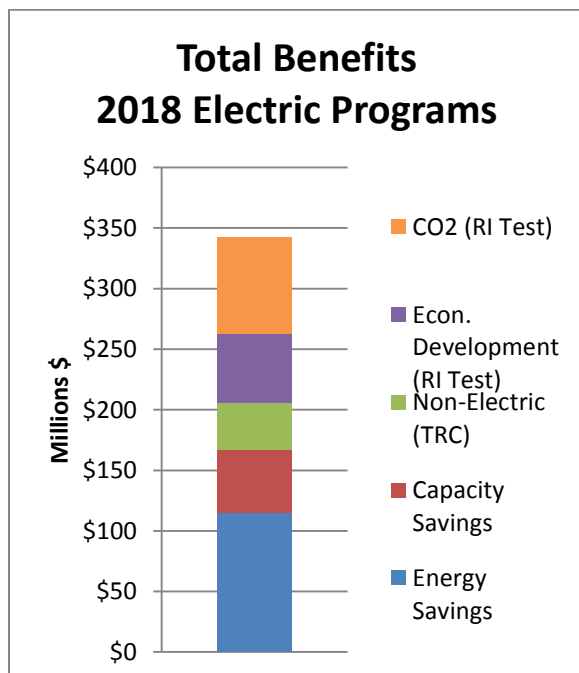


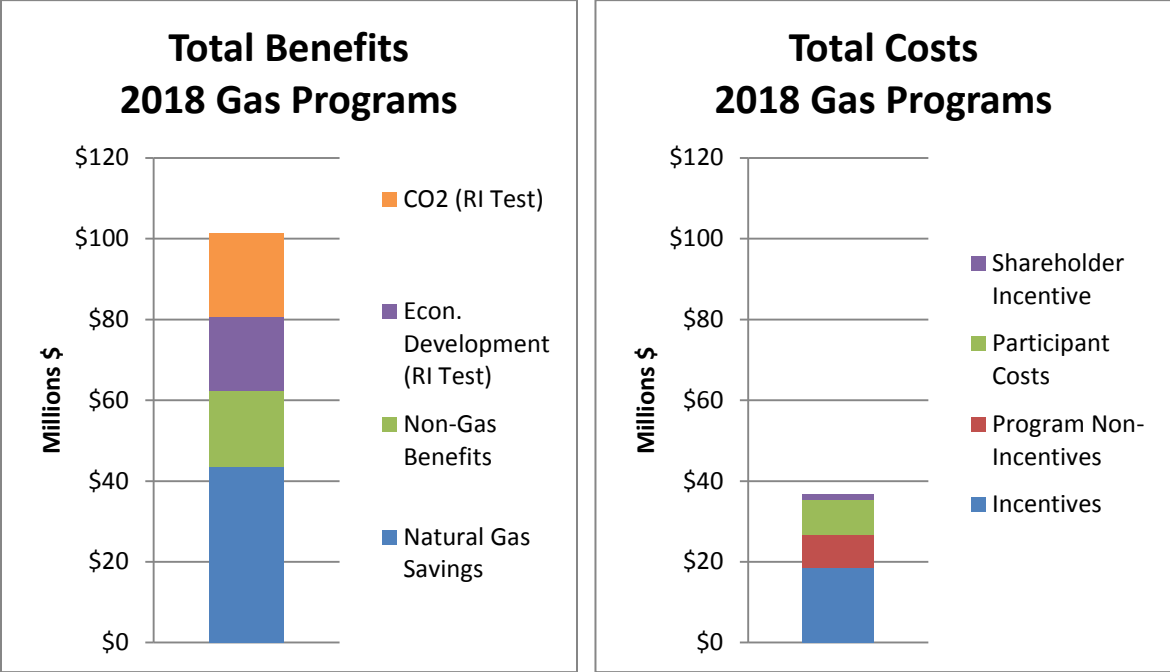
⁵ Macroeconomic Impacts of Rhode Island Energy Efficiency Investments: REMI Analysis of National Grid's Energy Efficiency Programs, National Grid Customer Department, November, 2014.

Cost-Effectiveness Report on National Grid's 2018 Energy Efficiency Plan and System Reliability Procurement Report



The graphs below show the major components of both the costs and benefits of the portfolios for the 2018 Plan. The total resource benefits in both the gas and electric portfolios are mostly derived from primary fuel savings. Similarly, the total resource costs are largely participant incentives. The top two sections of the benefits chart are the components that are included only in the RI Test; the lower sections are included in both the TRC and RI Tests. On the cost side, note that the BCR calculation includes an allowance for National Grid's shareholder incentive at the nominal or "target" value.





The Consultant Team also reviewed National Grid’s assessment of the cost of efficiency as compared to alternatives; the LCP standards require that efficiency be lower cost than acquisition of additional supply. Discussions between National Grid staff and the Consultant Team resulted in agreement on how to demonstrate this criterion. Because the choice for the utility is to either “purchase” energy through efficiency programs or through traditional supply contracts, the cost of the programs to the utility alone (i.e., not including customer contribution) is the appropriate basis for comparison. The avoidable costs of supplying energy to customers, best represented by the Company’s standard offer price, is the cost to which efficiency should be compared.

The 2018 Plan presents the results of this comparison, which demonstrates that the efficiency portfolios, both electric and gas, cost less than the cost of supply. Electric savings cost 5.2 cents per lifetime kWh saved as compared to 10.3 cents/kWh for standard offer, weighted across all customer sectors. Gas savings cost \$5.63 per lifetime MMBtu, as compared to \$7.02 per MMBtu for standard offer.

The EERMC Consultant Team concludes that the EE Plan meets the cost-effectiveness requirements of R.I.G.L. § 39-1-27.7(c)(5) and therefore should be approved by the Commission.

Assessing the Cost-Effectiveness of the 2018 SRP Report

The SRP report also presents information regarding a battery storage project in Little Compton. This project was selected in a public RFP process to procure a replacement for an earlier pilot

load curtailment program in that geographic area. The project will defer a substation upgrade for a period of four years. The value of this deferral provides the vast majority of the benefits of implementing this project, estimated at approximately \$650,000. Additional benefits of roughly \$71,000 are derived from largely from avoided capacity costs, similar to an energy efficiency project. With a total cost of the project for the four years of \$438,000, the project is cost-effective, with a net benefit of roughly \$283,000 and a benefit-cost ratio of 1.6.

VI. Conclusion

For the reasons stated herein, the EERMC and the EERMC's Consultant Team finds that National Grid's 2018 Energy Efficiency Program Plan and their 2018 System Reliability Procurement Report are cost-effective and lower cost than the acquisition of additional supply pursuant to R.I.G.L. § 39-1-27.7 (c)(5).

Appendices

A. The Rhode Island Legal and Regulatory Framework

Rhode Island's Comprehensive Energy Conservation, Efficiency, and Affordability Act of 2006 ("2006 Comprehensive Energy Act") established a comprehensive energy policy that explicitly and systematically requires maximization of ratepayers' economic savings through investments in all cost-effective energy efficiency. By means of this requirement on the distribution utility to procure all cost-effective energy efficiency, Rhode Island ratepayers stand to save hundreds of millions of dollars in energy bills over the next decade.

The primary guidelines informing the planning process to achieve this objective are the "standards for energy efficiency and conservation procurement and system reliability" Least Cost Procurement Standards or Standards), required in the 2006 legislation. The EERMC proposed the initial Least Cost Procurement Standards in June, 2008, and a subsequent revision was approved by the Commission in July, 2008. Updates to the Standards were proposed by the EERMC in 2011 under Docket #4202, in 2014 under Docket #4443, and in 2016 under Docket #4684, all of which were approved by the Commission. The purpose of these Standards is to provide sufficient direction to guide National Grid in its Three-Year and Annual Plans.

In the past, the Standards ordered by the PUC identified the Total Resource Cost (TRC) test as the methodology to use in determining whether the measures, programs, and the portfolio of energy efficiency (EE) services are cost-effective. The Standards for determining cost-effectiveness were modified in 2016 to include a revised definition in Section 1.2(B) that identified the Rhode Island Test (RI Test) as the basis for measuring cost-effectiveness. Briefly, the new test is intended to "more fully reflect the policy objectives of the State with regard to energy, its costs, benefits, and environmental and societal impacts." In practice, for this Three-Year Plan, the new test includes two additional categories of benefits: additional value of mitigating carbon emissions not already captured in the energy avoided costs and net economic benefits to the State resulting from efficiency program spending. To provide consistency with the previously applied TRC methodology, the Standards require the Plan to report the results of both the TRC and RI Tests.

B. Summary of EERMC Consultant Team's Qualifications

The EERMC Consultant Team is composed of Vermont Energy Investment Corporation ("VEIC") serving as the lead contractor, Optimal Energy Inc. ("OEI"), Energy Futures Group (EFG), and Ralph Prah (Consultant). The Consultant Team is led by Mike Guerard, previously in partnership with Scudder Parker. Key skills and expertise are provided by Craig Johnson (OEI) on data and analytical issues; Jeff Loiter (OEI) on cost-effectiveness review and regulatory issues; Richard

Faesy (EFG) and Glenn Reed (EFG) on the Residential market sector; George Lawrence (OEI), Zoe Dawson (VEIC and Jen Chiodo (Cx Associates) on the Commercial / Industrial sector; and Mark Kravatz (OEI) and Ralph Prah on evaluation, measurement, and verification (EM&V) activity. An additional layer of supporting staff is also in place, as well as a full range of industry experts available on an as-needed basis.

This team brings an impressive understanding of, and experience with, energy efficiency policy, regulatory practice, program design, cost-effectiveness analysis, measure characterization, assessment of potential savings, and evaluation, measurement and verification. Many of the individual consultants included on the Consultant Team have 15-30 years of direct experience in energy efficiency and broader regulatory policy. All participants also practice in jurisdictions outside of Rhode Island (many of those in New England) and their experience in those settings provides an important context and perspective to inform the EERMC in its oversight role.

The Team's strong familiarity with Rhode Island's policy, planning, implementation, and evaluation experience provides a high level of assurance that practices in Rhode Island are consistent with regional and national best practices in Energy Efficiency Least Cost Procurement.⁶

⁶ The EERMC and its Consultant Team also work closely with the Division and its Consultant through the Collaborative Subcommittee.