

The Narragansett Electric Company
d/b/a National Grid

National Grid 2018-2020 Energy Efficiency and System Reliability Procurement Plan

August 30, 2017

RIPUC Docket No. 4684

Submitted to:
Rhode Island Public Utilities Commission

Submitted by:

nationalgrid

August 30, 2017

BY HAND DELIVERY AND ELECTRONIC MAIL

Luly E. Massaro, Commission Clerk
Rhode Island Public Utilities Commission
89 Jefferson Boulevard
Warwick, RI 02888

**RE: Docket 4684 – The Narragansett Electric Company, d/b/a National Grid
2018-2020 Energy Efficiency and System Reliability Procurement Plan**

Dear Ms. Massaro:

I have enclosed ten (10) copies of National Grid's¹ 2018-2020 Energy Efficiency and System Reliability Procurement Plan (Plan) for the Rhode Island Public Utilities Commission (PUC)'s review and approval. The Company submits this Plan in compliance with R.I. Gen. Laws § 39-1-27.7 and the revised Least Cost Procurement Standards (Standards), which the PUC approved at an Open Meeting on April 27, 2017 in Docket 4684.

There are two parts in the Plan: Energy Efficiency Procurement and System Reliability Procurement. As in prior years, the Plan is the product of many meetings and discussions with the Rhode Island Energy Efficiency Collaborative (Collaborative)² and representatives of the Rhode Island Energy Efficiency Resource Management Council (EERMC). The EERMC voted to endorse the Plan on August 17, 2017.

This Plan is a framework for the detailed annual Energy Efficiency Program Plans (Annual Plans) and annual System Reliability Reports (SRP Reports), which the Company will file with the PUC over the next three years. The Company will file a detailed Annual Plan and SRP Report with the PUC by November 1, 2017 for program year 2018, and by October 15 for the following two program years (2019 and 2020).

PUC approval of this Plan will provide essential guidance for the development of the Company's Annual Plans and SRP Reports. Since the Three-Year Plan is illustrative and provisional, there may be variances between Annual Plans and Three-Year Plans due to changes in factors such as, but not limited to, legislative changes, sales forecasts, funding sources, avoided costs, and evaluation results. The Company will review these factors annually with the Collaborative and EERMC. The Company will also describe and explain any variations between the Annual Plan and Three-Year Plan in the annual filings.

¹ The Narragansett Electric Company d/b/a National Grid (National Grid or Company).

² Members of the Collaborative include the Rhode Island Division of Public Utilities and Carriers (Division) and the Division's consultant, Synapse Energy Economics, Acadia Center, the Rhode Island Office of Energy Resources, People's Power and Light, Rhode Island Housing, and The Energy Council of Rhode Island (TEC-RI).

Highlights of the enclosed Plan include:

- Cumulative energy efficiency savings of 7.53% of Rhode Island's 2015 electric load and 2.90% of 2015 natural gas load over the period 2018-2020. These savings will generate more than \$1.6 billion in benefits over the life of the installed measures.
- Carbon emission reduction strategies, including electrification of heating and increasing investments in delivered fuels efficiency offerings.
- Emphasis on reaching more income-eligible and moderate income customers.
- Strategies to pilot new innovative technologies and prepare for the future of energy efficiency and systems integration.
- Implementation strategies the Company will rely on to meet the savings goals. These strategies focus on four central themes: customers, least-cost, environment, and future innovation.
- Illustrative annual energy efficiency budgets that reflect relatively level customer funding required over three years.
- Promotion of non-wires alternatives (NWAs) in SRP through the development of a RI System Data Portal, which will have a Heat Map component to identify opportunities where NWAs can be utilized to reduce or manage load in areas including, but not limited to the following: highly utilized distribution systems; areas where construction is physically constrained; and areas where the Company anticipates demand growth.

The enclosed Plan reflects the input of many parties, including the EERMC and its consultant team, and the Collaborative. The Company believes that the strategies in the Plan will enable it to successfully meet the goals of Least Cost Procurement and result in substantial savings and benefits for Rhode Island electric and gas customers.

Thank you for your attention to this filing. If you have any questions, please contact me at 781-907-2121.

Sincerely,



Raquel J. Webster

Enclosures

cc: Docket 4684 Service List
Jon Hagopian, Esq.
Steve Scialabba, Division

Certificate of Service

I hereby certify that a copy of the cover letter and any materials accompanying this certificate was electronically transmitted to the individuals listed below.

The paper copies of this filing are being hand delivered to the Rhode Island Public Utilities Commission and to the Rhode Island Division of Public Utilities and Carriers.



Joanne M. Scanlon

August 30, 2017

Date

**Docket No. 4684 – RI Energy Efficiency Resource Mgmt. Council (EERMC)
Energy Efficiency Savings Targets, 2018-2020**

Service list updated 3/3/17

Name/Address	E-mail Distribution List	Phone
Marisa Desautel, Esq. (EERMC) Law Office of Marisa Desautel, LLC 55 Pine St. Providence, RI 02903	marisa@desautelesq.com ;	401-477-0023
Mike Guerard, Optimal Energy	guerard@optenergy.com ;	
Jon Hagopian, Esq. Division of Public Utilities and Carriers	Jon.hagopian@dpuc.ri.gov ;	401-784-4775
	Al.contente@dpuc.ri.gov ;	
	Macky.McCleary@dpuc.ri.gov ;	
	Jonathan.Schrag@dpuc.ri.gov ;	
	Steve.scialabba@dpuc.ri.gov ;	
Acadia Center Erika Niedowski	ENiedowski@acadiacenter.org ;	
Tim Woof Jennifer Kallay Synapse Energy Economics	twoolf@synapse-energy.com ;	
	jkallay@synapse-energy.com ;	
Raquel Webster, Esq. National Grid 280 Melrose St. Providence, RI 02907	Raquel.webster@nationalgrid.com ;	781-907-2121
	Joanne.scanlon@nationalgrid.com ;	
	Celia.obrien@nationalgrid.com ;	
Carol Grant, Commissioner Office of Energy Resources (OER)	Carol.grant@energy.ri.gov ;	
	Christopher.Kearns@energy.ri.gov ;	
	Danny.Musher@energy.ri.gov ;	
	Nicholas.Ucci@energy.ri.gov ;	
	Becca.Trietch@energy.ri.gov ;	

Andrew Marcaccio, Esq. Dept. of Administration Division of Legal Services One Capitol Hill, 4 th Floor Providence, RI 02908	Andrew.Marcaccio@doa.ri.gov ;	401-222-8880
Original & 9 copies file w/: Luly E. Massaro, Commission Clerk Public Utilities Commission 89 Jefferson Blvd. Warwick, RI 02888	Luly.massaro@puc.ri.gov ;	401-780-2107
	Linda.George@puc.ri.gov ;	
	Cynthia.WilsonFrias@puc.ri.gov ;	
	Alan.nault@puc.ri.gov ;	
	Todd.bianco@puc.ri.gov ;	

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**2018-2020 Energy Efficiency
System Reliability Plan**

Executive Summary

The Narragansett Electric Company d/b/a National Grid (National Grid or the Company) is submitting this 2018-2020 Three-Year Energy Efficiency and System Reliability Plan (Plan or Three-Year Plan) as the fourth triennial plan submitted in fulfillment of The Comprehensive Energy Conservation, Efficiency and Affordability Act of 2006 (the Act). The Act provides the statutory basis for Least Cost Procurement in the State of Rhode Island. The Act specifies that the Plan should include “measurable goals and target percentages for each energy resource, pursuant to standards established by the Rhode Island Public Utilities Commission (PUC), including efficiency, distributed generation, demand response, combined heat and power, and renewables.”¹

Purpose and Priorities

The purpose of this Three-Year Plan is to establish an overarching strategy for the next three years that will enable the Company to successfully meet the goals of Least Cost Procurement and deliver the Proposed Energy Savings Targets established by the Rhode Island Energy Efficiency Resources Management Council (EERMC or Council). PUC approved the targets in Docket 4684 at an Open Meeting on April 27, 2017. National Grid seeks PUC approval of this Plan to guide the development of the Energy Efficiency Program Plans for 2018, 2019, and 2020 (EE Annual Plans) and the Annual System Reliability Procurement Reports (SRP Reports). The Company will file the EE Annual Plans and SRP Reports with the PUC annually for review and approval.

National Grid has developed this Plan through consensus agreement with organizations that have historically joined the Company in settlements for the Company’s EE Annual Plans and SRP Reports. The Three-Year Plan lays out four key priorities:

1. **Customers** - Deliver comprehensive services encompassing all market segments and customers. Such services will enable customers to control their energy use, reduce their bills, and help support their financial well-being.
2. **Least Cost** - Deliver energy efficiency services as cost-effectively as possible through optimizing finance and promoting upstream initiatives. Continuing to deliver

¹ R.I. Gen. Laws § 39-1-27.7.

cost-effective energy savings under Least Cost Procurement will create cost savings to all customers, while creating economic benefits that create and maintain local jobs and businesses.

3. **Environment** - Provide solutions that maximize greenhouse gas emission reductions and contribute to Rhode Island's clean energy policy goals, including the Resilient Rhode Island Act.
4. **Future** – Innovate to capture savings from new technologies and strategies to position energy efficiency programs for the future, including the integration of energy efficiency with demand response, renewable energy, and smart grid technologies. This includes incorporating outcomes from the Rhode Island Power Sector Transformation Initiative and Docket 4600.

Three-Year Savings Targets

The EERMC's Recommended Targets for Electric and Natural Gas Energy Efficiency (Targets) in Docket 4684 established three-year savings targets for energy efficiency. The EERMC Targets set a high bar while committing to address the constant evolution in energy efficiency markets, technologies, funding, state and federal policies, and evaluation results. National Grid is committed to maintaining national leadership in energy efficiency by achieving ambitious savings. The savings illustrated in this Three-Year Plan will save 2.40%, 2.60%, and 2.53% of 2015 electric load in 2018, 2019, and 2020 respectively and 0.94%, 0.97%, and 0.99% of 2015 gas load in 2018, 2019, and 2020 respectively. The electric target in 2018 and the gas targets in 2018, 2019, and 2020 are slightly lower than the Targets the PUC approved in Docket 4684 due to the incorporation of recent evaluation findings that are explained in Attachment 2.^{2,3} The electric target in 2019 includes 25,539 Annual MWh for future innovation above what the Company can assess as achievable today. The electric target in 2020 is slightly higher than the approved Targets.

² In Docket 4284 (the 2012 - 2014 Energy Efficiency Program Plans and System Reliability Annual Reports for Electric and Gas approved by the PUC at an Open Meeting on December 21, 2011) the Company put forth lower gas savings targets than those approved in Docket 4202 due to updated evaluation results and updated avoided cost.

³ Application of pending final evaluation results to the commercial and industrial sector programs for the 2018 Annual Plan and subsequent annual plans will likely increase gas savings and decrease electric savings compared to what is illustrated in this Plan.

The savings targets included in this Plan will continue Rhode Island’s leadership across the nation in procuring the least cost fuel through energy efficiency. The Company is committed to reviewing new savings opportunities with the EERMC and Collaborative to help achieve our mutual commitment to capturing all cost-effective energy savings through Least Cost Procurement.

Meeting the targets set forth in this Plan will require the Company to innovate and maximize customer service, energy efficiency delivery, and accelerate market transformation. This holds true in each year of the Plan, but is even more evident in program year 2019, where savings from unknown future innovation was added to the Electric Funding Plan in order to illustrate meeting the approved Targets. These energy savings can only be realized with continued commitments and actions from the Company, state, and customers in addition to new technologies entering the market. National Grid has highlighted how much energy savings depends on innovation, policy changes, and large scale projects in this Plan.

New for the 2018-2020 Three-Year Plan

The revised Standards set forth new requirements for a cost-effectiveness test called the Rhode Island Benefit Cost Test (RI Test), which “more fully reflects the policy objectives of the state with regard to energy, its costs, benefits, and environmental and societal impacts.”⁴ In accordance with the Standards, the Company worked in collaboration with the Rhode Island Division of Public Utilities and Carriers’ (Division) consultants, EERMC consultants, the Rhode Island Office of Energy Resources (OER), and the Collaborative⁵ to incorporate new benefits and costs into the RI Test. The RI Test includes Greenhouse Gas reduction values and economic benefits.

During the years 2018 through 2020, the Company will examine or offer a suite of new or expanded services for customers. Highlights of these services include:

⁴ Least Cost Procurement Standards (Standards) approved at the Open Meeting on April 27, 2017 in Docket 4684.

⁵ Since 1991, a collaborative group (Collaborative) has been meeting regularly to analyze and inform the Company’s electric and gas energy efficiency programs. Members of the Collaborative presently include the Company, the Division, PP&L, Rhode Island Housing, TEC-RI, and Acadia Center. In addition, the OER, and several EERMC members, and representatives from the EERMC’s Consulting Team participate in the Collaborative group. The constitution of the Collaborative has varied since 1991, as some organizations have withdrawn and others have joined.

- Support moderate income customers by making financing more accessible through a revolving loan fund at the Capital Good Fund and create program strategies that enable more participation.
- Continue income-eligible incentives for delivered fuel customers and provide weatherization incentives to single family and multi-family customers.
- Assess high-efficiency electric and gas HVAC equipment for potential upstream (to the manufacturer) or midstream (distributors and contractors) delivery models.
- Focus on offering more technologies, greater comprehensiveness, and more customer friendly approaches to customers in multifamily homes including income eligible customers.
- Consider expanding income eligible offerings to more customers in conjunction with enrolling customers on the A-60 rate.
- Continue efforts to improve codes and standards by increasing energy code compliance through focusing resources on measured compliance and enforcement gaps. Pursue opportunities to expand support of federal and state appliance standards as well as the state's forthcoming stretch energy code.
- Include incentives for strategic electrification of heating and support the installation of heat pumps for heating as well as cooling when cost effective, including educating consumers and installers on cost savings associated with using cold climate systems for heating.
- Expand community-based initiatives to achieve greater program participation in the residential and commercial and industrial (C&I) sectors and to support strategic electrification efforts.
- Invest in pilots and demonstrations, including electric demand response, energy monitoring, and battery storage, such that they support the Company's planning and strategic electrification efforts. Investigate the benefits of gas demand response that addresses gas peaks and continue promoting electric energy efficiency measures that provide savings during winter peak.
- Overcome customer barriers by continuing to invest in and optimize finance tools, including the Efficiency Building Fund (EBF), On Bill Financing and Repayment, and C-PACE.

- Explore new finance tools for residential and commercial customers and develop a cohesive implementation of current and new finance solutions.
- Increase commercial and residential new construction participation and comprehensiveness.
- Retrofit street lights in a large number of cities and towns and work collaboratively with OER, Rhode Island municipalities, and Partnership for RI Streetlights Management.
- Work closely with large C&I customers to plan for and install combined heat and power (CHP).
- Encourage large C&I customers achieve deeper energy savings through improvements in operations, management, adopting new technologies and creating long term energy savings plans and commitments through Strategic Energy Management Planning (SEMP) partnerships, expanding the retro-commissioning initiative, continuing pay for performance and exploring the potential of Strategic Energy Management (SEM).

Resilient Rhode Island Act

The 2018-2020 Three-Year Plan marks the first triennial plan under the Resilient Rhode Island Act. Under the act, the state set forth the goal to reduce greenhouse gas (GHG) emissions to 80% below 1990 levels by 2050.⁶ The Rhode Island Greenhouse Gas Emissions Reduction Plan (GHG Plan) identifies energy efficiency as an important component to achieving the Resilient Rhode Island Act GHG targets.⁷ The electric, gas, and oil energy efficiency measures proposed within this Plan will contribute to the Rhode Island's climate goals by reducing carbon emissions by 3.7 million tons over the lifetime of the installed measures.⁸ In addition to creating carbon savings through lowering electricity usage, the Plan puts forth additional innovative carbon reduction strategies such as the electrification of heating, and increasing investments in delivered fuels efficiency offerings.

⁶ RI. Gen. Laws § 42-6.2

⁷ Rhode Island Greenhouse Gas Emissions Reduction Plan, December 2016.

⁸ Electric carbon emissions factor from 2014 ISO New England "Electric Generator Air Emissions Report" at https://www.iso-ne.com/static-assets/documents/2016/01/2014_emissions_report.pdf; Oil and gas carbon emissions factors from http://www.eia.gov/environment/emissions/co2_vol_mass.cfm.

Illustrative Benefits, Costs and Funding

National Grid has illustrated the energy savings, benefits, and costs that the Annual Plans will aim to create and deliver. Over the next three years, energy efficiency will deliver \$1.6 billion in benefits – real dollar savings through avoided energy, transmission and distribution, and benefits such as water and maintenance savings, carbon savings, and economic stimulus. The cumulative energy efficiency savings targets proposed in this Plan for the period of 2018 – 2020 are 7.53% of Rhode Island’s 2015 electric load and 2.90% of 2015 natural gas load.

The Plan describes funding sources, and Attachment 1 illustrates funding required to save energy and create customer and state benefits. National Grid is committed to working with stakeholders to adapt Annual Plans to deliver maximum customer benefits in conjunction with any changes in funding. The primary source of funding remains the Energy Efficiency customer charge, and National Grid will continue working with stakeholders and regulators to ensure that the charge is reconciled in the best manner for customers.

The following tables summarize illustrative benefits, costs, and funding proposed in this Plan.

Electric Programs	2018	2019*	2020
Savings and Benefits			
Annual MWh Savings	179,968	194,677	189,509
Lifetime MWh Savings	1,712,064	1,904,592	2,160,318
Savings as a Percent of 2015 Sales	2.40%	2.60%	2.53%
Annual Peak kW Savings	29,639	35,188	34,224
Winter Peak kW Savings	29,092	26,517	28,466
Total Benefits (RI Test)	\$ 373,004,694	\$ 438,942,301	\$ 451,782,884
Costs			
Total Funding Required	\$ 115,547,860	\$ 124,932,991	\$ 109,090,025
Cents per lifetime kWh	\$ 0.071	\$ 0.077	\$ 0.062
EE Program Charge per kWh	\$ 0.01090	\$ 0.01390	\$ 0.01193
Benefit Cost Ratio (RI Test)	2.93	2.88	3.23
Participation	TBD	TBD	TBD
*2019 includes 25,539 Annual MWh and correlated costs and benefits, as an adder for future innovation.			

Natural Gas Programs	2018	2019	2020
Savings and Benefits			
Annual MMBtu Savings	384,486	396,859	405,373
Lifetime MMBtu Savings	4,391,662	4,553,143	4,682,906
Savings as a Percent of 2015 Sales	0.94%	0.97%	0.99%
Total Benefits (RI Test)	\$ 97,702,163	\$ 101,369,221	\$ 104,184,334
Costs			
Total Funding Required	\$ 29,399,869	\$ 30,776,029	\$ 31,846,313
Cost per lifetime MMBtu	\$ 8.47	\$ 8.62	\$ 8.68
Average EE Program Charge per Dth	\$ 0.800	\$ 0.819	\$ 0.841
Residential Charge per Dth	\$ 0.882	\$ 0.903	\$ 0.928
C&I Charge per Dth	\$ 0.721	\$ 0.739	\$ 0.758
Benefit Cost Ratio (RI Test)	2.53	2.49	2.47
Participation	TBD	TBD	TBD

2018-2020 SRP Three-Year Plan

Attachment 4 includes an overview of the Company's approach to System Reliability Procurement (SRP) over the 2018-2020 period developed in accordance with the Standards. Although the Company plans to continue screening transmission and distribution projects for non-wires alternatives (NWAs) over the next three-years, it is possible that no projects will be identified due to minimal load growth in Rhode Island. In an effort to further promote NWAs in accordance with the revised Standards, the Company will develop and deploy a RI System Data Portal, which will have a Heat Map component to identify opportunities where NWAs can be utilized to reduce or manage load in areas including, but not limited to the following: highly utilized distribution systems; areas where construction is physically constrained; and areas where demand growth is anticipated. These efforts will prolong the useful lifetime of existing systems.

Introduction

The 2018-2020 Three-Year Plan is the fourth triennial plan submitted by The Narragansett Electric Company d/b/a National Grid (National Grid or the Company) in accordance with Least Cost Procurement.⁹ In Docket 4684, the PUC approved the Rhode Island Energy Efficiency Resources Management Council's (EERMC or Council) Proposed Energy Efficiency Savings Targets for the years 2018-2020 (2018-2020 Savings Targets) in compliance with R.I. Gen. Laws § 39-1-27.7.1.

The cumulative energy efficiency savings targets for the period of 2018 – 2020 are illustrated as 7.53% of Rhode Island's 2015 electric load and 2.90% of 2015 natural gas load. The electric target in 2018, and the gas targets in 2018, 2019, and 2020 are slightly lower than the Commission approved Targets in Docket 4684 due to the incorporation of recent evaluation findings that are explained in Attachment 2.^{10,11} The electric target in 2019 includes 25,539 Annual MWh for future innovation above what the Company can assess as achievable today. The electric target in 2020 is slightly higher than the approved Targets. The Company will review available technologies, programs, evaluation results and strategies with the EERMC and Collaborative in subsequent Annual Plans in order to achieve our commitment to delivering cost-effective energy savings that are potentially achievable through Least Cost Procurement.

The Plan is consistent with the revised Energy Efficiency Procurement Standards and System Reliability Procurement Standards (Standards), which the PUC approved at an Open Meeting on April 27, 2017 in Docket 4684.

⁹ R.I. Gen. Laws §39-1-27.7

¹⁰ In Docket 4284, the 2012 - 2014 Energy Efficiency Program Plans and System Reliability Annual Reports for Electric and Gas, approved by the PUC at an Open Meeting on December 21, 2011, the Company put forth lower gas savings targets than those approved in Docket 4202 due to updated evaluation results and updated avoided cost.

¹¹ Application of pending final evaluation results to the commercial and industrial sector programs for the 2018 Annual Plan, and subsequent annual plans, will increase savings on the gas side to above the approved Targets in all three years, but will likely lower electric savings.

Table 1. 2018-2020 Docket 4684 Targets and Three-Year Plan Proposed Targets

Electric Targets	2018	2019*	2020	Total
Docket 4684 Electric Targets (Annual MWh)	202,166	194,678	187,191	584,035
% of 2015 Electric Sales	2.70%	2.60%	2.50%	7.80%
3YP Electric Targets (Annual MWh)	179,968	194,677	189,509	564,154
% of 2015 Electric Sales	2.40%	2.60%	2.53%	7.53%
Difference	-11%	0%	1%	-3%
Natural Gas Targets	2018	2019	2020	Total
Docket 4684 Natural Gas Targets (Annual MMBtu)	409,513	421,799	429,989	1,261,301
% of 2015 Natural Gas Sales	1.00%	1.03%	1.05%	3.08%
3YP Gas Targets (Annual MMBtu)	384,486	396,859	405,373	1,186,717
% of 2015 Natural Gas Sales	0.94%	0.97%	0.99%	2.90%
Difference	-6.11%	-5.91%	-5.72%	-5.91%
*2019 includes 25,539 Annual MWh and correlated costs and benefits, as an adder for future innovation.				

This Three-Year Plan was developed with entities that have historically joined the Company in settlements for the Company's Annual Plans. Together with the Company, these entities are collectively called the Collaborative. Members of the Collaborative include the Rhode Island Division of Public Utilities and Carriers (Division) and the Division's consultant, Synapse Energy Economics (Synapse), Acadia Center, the Rhode Island Office of Energy Resources (OER), People's Power and Light, The Energy Council of Rhode Island (TEC-RI), EERMC members, and the EERMC's consultant team led by the Vermont Energy Investment Corporation. Rhode Island Housing, while part of the Collaborative is currently a non-voting member. The EERMC Consulting Team reviewed the benefit cost illustration for cost-effectiveness included in this Plan. The EERMC voted to endorse this Plan on August 17, 2017.¹²

The savings targets in this Plan will result in significant benefits to electric and gas customers, the Rhode Island economy, and the environment. As illustrated, the Three-Year Plan will create annual savings of 564,154 MWh and 1,186,717 MMBtu and lifetime savings of 5,776,974 MWh and 13,627,710 MMBtu. The Plan will generate benefits of more than \$1.6 billion over the life of the measures (with \$1.3 billion in benefits coming from electric efficiency and \$303.3 million in

¹² Consistent with R.I. Gen. Laws § 42-140.1-5.

benefits from natural gas efficiency), which represents tremendous value for Rhode Island's residential, commercial, industrial, and income eligible energy customers.

In addition, the strategies defined in the Three-Year Plan will contribute to Rhode Island's greenhouse gas reduction goals, as this Plan will avoid 3.7 million tons of carbon over the lifetime of the installed measures.¹³

This Plan will also provide additional significant economic benefits, such as increased gross state product (GSP) and job creation. Investments made in energy efficiency under this Three-Year Plan are expected to add over \$328.5 million to Rhode Island's GSP and create more than 4,822 job-years of employment.¹⁴

RI Legislation of 2006 and Least Cost Procurement

The Comprehensive Energy Conservation, Efficiency and Affordability Act of 2006 provides the statutory basis for Least Cost Procurement in the State of Rhode Island. The general purposes of the Act are (1) to provide Rhode Island residents, institutions, and businesses the benefit of stability through diversification of energy resources, energy conservation, efficiency, demand management, and prudent procurement; (2) to facilitate the development of renewable energy resources; (3) to make the cost of energy more affordable by mitigating demand and rates charged to low-income households; and (4) to strengthen energy planning, program administration, management, and oversight in a manner that is publicly accountable and responsive.

Specifically, the Act provides for Least Cost Procurement of system reliability and energy efficiency and conservation resources. System reliability procurement includes, but is not limited to: renewable energy resources, distributed generation, targeted energy efficiency, direct load control, and demand response. Energy efficiency procurement includes "procurement of energy efficiency and energy conservation measures that are prudent and reliable and when such

¹³ Electric carbon emissions factor from 2014 ISO New England "Electric Generator Air Emissions Report" at https://www.iso-ne.com/static-assets/documents/2016/01/2014_emissions_report.pdf; Oil and gas carbon emissions factors from http://www.eia.gov/environment/emissions/co2_vol_mass.cfm.

¹⁴ Macroeconomic multipliers for the economic growth and job creation benefits of investing in cost-effective energy efficiency from National Grid's 2014 Regional Economic Model (REMI) Analysis, as presented by the Company to the Collaborative on May 29, 2014. To maintain consistency with RI Test economic benefits multiplier, the Company is only including construction phase impacts to GSP and job-years to account for only direct and indirect impacts.

measures are lower cost than acquisition of additional supply, including supply for periods of high demand.”¹⁵

The Act further requires that “each electrical distribution company shall submit to the PUC on or before September 1, 2008, and triennially on or before September 1, thereafter through September 1, 2024, a plan for system reliability and energy efficiency and conservation procurement.”¹⁶ The Act specifies that the plan should include “measurable goals and target percentages for each energy resource, pursuant to standards established by the Commission, including efficiency, distributed generation, demand response, combined heat and power, and renewables.”¹⁷

Purpose of the Plan

The purpose of the Three-Year Plan is to establish an overarching strategy for the next three years that will lead to successfully meeting the goal of Least Cost Procurement.¹⁸ National Grid seeks PUC approval of this Plan to guide the development of the Energy Efficiency Program Plans for 2018, 2019, and 2020 (Annual Plans) and the Annual System Reliability Procurement Reports (SRP Reports).¹⁹ As outlined in the Standards, this Plan includes identifies implementation strategies that will secure cost-effective energy efficiency resources that are lower than the cost of supply and prudent and reliable. The Plan also described strategies, cost-effectiveness, prudence and reliability, contains a funding plan with illustrative budgets, funding sources and initial targets, and includes a shareholder incentive mechanism. The SRP Plan that will guide the development of detailed Annual Plans and SRP Reports will be submitted to the PUC for approval. Since the Three-Year Plan is illustrative and provisional, variances between Annual Plans and Three-Year Plans due to changes in factors such as, but not limited to, legislative changes, sales forecasts, funding sources, avoided costs, and evaluation results are expected. The Company will provide explanations for any variances in its Annual Plan filings.

¹⁵ R.I. Gen. Laws § 39-1-27.7.

¹⁶ R.I. Gen. Laws § 39-1-27.7.

¹⁷ R.I. Gen. Laws § 39-1-27.7.

¹⁸ As specified by the Standards, every year, the Company will submit to the PUC an Annual Energy Efficiency Program Plan (Annual Plan) and an Annual System Reliability Plan Report (SRP Report) that will detail specific steps towards reaching energy efficiency goals and least cost procurement lower than the cost of supply.

¹⁹ The Company will file the 2018 Annual Plan and 2018 SRP Report with the PUC by November 1, 2017. The Company will file the 2019 and 2020 Annual Plans and SRP Reports with the PUC by October 15, 2018 and October 15, 2019, respectively.

Energy Efficiency Savings Targets

Recommended Targets

The EERMC's Recommended Targets for Electric and Natural Gas Energy Efficiency (Targets) serve as a guidepost in developing the Three-Year Plan. The Targets include an assessment of core program base potential, which included a bottoms-up approach for developing an estimate of the savings potential from current programs. The Targets Memo explains that the 2010 KEMA Opportunity Report was not used in the core program base potential because it no longer represented an accurate assessment of current and changing market conditions. The Targets also included an assessment of evolving potential, which highlights the potential impact of codes and standards, new technologies, and program enhancements that may occur over the next few years.

In the short time since the EERMC's Targets were filed, several evaluations have been completed and the lighting market continued to transform. These new evaluations and market trends impact cost-effectiveness for future energy savings. In order to adhere to best practices, and to comply with the cost-effectiveness provisions of the Standards, these evaluation results are incorporated in this Three-Year Plan to more accurately illustrate future cost-effectiveness.

Two recent factors have been incorporated into the illustration of cost-effectiveness: evaluation results and lighting market transformation. Results from evaluations have been incorporated in the illustration of cost-effectiveness, and they are more fully described in Appendix 2. The evaluations impact Residential and C&I Upstream Lighting in the electric portfolio, as well as Residential Behavior and Feedback and Codes Compliance in both the gas and electric portfolios. The evaluations will be filed in the 2018 Annual Plan. Additional studies will also be completed by the Annual Plan and will be incorporated; they include C&I Free Ridership and Spillover, Residential New Construction User Defined Reference Home, and other studies. It is important to highlight that the application of the C&I Free Ridership and Spillover study to the gas portfolio will likely result in an increase in claimable savings to above 100% of the approved Targets in 2018, 2019, and 2020. This same study will have the opposite effect on the electric portfolio and will likely decrease claimable savings in all three years. These evaluations were not available or included when setting the Targets as filed in Docket 4684.

The commercial lighting market continued to evolve since the Targets were developed. Customers have taken such great advantage of Upstream Lighting, particularly screw-in LED lamps, that National Grid is seeing market saturation in 2017, causing a reduction in the volume of lamps. National Grid will continue to transform the market by introducing new fixtures and lamps into the Upstream Lighting initiative. These new fixtures and lamps tend to have lower overall savings per unit than screw-in LEDs because they are replacing fluorescents as opposed to incandescent lamps. At the same time, LED efficacy is improving, and this may lead to greater savings for LEDs. National Grid has considered this new information in this Plan and will continue to adapt to market conditions in the future.

Overall, the evaluation results and transforming lighting market have the effect of lowering the achievable electric and gas savings compared to the Targets approved in Docket 4684. This Plan illustrates the lower achievable potential for the 2018 electric savings and for the 2018-2020 gas savings in this Plan. Deviations between the Recommended Targets and Three-Year Plan targets have occurred previously. Specifically, the PUC approved a deviation in the 2012-2014 Three-Year Plan in Order Docket 4284 based on recent evaluations results and avoided cost information, and the gas targets were cumulatively 16% lower than the Recommended Targets filing.

Identifying Opportunities and Data

The rapid changes in Rhode Island's energy efficiency market, as demonstrated in the changes between the Targets and this Three-Year Plan, have identified a need for additional information to support data-driven development of annual energy savings goals in the future. Additional information for a data-driven process includes: proven market technologies, resources to deliver those technologies, documented costs, impacts and benefits, and an implementation strategy.

To facilitate a data-driven process in the future, National Grid and the EERMC will explore options for assessing future potential through an Opportunities Report. An Opportunities Report identifies:

- Technical potential – a complete saturation of all measures deemed technically feasible from an engineering perspective.
- Economic potential – a subset of saturation potential measures that are cost effective.

- Achievable program potential – the cost-effective savings that can occur in response to program activities, including net savings, which removes savings that will naturally occur from codes, standard or other market activities.

Three-Year Plan Targets

The Three-Year Plan Targets, associated benefits, and costs are summarized in the tables below and in the Funding Plan in Attachment 1.

Table 2. 2018-2020 Three-Year Plan Summary

Electric Programs	2018	2019*	2020
Savings and Benefits			
Annual MWh Savings	179,968	194,677	189,509
Lifetime MWh Savings	1,712,064	1,904,592	2,160,318
Savings as a Percent of 2015 Sales	2.40%	2.60%	2.53%
Annual Peak kW Savings	29,639	35,188	34,224
Winter Peak kW Savings	29,092	26,517	28,466
Total Benefits (RI Test)	\$ 373,004,694	\$ 438,942,301	\$ 451,782,884
Costs			
Total Funding Required	\$ 115,547,860	\$ 124,932,991	\$ 109,090,025
Cents per lifetime kWh	\$ 0.071	\$ 0.077	\$ 0.062
EE Program Charge per kWh	\$ 0.01090	\$ 0.01390	\$ 0.01193
Benefit Cost Ratio (RI Test)	2.93	2.88	3.23
Participation	TBD	TBD	TBD
*2019 includes 25,539 Annual MWh and correlated costs and benefits, as an adder for future innovation.			

Natural Gas Programs	2018	2019	2020
Savings and Benefits			
Annual MMBtu Savings	384,486	396,859	405,373
Lifetime MMBtu Savings	4,391,662	4,553,143	4,682,906
Savings as a Percent of 2015 Sales	0.94%	0.97%	0.99%
Total Benefits (RI Test)	\$ 97,702,163	\$ 101,369,221	\$ 104,184,334
Costs			
Total Funding Required	\$ 29,399,869	\$ 30,776,029	\$ 31,846,313
Cost per lifetime MMBtu	\$ 8.47	\$ 8.62	\$ 8.68
Average EE Program Charge per Dth	\$ 0.800	\$ 0.819	\$ 0.841
Residential Charge per Dth	\$ 0.882	\$ 0.903	\$ 0.928
C&I Charge per Dth	\$ 0.721	\$ 0.739	\$ 0.758
Benefit Cost Ratio (RI Test)	2.53	2.49	2.47
Participation	TBD	TBD	TBD

Commitment to Evolving Potential

The Company and our partners remain optimistic and committed to researching, fostering, and delivering evolving potential. The Targets Memo defines evolving potential as “factors identified by the Consulting team having possible significant impact on savings potential, but are not currently being offered, or fully deployed through Rhode Island’s energy efficiency programs. These are specific items related to evolving markets, emerging trends and innovation that will impact potential.”

The Plan includes a significant number of innovative strategies to offer and fully deploy every identifiable option that will most aggressively deliver energy savings for customers. These strategies are described in the Customer, Pilots and Demonstrations, and Transformation sections of the Plan. Savings from these new, expanding, and enhanced strategies has been reviewed with the Consulting team and illustrated in this Plan.

The Company has demonstrated its commitment to evolving potential by assessing and incorporating the latest recommendations on new initiatives, strategies, and savings. The net effect of evaluation results and transforming lighting market decreases the electric achievable potential for 2018, 2019, and 2020. The Company does not predict innovation or new strategies will be available in time to make up the savings gap in program year 2018 and that is illustrated in this Plan. However, including all identifiable potential was not enough to counter the unanticipated lower savings in 2019. Therefore, the Company has included an adder for future innovation in 2019 to illustrate savings, benefits, and costs. This future innovation is equal to the difference between what is likely achievable for electric savings based on information and data available today and the approved 2019 electric Targets in Docket 4684.

At this time, the Company does not know which technologies will contribute to these future innovation savings or in which sectors it could occur. Therefore, the Company and our partners agreed to assume 2019 portfolio level average costs, kW, and benefits per MWh. The following chart identifies the future innovation assumptions included in the 2019 funding plan.

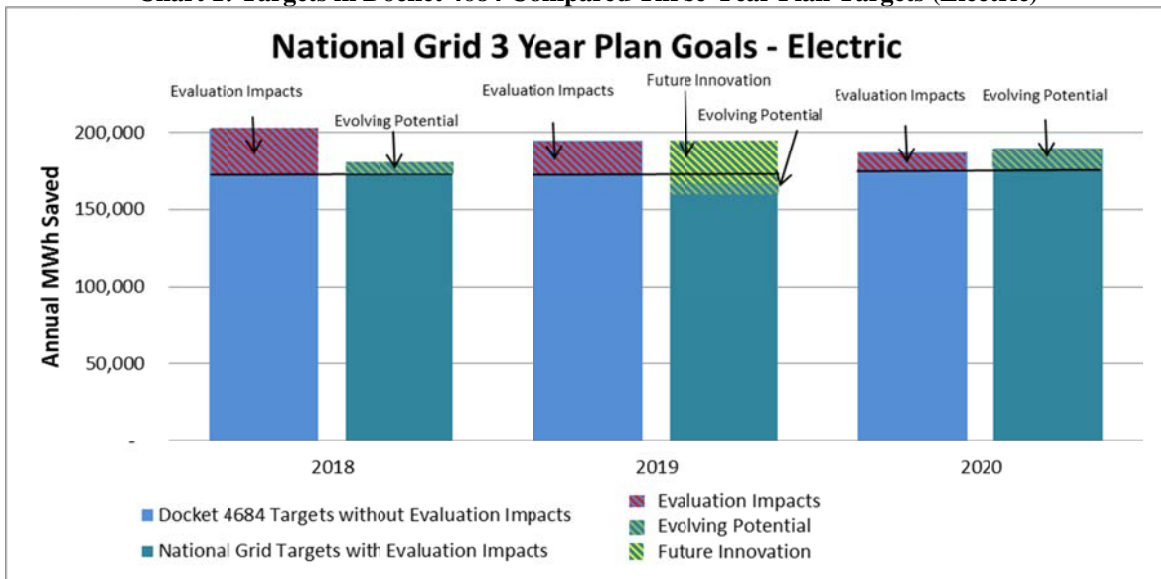
Table 3: 2019 Adder for Future Innovation

Electric Programs	Acheivable Potential	Future Innovation Adder	2019 Funding Plan
Savings and Benefits			
Annual MWh Savings	169,138	25,539	194,677
Lifetime MWh Savings	1,654,735	249,856	1,904,592
Savings as a Percent of 2015 Sales	2.26%	0.34%	2.60%
Annual Peak kW Savings	30,572	4,616	35,188
Total Benefits (RI Test)	\$ 381,359,060	\$ 57,583,241	\$ 438,942,301
Costs			
Implementation Budget	\$ 98,412,706	\$ 14,859,808	\$ 113,272,514
EE Program Charge per kWh	\$ 0.01174	\$ 0.00216	\$ 0.01390

Notably, these savings and budgets are purely illustrative. The Company will make every attempt feasible under the construct of Least Cost Procurement to meet the 2019 approved Targets in the most cost-effective means possible.

The following chart illustrates the Company's commitment to delivering all achievable potential energy savings to customers. The chart illustrates the initial Targets in Docket 4684, National Grid's proposed Three-Year Plan Savings with evolving potential added to the Targets, and the net effect of incorporating evaluation and lighting transformation. Incremental evolving potential is everything above the solid line in the National Grid Targets with Evaluation Impacts bar.

Chart 1: Targets in Docket 4684 Compared Three-Year Plan Targets (Electric)

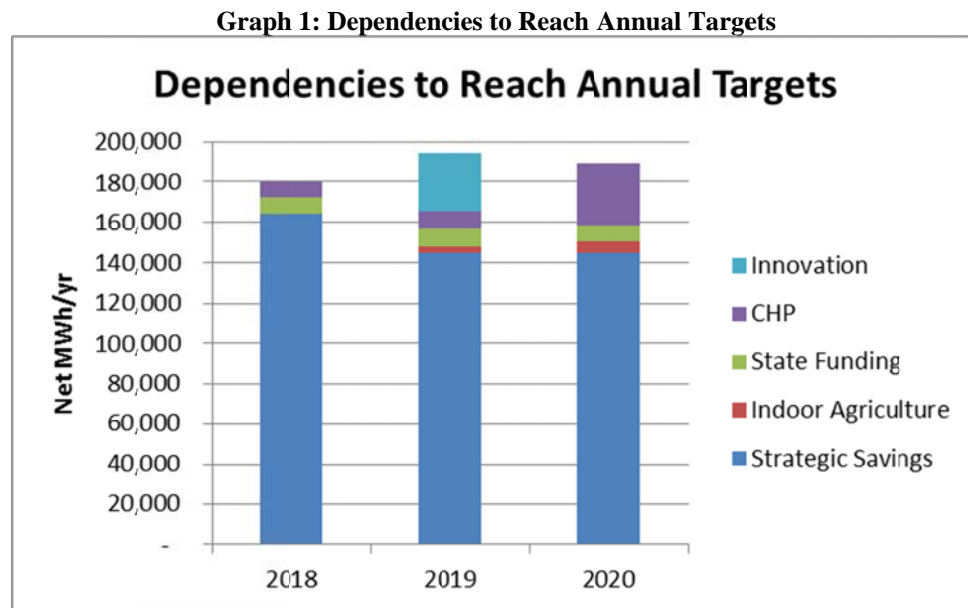


Electric Target Dependencies

National Grid is committed to meeting the nation-leading savings targets proposed in this Plan. The Three-Year Plan includes a mix of measures, programs, and services that rely on several factors that can change over the course of the 2018-2020 timeframe. Any changes to future innovation, state and federal leveraged funding, laws and regulations, industries and technologies, and the timing of larger projects such as combined heat and power (CHP) will impact the Company's ability to meet its savings targets, both positively and negatively. For several of these factors, National Grid has assessed the potential changes in cost-effective resource availability contained in this Plan. To achieve the energy savings targets illustrated in this Plan, the Company is depending on the following to occur:

1. Future innovation – The Company has included an adder of 29,539 Annual MWh of future innovation in program year 2019. This is in addition to what the Company believes is achievable based on the best information available today. The adder illustrates the approved 2019 electric Targets in Docket 4684.
2. State Funding – The impact of 2018 budget legislation may impact the 2018 goals, and it will be addressed in the Annual Plan. Additionally, the state, municipalities, and towns represent one of National Grid's largest customer segments in Rhode Island and have a great potential for energy savings. National Grid has partnered with the state, municipalities, and towns to deliver enormous energy savings over the next few years and our mutual success relies on continued public funding for the state's municipalities, and town's portion of the investment. An example of this is the RI State Strategic Management Partnership. The Company is forecasting continued public funding to achieve these savings.
3. CHP – The Company is forecasting numerous large customers will invest in CHP, which will be designed, installed and commissioned according to preliminary timelines.
4. Indoor Agriculture – The Company is forecasting that the state of Rhode Island will pass legislation that expands the indoor agriculture market in 2019, leading to new efficiency opportunities that do not exist today.

The following graph highlights where these energy savings are incorporated into the Three-Year Plan illustrations.



The following table illustrates the approximate potential resulting changes to savings, benefits, and costs if these dependencies do not occur.

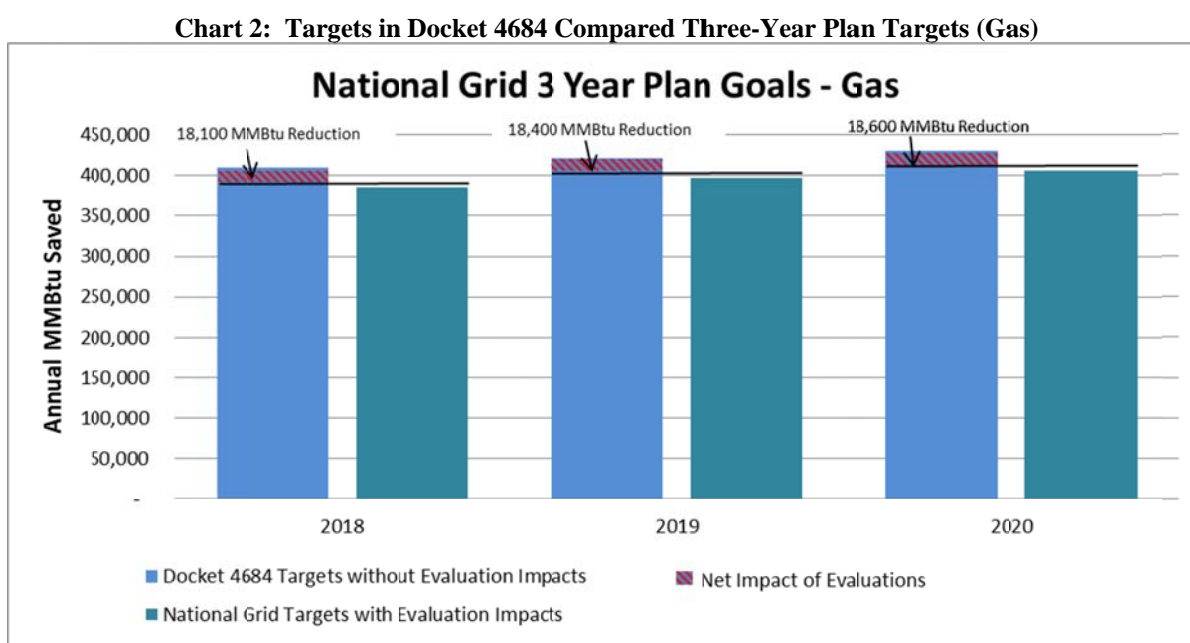
Table 4. 2018-2020 Potential Changes from Dependencies

Electric Programs	2018	2019	2020
Savings and Benefits			
Annual MWh Savings	169,495	155,339	158,626
Lifetime MWh Savings	1,661,179	1,501,255	1,605,797
Savings as a Percent of 2015 Sales	2.26%	2.07%	2.12%
Annual Peak kW Savings	27,758	27,658	28,958
Winter Peak kW Savings	26,991	24,100	24,013
Total Benefits (RI Test)	\$ 355,575,298	\$ 348,450,647	\$ 375,310,546
Costs			
Total Funding Required	\$ 112,021,003	\$ 99,117,304	\$ 102,265,675
Cents per lifetime kWh	\$ 0.077	\$ 0.075	\$ 0.073
EE Program Charge per kWh	\$ 0.01028	\$ 0.01041	\$ 0.01155
Benefit Cost Ratio (RI Test)	2.68	2.95	3.09
Participation	TBD	TBD	TBD

Gas Target Dependencies

National Grid is committed to meeting the nation-leading gas savings targets proposed in this Plan. The Three-Year Plan includes a mix of measures, programs, and services that rely on several factors that can change over the course of the 2018-2020 timeframe.

Although this Plan illustrates slightly lower gas savings goals than the Targets, National Grid believes that the 2018 Annual Plan will meet or exceed the targets at no additional cost. That is based on a preliminary C&I Free Ridership and Spillover evaluation which has not been finalized or incorporated in either electric or gas illustrations.



Annual Plans

National Grid is getting more information about market conditions, new technologies, and evaluation more rapidly than in previous years. This is due to rapid transformation of the lighting market as well as increasing evaluation efforts to keep pace with transformation. The Standards lay out a framework by which the latest market and evaluation information will be accurately incorporated in the Annual Plans. In each Annual Plan, National Grid will continue to review opportunities for additional savings. This occurred in 2016 when the electric annual goal was higher than that illustrated in the Three-Year Plan.

National Grid will continue its evaluation efforts, which are overseen by the EERMC consultant team. For the illustrative budgets, the electric and gas evaluation budget is approximately 2% of

the program budgets. This is in addition to the evaluation results leveraged from the statewide program administrators in Massachusetts.

Annual Plans will vary from this Three-Year Plan based on these dependencies or for other reasons, as has historically occurred in previous Plans. For example, National Grid had higher electric savings goals than Targets for both 2014 and 2016 and lower gas savings than Targets in 2015.

The EERMC's Recommend Targets "acknowledge that while the 2018-2020 electric and natural gas savings targets have been developed using the best information and data available at this time, the annual savings targets should be reviewed each year during the development of the Annual Plan. Following this review, the target should either be confirmed or revised in light of new information. The parties participating in the Annual Plan development should agree that revisions to the annual energy savings targets should be based only on clearly documented changes in cost-effective resource availability." National Grid will develop Annual Plans using the best information and data available.

Additionally, the settling parties of the Annual Plans, who collaborated on this Plan, recognize that this Plan illustrates savings beyond what National Grid believes to be achievable today. The parties have assured National Grid that they are committed to a data-driven process, as described above, in future Annual Plans whereby goals will be set at the most aggressive and nation-leading levels which are achievable in practice.

Benefits of Least Cost Procurement

Since its implementation, Least Cost Procurement has provided significant benefits to the State of Rhode Island. The 2009-2011, 2012-2014, and 2015-2017 Energy Efficiency Procurement Plans and related Annual Plans guided the Company with implementing cost-effective natural gas and electric energy efficiency programs to homeowners, businesses, municipalities, and non-profits throughout the state. These programs enabled electric and natural gas customers to save money on their energy bills, created jobs and local investment in the Rhode Island economy, and reduced overall electricity and natural gas consumption helping to lower greenhouse gas emissions. Least Cost Procurement and the success of the Annual Plans has made Rhode Island a national leader. In 2014, 2015, and 2016, the American Council for an Energy-Efficient

Economy (ACEEE) ranked Rhode Island's utility-sector energy efficiency programs number one in the nation.²⁰

As detailed in Table 5, from 2009 to 2016, the Company served 3,119,467 electric program participants,²¹ resulting in annual electric savings of 1,243,147 MWh and lifetime savings of 13,406,140 MWh at an average cost of \$0.034 per lifetime kWh saved. The electric savings will avoid over 6.3 million tons of carbon dioxide over the lifetime of the installed efficiency measures.²² The Company also served 604,329 gas participants,²³ resulting in annual natural gas savings of 2,242,934 MMBtu, and lifetime savings of 30,500,890 MMBtu at an average cost of \$3.44 per lifetime MMBtu. This reduction in electricity and natural gas consumption over the seven-year period represents a savings to customers of \$1.9 billion over the lifetime of the installed efficiency measures.²⁴ In 2017, the Company continued on the trajectory of savings approved for the third Three-Year Plan, and as of this summer, is on course to meet the 2017 electric savings goal of 201,347 annual MWh and 414,606 annual MMBtu.

The electric and natural gas efficiency investments made between 2009 and 2016 also created a positive impact on the Rhode Island economy. Investments made in energy efficiency under Least Cost Procurement are expected to add over \$369 million to Rhode Island's Gross State Product and create more than 5,420 job-years of employment.²⁵

²⁰ ACEEE State Energy Efficiency Scorecards for 2014, 2015, 2016 available at: <http://aceee.org/state-policy/scorecard>

²¹ Electric participation is aggregate and includes repeat participation by individual customers. Annual Reports include a participation analysis that details unique cumulative participation since 2012.

²² Carbon multiplier of 0.47 tons/MWh obtained from the 2014 ISO New England Electric Generator Air Emissions Report. Available at: https://www.iso-ne.com/static-assets/documents/2016/01/2014_emissions_report.pdf

²³ Gas participation is aggregate and includes repeat participation by individual customers. Annual Reports include a participation analysis that details unique cumulative participation since 2012.

²⁴ Savings equals the value of electric benefits detailed in Table E-2 and G-2 of the Company's Year End Report filings in years 2009-2016.

²⁵ Macroeconomic multipliers for the economic growth and job creation benefits of investing in cost-effective energy efficiency from National Grid's 2014 Regional Economic Model (REMI) Analysis as presented by the Company to the Collaborative on May 29, 2014. To maintain consistency with RI Test economic benefits multiplier, the Company is only including construction phase impacts to GSP and job-years to account for only direct and indirect impacts.

Table 5. Summary of 2009-2017 EE Plans

Electric Programs	2009 (Actual)	2010 (Actual)	2011 (Actual)	2012 (Actual)	2013 (Actual)	2014 (Actual)	2015 (Actual)	2016 (Actual)	2017 (Planned)
Annual MWh Savings	81,543	81,275	96,009	119,666	159,035	268,468	222,822	214,329	201,347
Lifetime MWh Savings	899,331	929,242	1,076,778	1,288,325	1,612,371	3,278,088	2,287,785	2,034,220	2,065,732
Total Benefits (\$000)	\$123,045	\$128,864	\$151,542	\$140,104	\$192,418	\$314,673	\$312,000	\$234,234	\$247,872
Total Spending* (\$000)	\$29,536	\$29,712	\$39,308	\$50,719	\$72,875	\$80,321	\$82,897	\$74,274	\$90,143
TRC Benefit Cost Ratio**	3.02	3.73	3.35	2.24	2.24	2.69	2.38	2.16	2.00
EE Program Charge/kWh	\$0.0032	\$0.0032	\$0.00526	\$0.00589	\$0.00862	\$0.00911	\$0.00942	\$0.01077	\$0.01124
\$ per lifetime kwh***	\$0.027	\$0.027	\$0.031	\$0.036	\$0.039	\$0.041	\$0.036	\$0.034	\$0.058
Participants	106,525	153,611	254,747	201,351	470,245	551,882	622,822	758,284	569,058
Gas Programs	2009 (Actual)	2010 (Actual)	2011 (Actual)	2012 (Actual)	2013 (Actual)	2014 (Actual)	2015 (Actual)	2016 (Actual)	2017 (Planned)
Annual MMBtu Savings	195,200	140,097	119,613	229,811	311,585	409,029	419,778	417,820	414,606
Lifetime MMBtu Savings	2,553,828	2,155,112	1,623,922	3,300,583	4,377,672	5,958,381	5,249,170	5,282,221	4,945,564
Total Benefits (\$000)	\$26,071	\$26,309	\$18,196	\$36,237	\$44,747	\$50,417	\$54,762	\$51,103	\$66,558
Total Spending* (\$000)	\$6,552	\$5,496	\$4,868	\$13,310	\$19,501	\$20,034	\$20,129	\$23,135	\$28,360
TRC Benefit Cost Ratio**	2.83	2.31	2.21	1.68	1.78	2.41	2.60	1.93	1.63
EE Program Charge/Dth	\$0.150	\$0.150	\$0.150 ****\$0.411	\$0.384	\$0.414	\$0.600 (Resi) \$0.492 (C&I)	\$0.781 (Resi) \$0.637 (C&I)	\$0.748 (Resi) \$0.487 (C&I)	\$0.888 (Resi) \$0.726 (C&I)
\$ per lifetime MMBtu***	\$2.44	\$2.33	\$2.73	\$3.72	\$4.21	\$3.84	\$3.47	\$4.78	\$7.96
Participants	8,339	5,670	3,080	11,681	135,646	143,655	146,098	150,160	112,316

*Total Spending includes implementation, evaluation, commitments, EERMC, and OER.

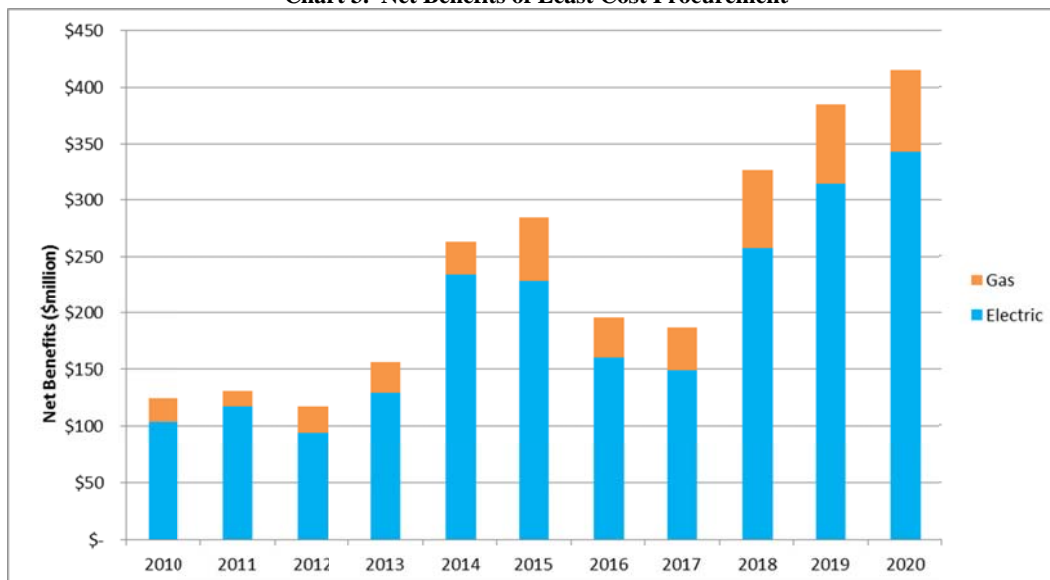
**TRC Benefit/Cost Ratio = Benefits/(Implementation Expenses + Customer Contribution + Evaluation Cost + Shareholder Incentives).

***Implementation costs/Lifetime savings

**** December 2011 PUC voted to increase gas EE Program charge to \$0.411/Dth.

Actual values are from filed Annual Reports. 2017 Value from 2017 Annual Plan.

As the energy savings requirements of Least Cost Procurement grew over the past nine years, so have the benefits. Chart 3 details the total benefits of energy efficiency after accounting for program costs. Total benefits include the avoided cost of supply, avoided cost of transmission and distribution, and non-electric benefits such as water and maintenance savings. Starting in program year 2018, carbon emission reduction benefits and economic benefits were included per the revised Standards.

Chart 3. Net Benefits of Least Cost Procurement

The Company also provided energy efficiency services to delivered fuel heating customers through the income eligible programs. As detailed in Table 6, market rate homeowners with delivered fuel as a primary heating source, were also eligible for energy efficiency services from 2009-2012 as a result of American Reinvestment and Recovery Act funding, in 2013 from electric EE Program Charge funds, and in 2014-2017 from Regional Greenhouse Gas Initiative funds and electric EE Program Charge funds.

Table 6. Historical and Planned Market Rate Energy Efficiency Services in Delivered Fuels Sector

Program Year	Oil Savings (Annual MMBtu)	Funding Amount	Funding Source
2010	16,046.6	\$910,587	ARRA
2011	30,573.3	\$1,707,780	ARRA
2012	14,482.9	\$879,220	ARRA & EE Program Charge
2013	15,036.8	\$795,463	EE Program Charge
2014	29,876.5	\$1,370,849	RGGI & EE Program Charge
2015	36,985.1	\$4,510,657	RGGI & EE Program Charge
2016	35,326.4	\$4,214,972	RGGI & EE Program Charge
2017	28,444.6	\$5,030,000	RGGI & EE Program Charge
2018	52,618.4	\$10,134,000	EE Program Charge
2019	55,186.7	\$10,615,700	EE Program Charge
2020	57,849.0	\$11,106,985	EE Program Charge

Approximately one-third of Rhode Island homes heat with delivered fuels.²⁶ These homes still need the same energy efficiency solutions as those served by electric and natural gas, and the Company is well-positioned to serve the households in its service territory. Therefore, National Grid proposes to deliver additional oil saving in 2018-2020 as detailed in Table 6 above through the electric EE Program Charge. Details of these offerings are provided in the residential section of this Plan.

It is clear that the benefits of Least Cost Procurement far outweigh the costs, providing significant cost-savings to Rhode Island electric and natural gas customers. The Company appreciates the opportunity to continue working with the PUC, the Collaborative, and the EERMC to deliver cost-effective energy savings over the next three-years and meet the growing customer demand for energy efficiency programs and services.

²⁶ Rhode Island Thermal Working Group Report, July 2015.

Cost Effectiveness

In previous Three-Year Plans and Annual Plans, the Company assessed the cost-effectiveness of measures, programs, and portfolios according to the Total Resource Cost (TRC) Test. As previously noted, the revised Standards set forth new requirements for a cost-effectiveness test called the Rhode Island Benefit Cost Test (RI Test), which “more fully reflects the policy objectives of the state with regard to energy, its costs, benefits, and environmental and societal impacts.”²⁷ The change to the RI Test is a positive development for energy efficiency. Accounting for all costs and benefits associated with energy efficiency provides for a more holistic view of its impacts to electric and gas customers, the environment, and the economy.

As prescribed by the Standards, the Company is directed to consult with the EERMC and propose specific benefits and costs to be included in the RI Test. The Standards indicate that “these benefits should include resource impacts, non-energy impacts, distribution system impacts, economic development impacts, and the value of greenhouse gas reductions, as described below. The accrual of specific non-energy impacts to only certain programs or technologies, such as income-eligible programs or combined heat and power, may be considered.”²⁸

In accordance with the Standards, the Company collaborated with the Division’s consultants, EERMC consultants, and the Collaborative to incorporate new benefits and costs into the RI Test. This working group determined that it was prudent to take an incremental approach to adding new factors. The group identified non-embedded greenhouse gas reductions (i.e., the value of reducing greenhouse gas emissions that is not already included in the baseline avoided costs) and economic development impacts as an appropriate starting point in this effort. These two factors already have existing, well-vetted values that can be easily incorporated in the cost-effectiveness screening, as detailed below, and will be used in the 2018 Annual Plan. Over the Three-Year Plan timeline, the Company will continue to work with stakeholders to refine these

²⁷ Least Cost Procurement Standards (Standards) approved at the Open Meeting on April 27, 2017 in Docket 4684.

²⁸ Standards Section 1.2(B)

new factors and propose additional costs and benefits as deemed appropriate by the RI Test and the anticipated completion of the Docket 4600 Benefit-Cost Framework.²⁹

All other aspects of cost-effectiveness screening will continue to follow the methodology defined in Attachment 4 of the 2017 EE Plan as approved in Docket No. 4654. As part of its 2018 EE Plan, the Company will update Attachment 4 to reflect the changes made to comply with the RI Test.

Greenhouse Gas Reduction Values

In previous Plans, the Company incorporated the costs of CO₂ mitigation imposed and projected to be imposed by the Regional Greenhouse Gas Initiative (RGGI) and the costs associated with reasonably anticipated future federal greenhouse gas regulations in the avoided costs used in the TRC Test.

In accordance with Section 1.2(B)(iii) of the Standards and in consultation with the Division's consultants, EERMC consultants, and the Collaborative, the RI Test now includes the value of greenhouse gas reductions not previously included in avoided energy costs. The value of these "non-embedded" greenhouse gas reductions was derived from the Avoided Energy Supply Costs in New England: 2015 Report (AESC Report).³⁰

The Resilient Rhode Island Act sets forth a CO₂ emissions reduction goal of 80% below 1990 levels by 2050.³¹ The AESC Report determines that the marginal cost of stabilizing CO₂ emissions at 80% below 1990 levels by 2050 will be \$100 per short ton. The report finds this cost is a "reasonable estimate of the societal cost of carbon emissions, and hence as the long-term value of the cost of reductions in carbon emissions required to achieve those targets".³² The costs of compliance with the Regional Greenhouse Gas Initiative (RGGI) and reasonably anticipated future federal regulations are one component of the \$100 per short ton value. These costs are already included or "embedded" in the projected electric energy market prices used in

²⁹ At the time of this filing, the Benefit-Cost Framework developed as part of Docket 4600 is incomplete due to missing methodologies for quantifying costs and benefits for new principles. At an open meeting on May 4, 2017, the PUC directed the Division to develop methodologies needed to populate the missing information in the Benefit-Cost Framework, and submit these proposed methodologies to the PUC as part of Docket 4600.

³⁰ Tabors, Caramanis, and Rudkevich (TCR), Avoided Energy Supply Costs in New England: 2015 Report, April 3, 2015.

³¹ R.I. Gen. Laws § 42-6.2

³² AESC Report page 4-29.

the TRC Test. Therefore, the difference between the \$100 per short ton societal cost and the regulatory compliance costs already embedded in the projected energy market prices represents the value of carbon emissions not included in the existing TRC Test. . The Company added the non-embedded CO₂ values from the following tables in the 2015 AESC report to the avoided costs used in the RI Test cost-effectiveness screening: Exhibit 4-5 for electric savings, Exhibit 4-14 for gas savings, and Exhibit 4-18 for oil savings (included in Attachment 3).

The next revision to the AESC Report is due in 2018. The non-embedded value for New England's CO₂ emissions will be updated as part of this study and will be incorporated in the 2019 EE Plan.

Economic Benefits

In previous Plans, the Company applied an economic development impact multiplier to account for benefits to state gross domestic product (GDP) to its cost-effectiveness screening of combined heat and power (CHP) projects. In accordance with Section 1.2(B)(i) of the Standards and in consultation with the Division consultants, EERMC consultants, and the Collaborative, the RI Test now includes the application of multipliers for economic development impacts to all measures.

The original CHP macroeconomic multipliers for the economic growth and job creation benefits of investing in cost-effective energy efficiency came from a recent study "Macroeconomic Impacts of Rhode Island Energy Efficiency Investments: REMI Analysis of National Grid's Energy Efficiency Programs", National Grid Customer Department, November, 2014. Though not applied to cost-effectiveness previously, this REMI Analysis provided macroeconomic multipliers for energy efficiency measures in addition to CHP. The Company took this opportunity to reexamine the energy efficiency and CHP multipliers within the study and refine them for the RI Test.

The multipliers from the REMI analysis take into account how the energy efficiency programs impact Rhode Island's economy in three ways:

1. Program and participant spending represents a direct investment in Rhode Island energy efficiency infrastructure, creating jobs (construction impacts).

2. Bill savings to participants have positive economic impacts over the life of the energy efficiency measures, resulting in more spending on goods and services.
3. Rate increases and participant contributions to the cost of installing energy efficiency measures create short-term costs and reduce spending on goods and services.

After review of the REMI analysis and current benefit-cost model, it is likely that the benefit of bill savings to customers is already accounted for in the TRC Test since the value of all energy savings is included as a monetary benefit. In addition, the impact of customer costs is also already included as a negative dollar benefit. Therefore, to ensure no double counting of costs and benefits, it was determined that only the multipliers associated with construction impacts should be included in the RI Test for both energy efficiency and CHP measures.

It is widely acknowledged that increased spending from installing energy efficiency measures creates jobs in the local economy. It is also evident after a review of the benefit-cost model that these benefits were not yet accounted for outside of CHP. The Company, therefore, will apply the multipliers below to program and participant spending in its benefit-cost model. These multipliers are derived from Table 2 of the REMI analysis report.

GDP Multipliers for Construction Impacts		GDP/\$ Spending	
		Electric	Natural Gas
Residential	Program Spending	0.71	0.71
	Participant Spending	0.75	0.75
Commercial	Program Spending	0.56	0.56
	Participant Spending	0.58	0.58

To maintain consistency across all energy efficiency measures in the RI Test, the Company also modified the CHP multiplier to only include GDP increases related to construction impacts. This changes the CHP multiplier from \$2.73 per dollar spent to \$0.80 per dollar spent. The below CHP multiplier is derived from Table 6 of the REMI analysis report.

CHP Project Economic Multipliers	GDP/\$ Spending
Construction Spending	0.8

The Company finds that this application is a suitable first step in incorporating economic development impacts to the RI Test. The Company plans to commission an updated economic impact study during the 2018 program year to refine these assumptions for its 2019 EE Plan.

Discount Rate

As prescribed by the Standards, all values in the Plan and the benefit-cost model are stated in present value terms, “using a discount rate that appropriately reflects the risks of the investment of customer funds in energy efficiency; in other words, a low-risk discount rate which would indicate that energy efficiency is a low-risk resource in terms of cost of capital risk, project risk, and portfolio risk”.³³

Specifically for the 2018-2020 Plan, the Company used a discount rate equal to the twelve-month average of the historic yields from a ten-year United States Treasury note, using the 2016 calendar year to determine the twelve-month average.

The Company will review and update the discount rate for each Annual Plan, as appropriate, to ensure that the applied discount rate is based on the most recent information available.

Comparison of TRC Test to RI Test

In accordance with Section 1.2(B)(vi) of the Standards, the Company provides the benefits and cost-effectiveness ratios for the Three-Year Plan using the TRC Test and the new RI Test in the Energy Efficiency Funding Plans included in Attachment 1.

Energy Efficiency Priorities

National Grid has identified the four following priorities for the programs identified within the Three-Year Plan. All of the strategies, programs, and initiatives in this Plan contribute to achieving a core priority of reducing energy through efficiency. In addition, each of the Company’s strategies, programs and initiatives are focused on meeting the needs of customers, the environment, and preparing for the future. Below are the four key priorities the Company has identified for the 2018 – 2020 Plan.

³³ Energy Efficiency Procurement Standards, Section 1.2.A.ii.c.

1. **Customers** - Deliver comprehensive services encompassing all market segments and customers. Such services will enable customers to control their energy use, reduce their bills, and help support their financial well-being.
2. **Least Cost** - Deliver energy efficiency services as cost-effectively as possible through optimizing finance and promoting upstream initiatives. Continuing to deliver cost-effective energy savings under Least Cost Procurement will create cost savings to all customers, while creating economic benefits that create and maintain local jobs and businesses.
3. **Environment** - Provide solutions that maximize greenhouse gas emission reductions and contribute to Rhode Island's clean energy policy goals, including the Resilient Rhode Island Act.
4. **Future** – Innovate to capture savings from new technologies and strategies to position energy efficiency programs for the future including the integration of energy efficiency with demand response, renewable energy, and smart grid technologies. This includes incorporating outcomes from the Rhode Island Power Sector Transformation Initiative and Docket 4600.

National Grid's experience with delivering energy efficiency in Rhode Island has provided a foundation for achieving the ambitious savings and benefits in this Plan. As an energy provider that serves 99% of Rhode Island homes and businesses, National Grid is in a unique position to leverage its existing infrastructure while providing programs tailored specifically to Rhode Islanders' needs. Over the next three-years, the Company will focus on saving energy for customers, providing benefits and valuable services to customers, reducing carbon emissions by helping customers save energy, and continuing to expand programs and policies focused on integrating energy efficiency and clean energy.

A detailed annual program implementation plan and detailed program budget will be developed each year, and submitted to the PUC for review and consideration, beginning on November 1, 2017 and on October 15 in each of the two years thereafter.

Residential Customers

The success of Rhode Island's energy efficiency efforts is well recognized through awards presented by national organizations such as American Council for an Energy-Efficient Economy (ACEEE), the United States Environmental Protection Agency (EPA) and Department of Energy (DOE). One aspect of being in the market for several decades and being a leader in the nation for energy efficiency is the positive result seen through market transformation, such as the residential lighting market. The combination of market acceptance of light emitting diode (LED) technology, reduction in LED manufacturing costs, policies that promote the use of efficient LEDs, and strong energy efficiency programs have created a market change far faster than anticipated through the rapid adoption of energy efficient lighting. This change in the marketplace, while reducing opportunities for efficiency savings through lighting, presents opportunities to focus on other energy saving technologies and program design models to bring energy efficiency solutions to consumers.

During the next three years, the Company will promote services that are accessible to all customers. The behavior programs, which began four years ago through the Home Energy Report program, brought energy use and savings to a new level of prominence and understanding for Rhode Islander electric and gas customers. Behavior programs will continue to customize and target customer segments to keep consumers engaged while making the information presented meaningful and actionable. To provide services while optimizing investments, the Company will streamline incentives for customers to make the transactional processes less cumbersome through models such as upstream incentives where the incentive is embedded into the price and the incentive form and process are eliminated. The Company would also like to present alternative financing options to the consumer.

Residential programs will support Rhode Island's greenhouse gas goals and the environment by enhancing energy efficiency for delivered fuel customers and targeting energy savings in the heating sector. In looking to the future, residential customers will be able to access more information about their energy usage and have an array of products offered for a connected home so control over energy use is available whether the consumer is home or away. Further descriptions of future opportunities are described in the pilots and demonstration section of this Plan.

Residential Finance – Heat Loan & New Products

One time, upfront costs for investments in energy efficiency solutions can be viewed as a barrier for customers interested in participating in energy efficiency. By providing customers with residential financing options, the Company offers a solution to this barrier and spreads the investment over a longer period of time. This makes energy efficiency more accessible to a larger number of customers and has allowed customers to take advantage of more energy savings solutions. To date, the only specific energy efficiency financing tool has been the HEAT loan, which provides 0% financing for weatherization and efficient heating systems. This offering has been serving customers for six years and has taken \$4.5 million and leveraged this funding to nearly \$27 million in private capital. The Company anticipates that the HEAT loan will continue to be a strategic solution during the next three years and eagerly anticipates the introduction of other consumer financing options such as the Rhode Island Infrastructure Bank's residential offering which is scheduled to be offered in early 2018 and will also be promoted through the energy efficiency programs. Over the next three years, the Company will look to optimize investments in financing by continually improving the offering and reducing costs so that more customers can be served.

Looking forward, the Company recognizes the importance of supporting moderate income customers and making financing accessible to these customers. National Grid will be enhancing the moderate income HEAT loan, currently offered through the Capital Good Fund, by providing the capital for a revolving loan fund. Currently the Capital Good Fund has limited access to costly capital. The seed funding to Capital Good Fund would remove some of that capital burden while also allowing them to serve nearly three times more moderate income customers annually.

Additionally, the Company will continue to investigate whether it is feasible to offer an on-bill recovery mechanism for residential customers. It will be important for the Company to work with customers and stakeholders, such as Rhode Island Housing, which plays a significant role in the state's income eligible, multi-family and residential markets, to ensure that customer needs are being addressed in a cost efficient manner.

Lighting Market Transformation

Residential lighting market transformation demonstrates the potential for all energy efficiency technologies when a new technology meets or exceeds existing product performance at a reasonable cost and the marketplace embraces the technology. Today, an LED lamp uses 80% less energy than an incandescent bulb from a decade ago and shelf pricing continues to drop. But to arrive at this market transformation, there was decade and a half of energy efficiency programs promoting compact fluorescent bulbs (CFL) and preparing the marketplace for an efficient replacement. Although the CFL technology was not universally embraced due to performance limitations that prevented true market transformation, it was an outstanding educational tool for communicating the benefits of efficiency. When the LED emerged and became reasonably priced through rapid demand and market adoption, the foundation had been established for complete market transformation.

By 2020, the requirements for lighting performance, at 45 lumens per watt, will make most of the efficient lighting currently being promoted the default standard product. Therefore, savings from standard bulbs will be drastically reduced through traditional, mass market channels. The program will be challenged to ensure that the hard-to-reach marketplace has access to – and is aware of – energy efficient options. Savings opportunities may still persist through direct install channels where existing technology can be noted before an efficient replacement is installed. The Company will also support specialty lighting products where an efficient lighting alternative may still present savings. Overall the program will look to reduce costs while continuing to support access to all customers.

Home Energy Assessment Transformation

Home energy assessments are solutions where an energy specialist visits a customer's home and educates the resident on how their home uses energy while providing personalized recommendations to reduce energy, save money, and make the home more comfortable. The visit may also include upgrades of lighting, faucet and shower aerators, advanced power strips, programmable thermostats, and pipe insulation as needed. At the end of the assessment, an Energy Action Plan is provided for improvements that remove the leaks and further insulate the home. The homeowner can then decide whether they are interested in continuing with the next phase of energy solutions. There are three programs that provide Home Energy Assessments:

EnergyWise for single family market rate customers, Income Eligible Services for single family income eligible customers, and Multifamily Services for customers who live in buildings with five or more units. From 2018-2020, the same changes that will transform the lighting market will also impact the home energy assessment arena where lighting savings have covered the cost of the initial visit. In preparation for the changes, the program will be supporting and observing demonstrations that could be incorporated for enhanced savings. These demonstrations include home energy monitoring where different end use loads can be observed and potentially be used as an engagement opportunity for behavior change. Another area being tested is with Wi-Fi thermostats where seasonal temperature optimization will look to capture energy savings. Additionally, behind-the-meter battery storage and aspects for savings will also be considered as a future opportunity. Best practices for program deployment will also be researched as the program adapts and seeks to identify cost savings opportunities.

Residential New Construction and Market Transformation

As Rhode Island adopts the new International Energy Conservation Code (IECC) energy codes for Residential New Construction Program (RNC), the energy savings needed to warrant energy efficiency incentives diminishes. Therefore, the Company is considering a re-design of the RNC program over the next three years to optimize the available savings, and will push toward a zero energy home that will also support the Zero Energy Task Force Recommendations³⁴ and the Power Sector Transformation efforts. To support the development of a program re-design, the Company plans the following developments over the next three years:

- In 2018, the Company will adopt a new User Defined Reference Home (UDRH) baseline, which will reflect the current energy efficiency of new construction single-family homes in Rhode Island. This new baseline will reduce the amount of savings available and will begin to inform the Company on how to modify the RNC program to maintain cost-effectiveness.
- The Company will benefit from a 2017 Participation Study to provide direction on market sectors that remain favorable for the program.

³⁴ https://www.nationalgridus.com/media/pronet/ri-ee-task-force/cm6459-ri-zne-white-paper-12_16.pdf;

- Based on both the new UDRH and Participation Study, the Company plans to develop a re-design of the RNC program in 2018. The program may include packages of offerings in order to maximize savings, smart home technologies to engage the customer in their energy management or move to a zero energy home model.
- On-going review of the impacts of the RNC market transformation will be conducted annually to determine if, and when, to sun-set the program.

ENERGY STAR's Retail Products Platform

The Company will investigate supporting ENERGY STAR's Retail Products Platform, which engages national retailers to stock more efficient consumer products through the support of energy efficiency providers. By working nationally, the Rhode Island energy efficiency program leverages national scale allowing for a reduced investment to influence retailer stocking of efficient consumer appliances.

Upstream HVAC

In an effort to reach customers in new ways and simplify processes to encourage greater customer participation, high-efficiency electric and gas HVAC equipment will be assessed for the potential effectiveness of an upstream (to the manufacturer) or midstream (distributors and contractors) delivery model. Through initial assessment of equipment for transferring into an up/midstream model, the Company has identified heat pump water heaters as a viable option for 2018. The outcome of this initial launch will inform the process for delivering future HVAC equipment up/midstream. The potential shift in where the energy efficiency incentive is offered has been shown to increase sales which result in more savings based on quantity. Importantly, increased sales result in increased incentive costs, which could cause a dramatic shift in program budgets. Offering a mid or upstream – incentive simplifies residential customer participation because the high efficiency product is already discounted and the customer is not required to submit rebate forms or wait for rebate checks.

Home Energy Reports and Behavioral Savings Opportunities

In the next three years, the Company will continue the Home Energy Reports program by educating customers about their energy use as compared to similar households through print and electronic reports delivered throughout the year. The program has evolved since 2013 from offering mailed insights to now being integrated into the Company's website with online

assessment tools, High Temperature Alerts, Non-Advanced Metering Infrastructure (AMI) High Usage Alerts, and segmentation to target different populations. In addition, in the upcoming years, the Company will expand behavioral energy efficiency program efforts as follows:

- Assuming successful results from the 2017 Non-AMI High Use Alert pilot, the Company will continue proactive notifications to alert customers where they can take actions before they receive a high bill. As new technologies come online, this approach will provide customers with even more control over their energy consumption.
- The Company will make broader use of segmentation over the next three years to ensure Rhode Islanders, such as income eligible customers, are fully aware of programs that will specifically benefit them. For example, the Company will make use of the information customers provide during the online assessment process and notify customers of upgrades that would be relevant to their specific situation (e.g. Promoting heat pumps to customers heating with electricity).
- Working with the Company's New Energy Solutions team, the program will consider how home energy disaggregation products and home automation tools will affect how customers interact with energy and any associated behavioral savings. Further, the Company will utilize smart thermostats in more capacities as newly integrated technologies come online and thermostats become even "smarter".

Multifamily

Applying the learnings of a deep review of the Company's Income Eligible and Market Rate Multifamily programs, over the next three years, the Company will focus on offering more technologies, greater comprehensiveness, and more customer friendly approaches in the program while serving a broader range of facilities than have been traditionally served. While the prevalence of LED lighting in multifamily applications continues to grow, the Company remains committed to aggressively seeking avenues for continued energy savings. For example, advancing ductless mini-split technology throughout electrically heated condominiums may offer considerable savings for these customers. As these new technologies are more expensive than traditional direct-install measures, the company will increase the funds allotted for the multi-

family sector HEAT loan to assist in overcoming any copayments remaining after applied incentives.

- *Increasing technologies and innovative approaches:* This may include installing new mechanical systems (i.e. In-unit and Central systems), smart thermostats, or conducting education and training to change how customers in these facilities interact with their newly installed measures. Especially relevant in the case of smart thermostats and mini-split technologies, customers will benefit from training on how to use these products to ensure a reduction and not an increase in energy usage. Where the installation of new mechanical equipment is not cost effective, the Company may offer monitoring and optimization technologies to offer the customer increased savings.
- *Customer-centric recruitment process:* Giving customers the opportunity to participate is the first and most important step on the road to energy savings. By offering customized online invitations and sign-up processes that are site-specific, customers will be able to take part in the program in a more convenient manner than ever before.
- *Commitment to serving scattered-sites:* As the program has served many of the state's largest multi-family facilities, the Company will commit to continuing to identify and target Rhode Island's smaller, scattered-sites.
- *Building Benchmarking Data:* As noted more extensively in the Commercial and Industrial section of the text, the Company for 2018-2020 will be offering automated uploads of aggregate energy usage to the US Environmental Protection Agency's Portfolio Manager. This will benefit multifamily building owners and operators by allowing them to track energy use across their portfolio of buildings.

Income Eligible Customers

National Grid works to ensure that all customers in the State of Rhode Island benefit from its Energy Efficiency programs and initiatives. Equity is an essential component of this Plan, and

the below section outlines the Company's initiatives and efforts to assist customers who may not have as easy access to the cost savings associated with energy efficiency.

Moderate and Income Eligible Customers

The moderate and income eligible customer groups are of particular interest to the Company to ensure that customers with constrained means are benefitting from their contributions to the energy efficiency charge. The income eligible community is defined as households with an income below 60% of the area median income (AMI) which makes them eligible to be on the Company's A-60 electric rate. A moderate income residential customer currently has a working definition as having a household with an income below 100% of the area median income (AMI) but above the income eligible rate class of 60% AMI.

The Company is currently analyzing past customer participation in the energy efficiency programs to best determine where there may be opportunities to further promote energy efficiency offerings. Both the moderate income and income eligible customer groups will be evaluated to understand if they are being served in proportion to their contributions to the energy efficiency charge. The study results will be used to develop a strategy for future energy efficiency programs to effectively serve any under-represented groups.

The Company is also committed to streamlining income eligible services and is working to ensure that customers who are newly added to the income eligible rate (A-60) are connected directly to income eligible services (IES) for energy efficiency. This process is expected to increase new participants in IES. As mentioned in the Residential Finance – Heat Loan & New Products section of this Plan, financing provided through the Capital Good Fund will also support moderate income customers when the time comes to invest in efficiency.

Serving More of the Income Eligible Market

National Grid currently has approximately 35,000 customers on the A-60 discount rate and, out of that number, approximately 13,500 have participated in the energy efficiency programs. The Company is aware that an additional 60,000 customers in Rhode Island could be eligible for the discount rate and is currently developing strategies to address a three-pronged approach to supporting these customers with arrears management, enrolling these customers onto the discount rate, and enrolling them into the energy efficiency program. Strategies may include targeted marketing, community expos, educational seminars, alerts, messaging and enhanced

collaboration with program stakeholders, including the RI Department of Human Services (DHS) and Rhode Island Housing (RIH). In summer to fall of 2017, the Company will be engaging with stakeholders and subject matter experts regarding opportunities to better serve the state's income eligible population.

The high-level objective will be to provide a seamless, time-efficient delivery of all services to improve the financial stability of the customer. As the development of this effort continues to evolve, the Company will develop strategies to accommodate the potential exponential increase of new customers.

Commercial and Industrial Customers

National Grid's Commercial and Industrial (C&I) programs, and the outreach and marketing that support them, are organized according to the way the commercial built environment is organized, – i.e., the existing built environment and the new environment being built and renovated. The Company has two umbrella programs that serve these markets, Retrofit and New Construction. Building owners, operators occupants, and tenants are part of the existing built (retrofit) environment and developers, owners, architects, engineers, equipment specifies, equipment suppliers, and many others, as part of the new construction environment. Although these programs have been highly successful in delivering energy efficiency to these environments, the Company strives to improve program design and delivery, and engage with customers and market actors with new offerings and innovative technologies to further increase energy efficiency in the built environment.

The Commercial and Industrial sector has seen a transformation in the lighting market in the past few years due to a combination of LED technology, reduction in LED manufacturing costs, and strong energy efficiency programs and policies. This market transformation is a success story for energy efficiency in Rhode Island, but it also means that the programs will see diminishing savings from lighting in the next three years. Additionally, as the next cycle of building energy codes and appliance standards come into effect, savings from new construction and major renovations projects will also diminish. These shifts in the marketplace present challenges as well as opportunities in the next three years. The Company is committed to the process of

program improvement, promoting new technologies, new delivery models to address the changing market and economic conditions on ongoing basics.

The Company's focus for this Three-Year Plan will be to innovate for tomorrow, with new strategies and solutions such as: demand response, integrating renewables and storage with pilots and demonstrations, creating deeper more comprehensive savings and provide solutions such as finance that mitigate first cost barriers to achieve deeper energy efficiency savings and performance in buildings. The Company will collaborate with stakeholders like the Rhode Island Infrastructure Bank who sponsor the C-PACE program to leverage all available finance for energy efficiency.

The Company will continue to engage with customers who have been relatively under-served and provide new offerings and technologies to further increase efficiency and performance of buildings for customers that have been served in the past. In that context, the sections below provide strategic descriptions of a number of new initiatives and improvements to existing initiatives that the Company plans to implement in the next three years. The level of detail varies as some elements are more conceptual in nature at this juncture. Full detail will be provided in subsequent Annual Plans.

Retro-Commissioning

Retro-Commissioning (RCx) is defined as “the process of applying rigorous testing, verification and upgrade protocol to an existing building control system to identify and correct operational inefficiencies”³⁵. RCx can be coupled with a monitoring system which uses metering and software to provide ongoing energy performance feedback directly to building operators and or the Company. The RCx initiative was started in 2017, and the Company plans to bring it to scale over the next three years. The Company had three projects in 2017 that were successful, and it believes that expanding this program will help target customers who may not have otherwise participated in energy efficiency.

RCx Programs target both electric and gas saving measures and help commercial and industrial customers improve performance and reduce energy consumption of their facilities through the systematic evaluation of existing building systems and may include continuous commissioning.

³⁵ *Retro-commissioning Best Practice Study*, Revised Draft for C&IMC Review, MA, May 22, 2014.

RCx recommendations from a study are usually no-cost and low-cost HVAC measures that can be implemented in the course of normal maintenance or enhancements to building automation systems, eliminating energy waste. In addition to energy benefits, RCx results in increased comfort for occupants, building information for owners and operators that allow building operators to meet occupant needs for specialized systems, safety, security, and improved long-term capital improvement plans.

Over the next three years, the initiative will target commercial office space, healthcare, hospitality, and higher education. As part of this initiative, the Company will identify common measures in these sectors and develop savings calculation approaches, so that future applications can be streamlined. Although RCx is an area of significant opportunity that will allow the Company to cost effectively capture benefits, there is a lack of vendors in the market who specialize in RCx services. The Company will investigate and determine ways to develop the vendor services market and test various TA vendors as well as turnkey RCx service providers. More Strategic Energy Management Plan (SEMP) and other longer-term pipeline building with C&I customers.

Strategic Energy Management Plan

National Grid's SEMP is an initiative between National Grid and its largest C&I customers to help establish and achieve energy management goals over multiple years. The Memorandum of Understanding (MOU) is an agreement between customers, and the Company that presents a multi-year roadmap that outlines energy efficiency savings and incentives. These savings and incentives allow the customer to make smart financial and energy decisions that align with the customer's goals and priorities. The road map and planning allows for deeper and more comprehensive energy efficiency savings.

In the next three years, the Company plans to further develop the SEMP initiative to include three tiers of offerings to customers, including financial tiers and service offerings tiers, such that customers receive products and services customized to meet their needs. Tier 1 will be basic services that establish a governance structure and help the customer coordinate gross annual energy savings. Tier 2 will include the basic service available in Tier 1 plus Technical Assistance (TA) services, Tier 3 will include Tier 2 services plus provide project management services to the customer. National Grid will also pilot Non-EE Solutions within its SEMP

initiative, with individual customers who are interested in demonstrating and or adopting renewables, storage, Electric Vehicles FV, and distributed energy resources and technologies. National Grid will also explore service agreements and business models that will allow the Company to offer other energy solutions as part SEMP initiative. The Company will look to engage with SEMP initiatives with cities, K-12 schools and industrial customers in addition to the sectors it currently serves (colleges, universities, state facilities, and large hospitals).

Strategic Energy Management

Strategic Energy Management (SEM) is an evolving new concept that can encompass a number of interconnected and mutually reinforcing activities. This initiative is a continuous improvement approach to reducing energy intensity characterized by demonstrated customer commitment, planning and implementation, and systematic measurement. SEM focuses on changes to business practices, affecting organizational culture, and reducing waste. Within Rhode Island's energy efficiency programs, activities that contribute to SEM include, retro-commissioning, trainings for building operators, owners and managers (BOC Training) and customized process and behavioral approaches within the broader context of MOU/SEMPs. Over the next three years, the Company will examine pilots and demonstrations in neighboring states and in the country to determine best practices that can be used to expand existing offerings.

Combined Heat and Power (CHP)

CHP projects are a cost-effective way to provide efficient energy savings, reduce energy operating costs, improve resiliency, and reduce greenhouse gas emissions. In the past three years, significant savings have come from CHP projects due to National Grid's go-to-market strategy that has a dedicated team, including National Grid sales and technical staff, a CHP manager, and CHP Technical vendors, who identify opportunities to execute on projects. National Grid believes that in the next few years, it will continue to see significant savings from CHP projects. To expand opportunities with CHP projects, National Grid will continue with targeted outreach to customers in sectors that have been identified with higher potential. The Company will look to expand into smaller and medium opportunity CHP projects with customers like nursing homes, multi-family projects and health centers.

CHP projects also present challenges from an implementation perspective. These projects involve substantial capital investments, have complex technical requirements for installation, are design-intensive with long lead times for installation. These complexities pose challenges in predicting savings realized within a year. To mitigate some of this unpredictability, the Company plans to address a project's probability of completion for inclusion in Annual Plans each year.

The Company has experience with large-scale CHP projects that have been delayed, which, in turn, has a serious negative impact on annual budgets and savings targets. Because of this experience, National Grid will only include CHP projects with realistic expectations of being completed within the calendar year. This typically means that the CHP equipment has been ordered. For planning, this will help ensure that the customer incentive is both collected from ratepayers and paid in the same calendar year – the best use of all ratepayer dollars. It is also to ensure that the targets can be achieved within the calendar year at the budgeted cost per savings. For example, a large CHP project may be 30,000 Annual MWh, representing 30% of the C&I sector anticipated savings, at an average cost of \$180 per MWh. If it is delayed, there is little chance that other projects can be completed in time to make up for the 30,000 Annual MWh if those projects were not already in development. Additionally, the average cost of non-CHP measures typically cost twice as much.

Small Business Program

The Small Business Direct Install Program (SMB/DI Program) provides turnkey services to the commercial and industrial customers with an average demand of less than or equal to 200kW. There is no upper limit of gas consumption that disqualifies a customer from receiving the gas measures offered by the SMB/DI program.

Customers are provided turnkey services consisting of an energy audit, direct installation measures, program incentive contribution of 70% of total project cost and On-bill repayment for customers' 30% share of project costs, with 0% interest. The Company is looking to add new measures to the program such as Wi-Fi thermostats and exploring additional go to market strategies to engage with vertical segments in this sector.

Market Segmentation and Customer Engagement

To continue providing Rhode Island Commercial and Industrial customer tailored programs, the Company will sustain its market segmentation and tailored marketing approach to deliver programs. This approach allows the Company to provide customized solutions for businesses and manufacturers to participate in energy efficiency and also addresses barriers to participation. Based on this approach the Company in the past identified its largest accounts in specific market segments and has addressed them with initiatives like SEMP, the industrial initiative and the grocery initiative, called Energy Smart Grocer.³⁶ In the next three years, the Company will focus on offering customized energy efficiency solutions to the next tier of accounts, including restaurants, hospitality, multi-family development (on the rise in RI), and emerging markets like indoor agriculture.

Enhanced Energy Tracking Tools and Benchmarking

The Company is committed to providing easy access to energy information for all customers, to help them make informed decisions about their energy use and energy efficiency investments.

Portfolio Manager Benchmarking Tool: The US Environmental Protection Agency's Portfolio Manager is an interactive benchmarking tool that allows customers to track and assess energy and water use across their portfolio of buildings. This benchmarking tool can be used to set a baseline and help identify and target buildings for energy improvements. By the beginning of 2018, National Grid will implement a data upload process for the Portfolio Manager where customers will be able to automatically upload aggregate energy usage data into Portfolio Manager. This process will also support the City of Providence's benchmarking ordinance, the City is looking to implement in 2018. The goal of the benchmarking ordinance is to improve energy efficiency in buildings within the City of Providence. The Company is currently supporting the City's stakeholder process for the development of this ordinance.

Green Button Initiative: The Green Button initiative is an industry-led effort that responds to a White House call-to-action to provide utility customers with easy and secure access to their energy usage information in a consumer-friendly and computer-friendly format. Customers are able to securely download their own detailed energy usage with a simple click of a literal "Green

³⁶ Energy Smart Grocer is an initiative that's implemented by a vendor from opportunity identification, customer site assessment, energy planning to finance and technical guidance.

Button" on electric utilities' websites.³⁷ In 2016-2017, more than 500 C&I and residential customers downloaded their energy use data with Green Button. This included both gas and electric customers. National Grid will explore engaging with customers who download their energy use data with automatic email outreach that details how the programs can help them manage their energy use and achieve their energy goals.

Energy Efficiency Planning for Comprehensive Savings

Today, strong indicators exist that the industry sees opportunities in investing in renewables and energy efficiency as a core business priority, with increasing interest in net zero energy buildings. Businesses are also looking to attract and retain talent to stay competitive and to do so many companies are looking to invest in workspaces. All these market conditions create opportunities in the retrofit market for deeper energy efficiency and operational energy efficiency.

To capitalize on these changing market conditions, the Company will explore opportunities for comprehensive and deep energy efficiency savings for customers in the new construction and retrofit market. The company will look to explore at both operational savings as well as capital improvements in the retrofit market and look at setting Energy Use Intensity goals (EUI) and performance based incentives and metrics for new construction.

The Company will identify commercial customers, developers and owner, who have a higher propensity to participate in deep energy retrofit, operational efficiency and deep and persistent energy efficiency in New Construction projects. The Company will look at all aspects of program development including: a customer engagement strategy, identifying the energy saving opportunities, financial analysis, and a multiyear recommendations approach to implement more comprehensive energy efficiency savings. The Company will also explore escalating incentives for higher levels of savings, thereby encouraging customers to achieve comprehensive savings.

Optimize relationships with HVAC vendors to enhance the HVAC upstream program.

In addition to the array of HVAC solutions the Company has supported for years, ranging from the air and water-cooled air conditioning and heat pump equipment to boilers and furnaces and

³⁷ <https://energy.gov/data/green-button>

related controls and services, the Company will begin to augment these offerings in a variety of ways to increase savings from this important end use category.

For the upstream air-conditioning and heat pump equipment offerings, the Company recently hired a new third-party vendor, who not only has the requisite back office and program administration capabilities, but also has very strong technical and commercial expertise that should improve and expand relationships with equipment distributors and lead to increased savings. Additionally, more products will be added to the upstream HVAC portfolio of offerings including Variable Refrigerant Flow (VRF) and Electronically Commutated Motor (ECM) pumps to better serve a broader array of customers' HVAC needs.

Through the Company's Channel Sales³⁸ group, there are plans to work more closely and collaboratively with supply houses and wholesalers of HVAC equipment to enable them to more effectively both upsell and cross-sell energy efficient equipment. The objective is to convert more standard efficiency equipment purchases into high efficiency purchases and to increase sales of related or add-on equipment as well. Importantly, this approach will also remove the transaction costs burdens typically confronted by customers and or their contractors by having the distributors provide the information necessary to incentivize these projects. It is expected that this approach will increase savings with customers who have in the past decided, despite awareness of the available incentives and services, not to participate. This approach could also lead to savings from customers who have historically been unaware of the available offerings.

Lighting Market Transformation

The lighting market is one of the most dynamic parts of energy efficiency programs across the country. This is no different in National Grid's programs in Rhode Island. Over the past six years, LEDs have become less expensive and have managed to improve the number of delivered lumens per input watt. The Company has taken advantage of these dynamics by engaging customers through multiple paths such as prescriptive, custom and upstream and by serving a diverse group of customers from restaurants to manufacturing to universities. The savings achieved over the past three years have been substantial and are currently the bedrock of the Company's programs.

³⁸ The Company's Channel Sales Group manages relationships with external partners such as Project Expeditors (PEX), trade allies (contractors, installers, electricians, plumbers) as well as manufacturers and distributors of gas and electric products and services.

In the next three years, the Company will be maintaining its focus on serving the entire commercial market with LED luminaries (indoor and outdoor) and controls. The Company will continue its relationships with important market actors such as lighting designers and Lighting Manufacturer Representatives to intercept projects, and make a difference in the space or building. The Company will also continue to pursue all lighting measure opportunities, lighting controls and emerging lighting technologies as well as expand the Performance Lighting initiative that focuses on system efficiencies with lighting design and lighting controls.

The Company expects to continue pursuing LED linear lighting through upstream and custom lighting initiatives. Recent efforts with TLED's and Troffers have provided incentives for these products and further efforts will be made to capture more of the linear lighting market share by reaching C&I leasing customers and commercial customer spaces. Due to increases in efficacy of LED's, savings per unit may rise over time and incentives will be proportioned to promote rising efficacy.

The Company is excited about the lighting possibilities that lie ahead, including using color tunable luminaries to benefit the residents in nursing homes and will explore new lighting technologies and solutions as they emerge.

Street Lighting

On June 1, 2017, National Grid established tariffs for both customer and Company-owned LED street lighting. This gives customers the option of having LED street lighting whether they choose to own or lease their street lighting. This is available to cities, towns, the state, as well as many other entities including any fire districts, regional school districts, and municipal water boards. Also included are: Kent County Water Authority, RI Commerce Corporation, Quonset Development Corporation, RI Airport Corporation and Narragansett Bay Commission. National Grid worked collaboratively with OER and Partnership for RI Streetlights Management (PRISM) to achieve this goal. Customers will receive the same level of energy efficiency incentive whether or not they own the LED street lights, based on expected energy savings.

New Construction

The enhancements in the Commercial New Construction Program in the last Three-Year Plan through a dedicated Company point person and streamlined incentive offers to the design teams have improved the program tremendously. Over the next three years, the goal of the New

Construction program will be to increase participation and to support more comprehensive energy efficient building design of new construction and major renovations projects. A longer term goal of the program will be to develop the market to move to zero energy and zero energy ready buildings. Another goal of the program in the next three years will be to create the market for higher operational performance of these new construction projects. To achieve these goals, the Company will develop the following key strategies.

- 1) The Company will engage developers and owners during the project conception stage prior to RFP process to acquire a design team.
- 2) The Company will explore performance-based procurement approaches that were developed by the National Renewable Energy Laboratory that help set performance based metrics (Energy Use Intensity goals), for design and operations of new construction projects and support the design teams with implementation of strategies to achieve these goals.
- 3) The Company will also revitalize outreach to the building community with accredited courses for American Institute of Architects (AIA) and United States Green Building Council (USGBC) and information on energy efficiency and design practices.
- 4) The Company will explore providing finance to owners and developers and the design team to achieve energy goals.

To encourage innovation in energy efficient design, the Company will explore holding a design competition and workshops. The Company will also explore starting an annual award for achievements in exceptional design and construction of new high performance buildings.

Technologies in New Construction: National Grid will work with the true new construction market to increase adoption of HVAC designs that use dedicated outdoor air ventilation systems with high efficiency heating and cooling systems which are decoupled from ventilation. Such design approaches reduce the energy intensity of HVAC systems

Deep Energy Market

The Company will work closely with AIA to introduce architects to the concept of deep energy retrofits, inform them of the significant business opportunity deep energy retrofits represent,

educate them on the deep energy retrofit process and the architect's role in it, and familiarize them with financial tools and incentives available to this market sector.

All Customers

Below are the Company's programs and initiatives, which target all National Grid customers in Rhode Island, residential, low income, and commercial.

Finance – Helping customers overcome barriers

The Company, through its energy efficiency programs, has succeeded in lowering barriers for its customers to invest in energy efficient equipment, controls, and training for employees for more than 20 years. This has largely been accomplished through the use of incentives, which have been effective in reaching previous energy targets, and will likely aid in reaching aggressive savings targets in future years. However, incentive based programs have two key limitations.

The first limitation is that incentives never cover the full incremental cost of investing in energy efficiency. Some customers can and do prefer to use incentives to cover part of a project's incremental cost and then pay for the rest themselves. However, the Company is aware that there are a significant number of customers who will require more help covering first costs than incentives can currently provide. This is especially important as the Company endeavors to reach underserved customers and to move more customers into more complex, multi-measure projects.

The second is that incentives operate like grants, and by definition, grants cannot be returned into the system to be used over and over. This means that new funds need to be collected each year to cover program costs. And while this is fully compliant with the Least Cost Procurement Statute and achieves significant benefits, National Grid and its stakeholders agree that there are ways to potentially use some of these funds in a more cost efficient manner.

The Company believes that these limitations can be overcome, in part, with a thoughtful combination of finance tools. National Grid knows that the Efficient Buildings Fund (EBF), the Company's On Bill Financing/Repayment mechanism (OBR), and Commercial Property Assessed Clean Energy (C-PACE), and residential OBR all have important roles to play in aiding customers to complete projects that save money, increase comfort, or raise the value of a

customer's facility. What is not yet known is the optimal mix of these products to meet stakeholder expectations and kWh and therm goals over the next three years.

National Grid commits to the following for 2018-2020:

1. Partner with the Rhode Island Infrastructure Bank (RIIB) on providing a common quarterly reporting framework for the use and status of OBR and EBF financing funds that will provide valuable information for assessing and planning for future financing program allocations.
2. Partner with customers to understand which financing options are appropriate (or need to be developed) for them and spur them to action.
3. Partner with stakeholders and other partners (such as RIIB, OER, and the City of Providence) to identify which products are most likely to succeed in specific vertical markets.
4. Work with partners to develop "up and coming" financing solutions that encourage broader and deeper participation.
5. Work with partners to reduce friction in current financing solutions.
6. Work with partners, stakeholders, and energy financing experts on education of customers and cohesive implementation of current and new financing solutions.
7. Continue to enhance sales training on financial products to increase participation in programs and give customers more options for financing energy efficiency.
8. Explore piloting new strategies for the large C&I OBR fund to test customer response and implication on savings. Such pilots may include testing customer response to lower incentives combined with more finance dollars, and requiring more non-lighting measures for a portion finance dollars. The results of these pilots will help inform the Company's finance strategy in the later years of the Three-Year Plan.
9. Explore new financing opportunities such as a third party off-bill financing, Pay as you Save (PAYS), and the Metered Energy Efficiency Transaction Structure (MEETS).
10. Continue to investigate whether it is feasible for the Company to offer an on-bill recovery mechanism for residential customers.

Valuable Services through Design Thinking

Providing customers valuable services can only be accomplished by truly understanding what customers really desire and or/need. Too often, there is an impulse to provide a solution that serves the needs of the decision-makers, but is not necessarily the best option for the customer.

Usually, this takes the form of applying an existing program to a vast array of customer situations and expecting each unique situation to fit within the preexisting program design.

Understanding the inherent limitation of this approach, the Company is committed in 2018-2020 to employing “design thinking” strategies to craft new solutions and optimize existing programs to create value for customers in this changing energy landscape. These strategies will require the Company to be empathetic in its approach to customers in designing solutions that get to the heart of what customers value and need. This approach will require asking customers the right questions, and being empathetic to what they say. Only once a “need” is understood can insights be gained that allow the Company to engage in the ideation and prototyping necessary to bring to fruition a product or service that gets to the core of what the customer desires. By engaging in more focused customer interviews the Company will better understand how to build solutions and programs to better serve customers. To this end, the Company will experiment continuously, measure relentlessly, and learn from its successes and failures to deliver solutions that are of value to customers.

Engaging with Communities

The Company will create a more comprehensive Community Based Initiative over the next three years to achieve deeper energy efficiency commitments from Rhode Island cities and towns.

Since May of 2013, 17 of the state’s 39 municipalities have participated in the Company’s community energy efficiency initiative aimed at having residential customers pledge to be more energy efficient. As a result, over 13,000 customers have taken a pledge to find ways to save energy in their homes. For 2018 and beyond, the Company proposes to take the learnings from this successful initiative and optimize the program, which will lead to greater energy efficiency program participation in residential and C&I sectors. The Company’s engagement with communities will also include:

- Working with municipal leadership the Company will continue to expand beyond basic pledges for efficiency and will set energy savings goals for actions that must be achieved

within the city or town. These goals will be achieved by promoting energy efficiency programs – and strategic electrification of heat when cost-effective – to both residential and C&I customers. In the past the initiative focused on residential customers only but for 2018-2020 the Company will expand promotional efforts to C&I customers whose buildings are located within the targeted communities. This will highlight leaders who have moved forward with energy improvements on site while encouraging businesses to be vocal advocates for energy efficiency to their employees.

- The Company proposes to work with the distributed generation and electric vehicle groups within the Company to offer a customized suite of services to large employers interested in taking part in the community based initiative. Having a collection of offerings such as group purchase electric vehicle programs or Home Energy Assessment campaigns that are custom-branded for the employer to promote to the workforce will bring new value and ease of participation to residential customers while at the same time positioning the employer as a leader in sustainability.

Zero Energy Building (ZEB) Pathways

Zero Energy Buildings (ZEBs) have the potential to strongly support Rhode Island's greenhouse gas emissions reduction goals. ZEBs minimize their overall energy consumption through innovative designs and energy efficiency measures. Renewable energy technologies are then used to generate the remaining annual energy needs of the building. ZEBs can be homes, businesses, or other facilities.

As the largest utility in Rhode Island, National Grid has an integral role to play in enabling and accelerating the adoption of ZEBs in the state. In 2015, National Grid developed a whitepaper with input from key stakeholders for achieving ZEB goals by 2035.³⁹ Recommendations in the whitepaper included establishing policies and legislation that support ZEBs, launching a state-wide ZEB program across all building sectors, and enhancing utility energy efficiency programs to spur the ZEB market while addressing energy efficiency and renewable energy integration barriers. National Grid is committed to supporting the state and making progress on these recommendations.

³⁹ *Zero Energy Building pathway to 2035*, Whitepaper Report of the Rhode Island Zero Energy Building Task Force, Prepared by National Grid, November 2016.

National Grid has committed to developing ZEB demonstrations in 2018-2020 that will enable a go-to-market strategy for ZEBs. In 2017, National Grid will be working with Rhode Island Housing and Office of Energy Resources to develop a moderate income/income eligible zero energy home(s). This demonstration will provide important information to guide the development of a zero energy offering in 2018 or 2019. In addition, two more demonstrations are planned for 2018. One demonstration will be a market rate zero energy home that will demonstrate an all-electric smart home. Again, this process will inform the savings available from zero energy homes and will guide the development of a zero energy offering. In addition, two commercial demonstration projects have been planned for 2018-2019.

Support for ZEB growth in RI will require education and training for the building community, technical assistance, and improvements to codes and standards. Furthermore, benchmarking and building energy labeling will help building owners, sellers, renters, and buyers move the industry towards ZEBs by encouraging everyone to consider energy efficiency during building construction and transactions.

National Grid has committed resources to help automate benchmarking and labeling efforts for commercial facilities with Portfolio Manager (a free online tool from the EPA). Portfolio Manager allows owners and operators to track and compare energy usage in buildings or a portfolio of buildings over time. This data helps owners and operators identify under-performing buildings, set capital improvement priorities, verify efficiency improvements, and identify successful energy management practices.

To achieve the state's ZEB goals, solutions to drive both new construction and large-scale renovation markets towards ZEBs are needed. In both market segments, National Grid is supporting strategic electrification efforts with technologies like heat pumps. The Company will also identify geographical locations where ZEBs will have the most beneficial impact on the grid.

Pilots and Demonstrations

Electric Demand Response (DR)

In 2017, the Company launched a demand response (DR) demonstration for residential, large commercial and industrial customers. The goal of the DR demonstration program is to reduce peak demand costs for all customers in the regions as well as reduce installed capacity tag⁴⁰ for individual commercial and industrial customers through peak shaving and load shifting opportunities.

Through the Connected Solutions demonstration, the Company will continue to scale and assess the savings and corresponding costs of scaling demand response offering. Additional savings opportunities will be tested by investigating more technologies, such as hot water heaters, both electric and heat pump, heat pump mini-splits, as well as operating a seasonal saving component that will focus on reducing overall usage during winter time to relieve the demands of gas and electrically heated homes.

In early 2017, the Company enrolled over 5 MW of demand reduction for a summer demand response demonstration program with large C&I customers. The program offers customers monthly incentives for enrolled kW reduction as well as a performance incentive for DR event participation. National Grid will analyze data collected from the 2017 demonstration to assess the market potential, test delivery strategies, identify market barriers, and develop the cost effective screening framework for demand response (DR) programs. Over the next three years, the Company will look to expand the program targets from 5 MW based on the learning from the first year of deployment.

In the next few years, the Company will also explore demand response program opportunities for small business customers with direct load control technologies. The Company will look incentivize energy efficient connected technologies through the energy efficiency programs and will explore opportunities to reduce peak load by providing incentives for automatic load reduction during demand response events. Technologies include Wi-Fi thermostats that control air conditioners, smart heat pump water heaters, smart electric water heaters and network lighting. In addition, National Grid will explore other demand response-enabled technologies as

⁴⁰ Installed Capacity Tag is a capacity payment that is set for a customer by using their peak demand during the peak day/hour on the NEPOOL grid.

they become available in the market. The Company will also explore opportunities in the connected space, with other non-energy Wi-Fi enabled technologies that maybe an entry point or an engagement opportunity for energy efficiency and demand response with customers.

Demand response is a flexible resource that can be used to address system constraints and congestion. The Company will also examine geo targeting demand response solutions with marketing and community initiatives to address planning and strategic electrification efforts in the next three years.

Gas Demand Response and addressing Gas Peaks

During the extremely cold winters of 2013 and 2014, the region experienced energy price spikes due to increased demand of natural gas for electric generation and heating, combined with pipeline constraints. Since that time, the region has not experienced the same level of winter price volatility thanks to a combination of ISO-NE's Winter Reliability Program and relatively mild winters; however, gas pipeline constraints remain a concern.

Investment in energy efficiency has been one of the most cost-effective strategies to alleviate energy price spikes by lowering demand for generation during winter peak. The Acadia Center found that without electric efficiency programs, energy costs would have been \$1.5 billion higher in winter 2014 alone.⁴¹ In its Three-Year Plan, the Company will continue promoting electric energy efficiency measures that provide savings during winter peak.

The Company also proposes to investigate the costs and benefits of offering gas demand response programs as a potential means to alleviate gas pipeline constraints. Specifically, the Company will look to add a task to the scope of the 2018 Avoided Energy Supply Cost study to investigate the potential capacity benefits from reducing gas consumption at peak. The Company is also awaiting the outcome of a Massachusetts Department of Energy Resources pilot that seeks to quantify the potential benefits of gas demand response in New England. While the Company awaits these results it will operate a seasonal savings component of its residential demand response pilot that will focus on reducing overall usage during winter time to relieve the demands of gas and electrically heated homes.

⁴¹ Acadia Center, Winter Impacts of Energy Efficiency In New England, April 2015.

Energy Monitoring Demonstration

There are emerging technologies that show a homeowner how much energy each light or device in their home uses. Real time information allows homeowners to understand system performance and to have access to information remotely. The Company is considering testing these products for potential savings and customer engagement.

Battery Storage Demonstration

There is a lot of marketplace interest in behind-the-meter battery storage for consumers. The Company is considering investigating customer interest and interaction with battery storage units and testing the potential for integration with Connected Solutions and understanding how to make battery storage financially viable for all parties.

Zero Energy Home

As technologies are taking customer lives and homes to the next level of awareness and control, creating a fully connected, all electric, zero-energy home will be important to test to determine if savings are available to offer incentives to the customer. Based on the recommendations set forth in Zero Energy Task Force Whitepaper, “Zero Energy Building Pathway to 2035” zero energy pilot projects were recommended as a resource for demonstrating effective design, construction and operation of a zero energy home. In order to meet the goal set out by the Whitepaper of 100% of new construction to be ZEB after 2035, it is imperative to develop a program to support the market. The Company is proposing to develop a zero energy home that includes energy efficiency, demand response, solar, electric vehicle charging, battery storage, and smart devices to empower the homeowner to adjust their energy loads to meet the zero energy goal at the end of the year. This project would be used as a customer facing marketing and engagement tool for a period of time prior to its sale.

Indoor Agriculture

Commercial indoor agriculture is for recreational and medicinal marijuana production. For 2018, the strategy will be to enlist a medical marijuana facility to learn about energy usage and needs/concerns, planning for the eventual legalization of cannabis for recreational use in Rhode Island. This is an important emerging sector due to the high demand for lighting and HVAC. There are two building types associated with this market. One is a warehouse type facility with no windows. The second is a greenhouse type facility. There may be electrification issues, as

some growers are constrained from expanding their businesses due to limitations on the grid. The Company needs to learn what is important to growers – including worker safety in such areas as the blue-red lighting spectrum, which can cause eye strain and headaches, as well as reliability, production rates, energy costs, etc.

Reducing Upfront Costs of Ductless Mini Splits for Small Businesses

The Company will explore options to reduce the upfront costs of heat pumps among small businesses. This might be done through innovative financing ownership or financing structures with an installer or manufacturer as a partner. The aim would be to give customers the option to substantially reduce or avoid paying the costs associated with purchasing the units, yet benefiting from the heating and or cooling. Ductless heat pumps are often appropriate for installations in older buildings since no ductwork is needed. The Company can test usage in a variety of building types, as well as different lines of business.

LED Color Tuning for Lighting in Senior Care Facilities

Aging eyes combined with the unique lifestyles of elderly residents of senior living facilities frequently result in less than optimal lighting when fluorescent lighting is used. The fluorescents often have a lighting spectrum which is less than optimal for this audience. Nursing facilities often lack natural sunlight. Testing can be conducted to determine first the direct savings that comes from replacement of the original lighting combined with the additional savings from automatic dimming. Both the amount of light as well as the color of the light can vary with these controls. If lighting is too bright, it can upset the natural release of melatonin, which aids with the sleep-wake cycle. The demonstration project will include educating contractors to install systems for the staff and residents and training staff and residents about how the system operates. Non-energy benefits may include reduced medications for residents and/or a reduction in outbursts.

Transformations

Integration with Power Sector Transformation

Governor Raimondo tasked the PUC, the OER, and the Division with developing a new regulatory framework for Rhode Island's electric system, resulting in the Rhode Island Power Sector Transformation initiative. This proceeding consists of four parallel work streams: Utility

Business Model, Distribution System Planning, Grid Connectivity Functionality, and Strategic Electrification of Transportation and Heating. At the time of this filing, the initiative is still ongoing. However, the Company is committed to incorporating any outcomes of this initiative into its Annual Plans. In the meantime, the Company has taken the initiative to investigate the incorporation of beneficial electrification of heating into its Plan. In addition, the Company continues to pilot new technologies around demand response and automation to begin educating customers on real-time management of energy consumption to prepare them for future tools that may be available through grid modernization.

Integration with Renewables

As Rhode Island moves toward a clean energy future set out by Governor Raimondo and the General Assembly, National Grid recognizes the need to better integrate its offerings of energy solutions. In an effort to streamline a customer's experience with the many energy solutions including: energy efficiency, demand response, electric vehicles, renewable technology, and battery storage, National Grid will work with internal and external stakeholders to identify new opportunities to collaborate on the delivery of – and benefits from – integrated EE and renewable solutions.

As there are inherent complexities of EE and renewable technology programs, it will be necessary to demonstrate technologies and programs to determine effectiveness, benefits and ease of use. Included in this effort will be the pursuit of aligned funding of solutions to create a seamless experience for the customer.

Customer Transformation

National Grid has a team focused on the customer experience, which includes enhancements to the Company website, interactive voice response system, and additional transactional touch points. While energy efficiency is not specifically mentioned in customer experience objectives, EE enhancements can be included where appropriate.

Strategic Electrification Policy and Objectives

The Rhode Island Greenhouse Gas Emissions Reduction Plan (GHG Plan) identifies electrification of heating as a key strategy for meeting the GHG emissions reduction target of

80% below 1990 levels by the year 2050, as set forth in the Resilient Rhode Island Act.⁴² The Plan notes that that 27% of the state's GHG emissions are from fuel consumption for space and water heating in residential and commercial buildings. Furthermore, the GHG Plan suggests that 81% of residential and 67% of commercial main heating load will need to be converted to highly efficient electric heat pumps in order to meet the state's GHG reduction goals.⁴³

High efficiency electric heat pumps create GHG reductions by displacing emissions from fossil fuel heating systems such as propane and oil boilers and from their inherent higher efficiency. The GHG reduction benefit of electrification will increase over time as New England's electric supply continues to shift toward a more decarbonized resource mix. Other jurisdictions like Vermont and Maine have acknowledged the benefits of electrification and have incented the switch to heat pumps through their energy efficiency programs.

In order to help meet state policy goals and to provide additional energy and cost savings to delivered fuel customers, the Company proposes to include incentives for strategic electrification of heating in its Three-Year Plan. Although strategic electrification of heating is not a traditional energy efficiency measure because it increases the use of electricity, it does reduce overall energy consumption through improved efficiency and meets the spirit of state policy by both delivering savings to customers and reducing aggregate emissions. Neither existing law nor the revised Least Cost Procurement Standards prohibit the Company from including incentives for strategic electrification of heating in the Three-Year Plan as long as the Company meets the criteria for cost-effectiveness. Furthermore, Section 1.2(A)(iii) of the revised Standards specifically directs the Company to address new and emerging issues like strategic electrification, including how it may meet state policy objectives and provide system, customer, environmental, and societal benefits.

The Company finds that incentivizing the installation of high efficiency electric heat pumps for customers with existing electric resistance heating and oil boilers⁴⁴ is cost effective under the RI Test and, therefore, will provide customers with net energy savings, qualifying it as an energy

⁴² R.I. Gen. Laws §42-6.2.

⁴³ Rhode Island Greenhouse Gas Emissions Reduction Plan, December 2016.

⁴⁴ The Company also evaluated incentivizing the installation of high efficiency electric heat pumps for customers with propane and kerosene-fired boilers, but determined that these offerings are not cost effective at this time.

conservation measure under Least Cost Procurement.⁴⁵ Incenting more customers to switch from fossil fuel based heating to heat pumps will also help meet the state's GHG reduction goals and, in turn, create significant environmental and societal benefits.

Heat Pump Implementation and Education

In the Three-Year Plan, in instances where benefits exceed the costs, the Company will support the installation of heat pumps for heating as well as cooling. One integral component of heating with cold climate heat pumps will be in educating consumers and installers on the associated cost savings. Further detail on the design of this initiative will be provided in the 2018 Annual Plan.

Delivered Fuels

The Company recognizes and supports Rhode Island's state objectives to provide energy efficiency for delivered fuel heating customers, and will be addressing this segment with electric accounts in multiple ways. Income Eligible customers have always received the same services as electric and gas customers with no incurred customer costs. This is true of income-eligible multifamily customers in 5+ unit facilities as of 2017. These services are not anticipated to change during the next three years. For non-income eligible, single-family (1-4 unit) homes, and 5+ unit multifamily facilities, the Company will investigate providing weatherization services at the same or similar levels as gas customers. The HEAT loan as well as other financing, perhaps through the Rhode Island Infrastructure Bank, may also be available to support financing of weatherization and efficient heating equipment.

In addition to the suite of direct install measures that National Grid has traditionally offered customers, National Grid plans to offer increased options for customers that have delivered fuels such as oil and propane. The Company will reserve a portion of the Small Business Electric Revolving Loan Fund to cover 100% financing for upgrades.

Codes Program and Accounting for New Codes

Improving compliance with the state's residential and commercial building energy codes helps ensure that energy efficiency is incorporated into buildings at least cost – at the time of construction or alteration. Currently Rhode Island is one of the leading states offering a dedicated program to increase energy code compliance in its residential and commercial buildings. Efforts to improve code compliance began in 2013 with the Code Compliance

⁴⁵ See R.I. Gen. Laws § 39-1-27.7(a)(2).

Enhancement Initiative (CCEI), a dedicated effort of state-wide trainings and circuit rider technical assistance offered to building officials and the building industry to boost knowledge and compliance of the prevailing energy code. Recent evaluation studies have demonstrated that state-wide compliance rates have increased drastically since the start of the initiative even while the code itself became more stringent.

This effort will continue in the next three years, but will scale down considerably due to a changed focus solely on new construction savings. Also, a delay in the state's energy code update process coupled with our success in elevating compliance rates results in a further decrease in potential energy code savings. Despite a reduced scope and an uncertain energy code update schedule, the Company will adapt this program to focus on the remaining specific compliance gaps and remain flexible in order to react to an uncertain regulatory environment. The initiative will expand to e-learning modules that are expected to drive more participation and knowledge about energy codes to a wider audience of the new construction market. The initiative will also support building officials and the RI Building Code Commission to improve the enforcement process by developing and providing standardized documentation tools.

As Rhode Island adopts more stringent energy codes and transforms the new construction market, the Company will continue to support the state's aggressive energy policies in promoting the next-generation building sector. The Company will continue to work with state and local building departments and OER to develop and implement the voluntary stretch code to go beyond the energy code. The CCEI initiative will offer trainings and assistance related to promoting compliance with the stretch code as well as preparing the market for the zero-energy building future. The initiative will also investigate opportunities to support increased use of the stretch code.

The Company will also continue to work with OER and Northeast Energy Efficiency Partnerships (NEEP) to support the adoption of state-level appliance standards and will investigate supporting the federal appliance standards development process.

Funding Plan

The following funding sources may be used in each year. The amounts from each source will be detailed in the annual plans. The sources of the electric funding plan in this Plan include funds from the first three sources.

1. One line on the customers' bill currently labeled "Energy Efficiency Programs" comprised of the existing energy efficiency program charge of \$0.01077 per kWh, plus a fully reconciling funding mechanism charge in accordance with RI Gen. Laws § 39-1-27.7. This total of the two factors is represented by the "EE Charge per kWh" row in Attachment 1.
2. Revenue resulting from the participation of energy efficiency resources in ISO-New England's forward capacity market (FCM).
3. Projected large C&I commitments.
4. Proceeds from the auction of Regional Greenhouse Gas Initiative (RGGI) allowances pursuant to RI Gen. Laws § 23-82.6.
5. Funds from any state, federal, or international climate or cap and trade legislation or regulation including, but not limited to, revenue or allowances allocated to expand energy efficiency programs.
6. Other sources as may be identified by the EERMC and the Company.

The sources of the gas funding plan include the following funding sources:

1. One line on the customers' bill labeled "Energy Efficiency Programs" comprised of the existing average energy efficiency program charge of \$0.780 per Dth, plus a fully reconciling funding mechanism charge in accordance with RI Gen. Laws § 39-1-27.7. This total of the two factors is represented by the "EE Program Charge per Dth" row in Attachment 1.
2. Low Income Weatherization funds from Base Rates.

There are many uncertainties associated with the exact amount of the additional funding that will be needed: Company sales, customer co-payments, commitments made for future years, the settlement price for future FCM auctions, identification of additional outside sources of funding, the cost to achieve the savings to meet the future innovation line item in 2019, and the

Company's success in minimizing costs in order to maximize customer benefit. In each subsequent Annual Plan, the Company will incorporate any new evaluation results, new technologies and emerging markets, and work with the EERMC and Collaborative to attempt to meet the savings targets as proposed in Docket 4684. Increasing savings to meet the original targets will likely increase funding needs compared to what is currently proposed in Attachment 1.

Due to these uncertainties, the Company illustrates the amount of funding it expects to need in each year of the Three-Year Plan, and asks for provisional approval of these amounts in order to guide the development of the Annual Plans. The Company is required to submit its Annual Plans (including a detailed budget and implementation plan) to the Commission for review and consideration, including a detailed budget and implementation plan each year by November 1 in the initial year and by October 15 in the following two years.

Although Attachment 1 does not show sector-specific funding levels, the Company will continue its practice of having the residential, and commercial and industrial sectors subsidize income-eligible sector energy efficiency programs in order to provide equity in the availability of program funds and opportunities to benefit from energy efficiency, which is identified as a desirable objective in the Standards.

The Company intends to work with various market actors (vendors, distributors, designers, and builders) to obtain the best pricing for services to achieve program savings goals while controlling costs. The Annual Plans, including the upcoming November 1 filing of the 2018 Annual Plan, will reflect progress made in leveraging other sources of funding, if applicable.

2018 Legislation Impact on Funding

At this time, the 2018 state budget proposes to allocate \$12.5 million from the 2018 energy efficiency program budget to the state budget. It also proposes to cap the 2018 budget at 2017 levels.

This Plan has been designed to illustrate the new initiatives and strategies that the Company will pursue to help customers save energy, reduce carbon, create and maintain local jobs, and deliver economic benefits to the state over the next three years. This Plan does not limit the benefits of energy efficiency, specifically in 2018, due to the budget cap. The Company and Collaborative

will address the budget cap in the 2018 Annual Plan when more detailed information will be available.

The funding plan does illustrate the \$12.5 million reallocation from the efficiency program budget to the state budget. A \$12.5 million investment in energy efficiency is equal to approximately 23,279 Annual MWh in savings that would create \$48.3 million in benefits and avoid 103,940 tons of carbon over the life of the installed measures and create 1,210 jobs years. If the \$12.5 million was not taken from energy efficiency, it could have reduced the illustrated rate by 16% in 2018. For a very large industrial customer, this rate reduction could have saved \$29,700 a year.

Bill Impacts

National Grid recognizes that energy efficiency is an investment that results in lower costs over the life of installed measures due to avoided energy usage, price suppression, and avoided infrastructure investments. This investment is funded by a rate on customers' bills. National Grid conducts a Bill Impact Analysis to determine if all customers, even those who do not participate in energy efficiency projects, benefit by having lower future bills. Previous analysis has found that over the lifetime of the energy efficiency programs, the average Rhode Island customer's bills are lower than they would have been if there were no programs. National Grid will continue to conduct the Bill Impact analysis in Annual Plans.

Shareholder Incentive

The proposed shareholder incentive mechanism, applicable to energy efficiency efforts in 2018 to 2020, will initially be based on the same framework as approved in the 2017 Annual Plan. However, given the growing importance of aligning energy efficiency plans with the state's goals for power sector transformation and greenhouse gas emissions reduction, the Company will work with the OER, the DPUC, the EERMC, and the Collaborative to consider new performance metrics to promote these complementary policy goals.

Any agreed upon changes to the Performance Incentive mechanism would not be included until the 2019 Annual Plan. Changes in performance metrics may cause Annual Plan budgets to differ from the illustrative budget included in the Three-Year Plan because they will incent a different measure mix that may carry different implementation costs. This could change the total amount

of the shareholder incentive. The Company will also collaborate with stakeholders on possible further changes to the incentive structure for the 2021-2023 Three-Year Plan.

For the purpose of the illustrative budget in this Three-Year Plan, the Company calculated the incentive based on the framework in the 2017 EE Plan (Docket 4654).

As in 2017, the proposed incentive mechanism establishes an incentive of 1.25% of the annual spending budget for achieving 75% of the savings goals in a sector. This would increase linearly to 5% of the annual spending budget for achieving 100% and increase linearly from that point to 6.25% of the annual spending budget for achieving 125% of the savings goals.

Expressed mathematically, the shareholder incentive would be calculated as follows for both energy and demand savings, where SB is the Annual Spending Budget in the sector:

- From 75% of savings to 100% of savings:
 - Incentive = $SB \times (0.15 \times \% \text{ of savings achieved} - 0.10)$
 - x 0.7 for electric energy savings
 - x 0.3 for electric demand savings
 - x 1.0 for natural gas savings
- From 100% of savings to 125% of savings:
 - Incentive = $SB \times (0.05 \times \% \text{ of savings achieved})$

The Company believes that this structure will incent the Company to achieve savings that approach or exceed 100% of the annual goals. It does so by setting the threshold for savings required to earn an incentive at 75% of the annual savings goals, by creating a steep slope to earn a greater incentive in the range of 75% of savings to 100% of savings, by establishing the target incentive at 5.0% of the annual spending budget, and by offering a higher incentive for exceeding 100% of the annual goals.

The threshold performance level for energy savings by sector will be set at 75% of the annual energy and demand savings goal for the sector. The Company must attain at least this threshold level of savings in the sector before it can earn an incentive. The Company will have the ability to earn an incentive for each MWh, MW, or MMBtu saved once threshold savings for the sector are achieved. The cap for the target incentive amount of energy savings will remain at 125%.

In addition, in order to promote cost efficiency in spending in the achievement of the energy savings goals, an adjustment would be made under certain circumstances to MWh and MMBtu

savings goals in the shareholder incentive calculation. If the actual implementation expenses in a sector at year end are less than the planned implementation expenses for that sector by more than five percent, and if achieved savings in the sector exceed 100% of the target savings goal, the savings goal for that sector will be adjusted by the ratio of actual implementation expenses to the planned implementation expenses. Conversely, if the actual implementation expenses in a sector at year end are greater than the planned implementation expenses by more than five percent, and if achieved savings in the sector are less than 100% of the target savings goal, the savings goal for that sector will be adjusted by the ratio of actual implementation expenses to the planned implementation expenses.

The ability to earn up to 125% of the target incentive is worthwhile because Rhode Island customers will realize additional energy and cost savings if the Company achieves a high-level of energy savings performance. Given budget control requirements included in the incentive structure, this feature will provide the Company with an incentive to improve the efficiency of its program implementation efforts while providing Rhode Island customers with value in excess of the incremental incentive that may be earned by the Company. That is, the Company will have an incentive to increase customers' savings and customers will realize an overwhelming majority of the savings.

Table 7. Illustration of Target Shareholder Incentive

Electric Programs	2018	2019*	2020
Spending Budget	\$ 96,634,953	\$113,272,514	\$102,229,204
Target Shareholder Incentive			
Energy Savings (3.5%)	\$ 3,382,223	\$ 3,964,538	\$ 3,578,022
Demand Savings (1.5%)	\$ 1,449,524	\$ 1,699,088	\$ 1,533,438
Total Benefits	\$ 373,004,694	\$438,942,301	\$451,782,884
Gas Programs	2018	2019	2020
Spending Budget	\$ 27,408,372	\$ 28,709,749	\$ 29,707,869
Target Shareholder Incentive (5.0%)	\$ 1,370,419	\$ 1,435,487	\$ 1,485,393
Total Benefits	\$ 97,702,163	\$101,369,221	\$104,184,334

*2019 includes 25,539 Annual MWh and correlated costs and benefits, as an adder for future innovation.

Timeline

The Standards outline the following timeline for the development of the annual program implementation plans and detailed budgets. National Grid will work with the EERMC and the Collaborative to meet these deadlines:

a. Three-Year Least Cost Procurement Plans

- By August 17, 2017 and triennially thereafter: The EERMC will vote whether to endorse the Energy Efficiency Procurement Plan.
- September 1, 2017 and triennially thereafter: Submit the Energy Efficiency Procurement Plan for three years of implementation beginning with January 1 of the following year.
- September 1, 2017 and triennially thereafter: Submit the System Reliability Procurement Plan, which will propose general planning principles and potential areas of focus that incorporate non-wires alternatives into National Grid's distribution planning process for three years of implementation beginning January 1 of the following year.

b. Annual Energy Efficiency Procurement Plans

- National Grid will submit a draft Annual Plan to the EERMC and the for their review and comment annually at least one week before the EERMC's scheduled meeting prior to the filing date that year.
- The EERMC shall vote whether to endorse the Annual Plan prior to the prescribed filing date, annually.
- November 1, 2017 (and on October 15, 2018 and October 15, 2019): Submit the annual program implementation plan and detailed budget for the next program year. The Annual Plan filing shall also provide for adjustment, if necessary, to the remaining years of the Energy Efficiency Procurement Plan based on experience, ramp-up, and increased assessment of the resource levels available.

c. Annual System Reliability Procurement Reports

- November 1, 2017 (and on October 15, 2018 and October 15, 2019): Annual System Reliability Procurement Plan and funding plan submitted to the PUC.

Please see Attachment 1: Energy Efficiency Funding Plan

Attachment 1: Energy Efficiency Funding Plan

2018-2020 Energy Efficiency Plan Electric Funding Plan

PART A: TOTAL FUNDING AND GOALS

		2017	2018	2019*	2020	Three Year Total
1)	Projected kWh Sales:	7,503,692,780	7,458,294,598	7,462,072,041	7,437,757,554	
2)	Currently Effective EE Charge	\$ 0.01077	\$ 0.01077	\$ 0.01077	\$ 0.01077	
3)	Projected DSM Revenues from DSM Charge = (1) x (2)	\$ 80,814,771	\$ 80,325,833	\$ 80,366,516	\$ 80,104,649	\$ 240,796,998
4)	Other Sources of DSM Funding					
4a)	Projected Commitments from prior year	\$ -	\$ -	\$ -	\$ 4,000,000	\$ 4,000,000
4b)	Projected Entering Fund Balance and Interest:	\$ (2,677,637)	\$ 10,695,594	\$ 0	\$ 0	\$ 10,695,594
4c)	Projected Capacity FCM Payments from ISO-NE:	\$ 12,031,837	\$ 24,743,137	\$ 22,607,901	\$ 17,481,764	\$ 64,832,802
4d)	Projected RGGI Proceeds	\$ 2,009,452				
4)	Subtotal Other Sources of DSM Funding	\$ 11,363,652	\$ 35,438,731	\$ 22,607,901	\$ 21,481,764	\$ 79,528,396
5)	Projected Funding Available from Traditional Sources = (3) + (4)	\$ 92,178,423	\$ 115,764,564	\$ 102,974,417	\$ 101,586,413	\$ 320,325,394
6)	Implementation Budget	\$ 88,510,554.82	\$ 96,634,953.46	\$ 113,272,514	\$ 102,229,204	\$ 312,136,672
7)	Other Expenses					
7a)	Estimated Commitments to Future Years	\$ -	\$ -	\$ 4,000,000	\$ -	\$ 4,000,000
7b)	Target Incentive	\$ 4,425,528	\$ 4,831,748	\$ 5,663,626	\$ 5,111,460	\$ 15,606,834
7c)	EERMC Expenses	\$ 816,252	\$ 790,579	\$ 998,425	\$ 874,680	\$ 2,663,685
7d)	OER Expenses	\$ 816,252	\$ 790,579	\$ 998,425	\$ 874,680	\$ 2,663,685
7)	Subtotal Additions to Program Expenses	\$ 6,058,031	\$ 6,412,906	\$ 11,660,476	\$ 6,860,821	\$ 24,934,203
8)	RI Legislation Budget Request	\$ -	\$ 12,500,000	\$ -	\$ -	\$ 12,500,000
9)	Total Funding Required = (6) + (7) + (8)	\$ 94,568,586	\$ 115,547,860	\$ 124,932,991	\$ 109,090,025	\$ 349,570,875

PART B: FULLY RECONCILING FUNDING

10)	Projected Funding Available = (5)	\$ 92,178,423	\$ 115,764,564	\$ 102,974,417	\$ 101,586,413	\$ 320,325,394
11)	Fully Reconciling funding needed from additional source = (8) - (9)	\$ 2,390,163	\$ (216,704)	\$ 21,958,574	\$ 7,503,612	\$ 29,245,482
12)	Fully Reconciling funding charge per kWh = (10) / (1)	\$ 0.00031	\$ (0.00002)	\$ 0.00294	\$ 0.00100	
13)	Currently Effective EE Charge = (2)	\$ 0.01077	\$ 0.01077	\$ 0.01077	\$ 0.01077	
14)	Proposed Adjustment to Reflect Fully Reconciling Funding Mechanism = (11) + (12)	\$ 0.01108	\$ 0.01075	\$ 0.01371	\$ 0.01177	
15)	Proposed System Reliability Factor per kWh, excluding uncollectible recovery:	\$ 0.00002	\$ 0.00002	\$ 0.00002	\$ 0.00002	
16)	Currently Effective Uncollectible Rate	1.25%	1.25%	1.25%	1.25%	
17)	Proposed Energy Efficiency Program charge per kWh, including uncollectible recovery = (13)+(14) / (1-(15))	\$ 0.01124	\$ 0.01090	\$ 0.01390	\$ 0.01193	

PART C: Plan TARGETS AND COST/LIFETIME kWh

18)	Plan Target, Annual Net MWh	201,347	179,968	194,677	189,509	564,154
19)	Plan Target, Annual Net Peak kW Savings	28,543	29,639	35,188	34,224	99,051
20)	Plan Target, Net Lifetime MWh	2,065,732	1,712,064	1,904,592	2,160,318	5,776,974
	RI Test					
21a)	Total benefits	\$ 373,004,694	\$ 438,942,301	\$ 451,782,884	\$ 1,263,729,880	
22a)	Net benefits = (21a) - (9)	\$ 257,456,835	\$ 314,009,310	\$ 342,692,859	\$ 914,159,004	
23)	Customer Costs	\$ 24,104,979	\$ 27,490,604	\$ 30,574,406	\$ 82,169,989	
24a)	Cost/lifetime kWh = ((9) + (23)) / (20)*1000	\$ 0.071	\$ 0.077	\$ 0.062	\$ 0.070	
25a)	Benefit Cost Ratio = (21a) / ((9) + (23))	\$ 2.93	\$ 2.88	\$ 3.23	\$ 2.93	
26a)	Utility Spending per lifetime kWh = ((6)+(7b)) / (20)) / 1000	\$ 0.059	\$ 0.062	\$ 0.050	\$ 0.057	
	TRC Test					
21b)	Total benefits	\$ 247,871,847	\$ 238,486,733	\$ 287,248,549	\$ 297,271,014	\$ 823,006,297
22b)	Net benefits = (21b) - (9)	\$ 153,303,261	\$ 122,938,874	\$ 162,315,559	\$ 188,180,989	\$ 473,435,422
23)	Customer Costs	\$ 29,534,595	\$ 24,104,979	\$ 27,490,604	\$ 30,574,406	\$ 82,169,989
24b)	Cost/lifetime kWh = ((9) + (23)) / (20)*1000	\$ 0.058	\$ 0.071	\$ 0.077	\$ 0.062	\$ 0.070
25b)	Benefit Cost Ratio = (21b) / ((9) + (23))	\$ 2.00	\$ 1.88	\$ 1.88	\$ 2.13	\$ 1.91
26b)	Utility Spending per lifetime kWh = ((6)+(7b)) / (20)) / 1000	\$ 0.045	\$ 0.059	\$ 0.062	\$ 0.050	\$ 0.057

Notes:

- 1 Sales from Company sales forecast (Fall 2016) and includes Streetlights. The forecast is expected to be updated in Fall 2017 and will be used in the 2018 EE Annual Plan.
- 2 2016 EE Charge includes uncollectible recovery and System Reliability factor. See Line 13, Table E-1, Attachment 5 - 2016 EE Plan, Docket 4580.
- 4b Projected Entering Fund Balance source is the projected 2017 Year-End Fund Balance with actuals through June 2017. Fund balance assumed to be \$0 in 2019 and 2020 as part of Fully Reconciling Funding.
- 4c FCM Payments based on internal estimates.
- 6 Program expenses include implementation and evaluation expenses. Do not include RIIB funding, OER, EERMC, or target shareholder incentives.
- 7b Target incentive is equal to 5% of program expenses.
- 7c EERMC Expenses equal to 2% of total collections from customers' Energy Efficiency Program Charge, reduced by 1%.
- 7d OER Expenses equal to 2% of total collections from customers' Energy Efficiency Program Charge, reduced by 1%.
- 21-26 21-26a reflects benefit/cost using the RI Test and 21-26b reflects benefit/cost using the TRC Test
- 24a&b Excludes \$12.5 M legislation cost since it is not an energy efficiency expense.
- 25a&b Excludes \$12.5 M legislation cost since it is not an energy efficiency expense.
- *2019 includes 25,539 Annual MWh and correlated costs and benefits, as an adder for future innovation.

**2018-2020 Energy Efficiency Plan
Gas Funding Plan**

PART A: TOTAL FUNDING AND GOALS

	2017	2018	2019	2020	Three Year Total
1) Projected Dth Sales:	39,804,237	38,149,821	38,509,934	38,825,806	
2) Currently Effective Average EE Charge	\$ 0.596	\$ 0.780	\$ 0.780	\$ 0.780	
3) Projected DSM Revenues from DSM Charge = (1) x (2)	\$ 23,727,856	\$ 29,771,711	\$ 30,052,740	\$ 30,299,242	\$ 90,123,693
4) <u>Other Sources of DSM Funding</u>					
4a) Projected Commitments from prior year	0	0	0	0	\$ -
4b) Projected Entering Fund Balance and Interest:	\$ (1,515,724)	\$ (378,798)	0	0	\$ (378,798)
4c) Low Income Weatherization in Base Rates	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 600,000
4) Subtotal Other Sources of DSM Funding	\$ (1,315,724)	\$ (178,798)	\$ 200,000	\$ 200,000	\$ 221,202
5) Projected Funding Available from Traditional Sources = (3) + (4)	\$ 22,412,131	\$ 29,592,914	\$ 30,252,740	\$ 30,499,242	\$ 90,344,896
6) Implementation Budget	\$ 27,750,991	\$ 27,408,372	\$ 28,709,749	\$ 29,707,869	\$ 85,825,990
7) <u>Other Expenses</u>					
7a) Estimated Commitments to Future Years	\$ -	\$ -	\$ -	\$ -	\$ -
7b) Target Incentive	\$ 1,387,550	\$ 1,370,419	\$ 1,435,487	\$ 1,485,393	\$ 4,291,299
7c) EERMC Expenses	\$ 304,264	\$ 310,540	\$ 315,396	\$ 326,525	\$ 952,461
7d) OER Expenses	\$ 304,264	\$ 310,540	\$ 315,396	\$ 326,525	\$ 952,461
7) Subtotal Additions to Program Expenses	\$ 1,996,077	\$ 1,991,498	\$ 2,066,280	\$ 2,138,444	\$ 6,196,221
8) Total Funding Required = (6) + (7)	\$ 29,747,068	\$ 29,399,869	\$ 30,776,029	\$ 31,846,313	\$ 92,022,211

PART B: POTENTIAL INCREMENTAL FUNDING NEEDED

9) Projected Funding Available = (5)	\$ 22,412,131	\$ 29,592,914	\$ 30,252,740	\$ 30,499,242	\$ 90,344,896
10) Fully Reconciling funding needed from additional source = (8) - (9)	\$ 7,334,936	\$ (193,044)	\$ 523,290	\$ 1,347,070	\$ 1,677,316
11) Fully Reconciling funding charge per Dth = (10) / (1)	\$ 0.184	\$ (0.005)	\$ 0.013	\$ 0.034	
12) Currently Effective Average EE Charge = (2)	\$ 0.596	\$ 0.780	\$ 0.780	\$ 0.780	
Proposed Adjustment to Reflect Fully Reconciling Funding Mechanism = (11) + (12)	\$ 0.780	\$ 0.775	\$ 0.793	\$ 0.814	
14) Currently Effective Uncollectible Rate	3.18%	3.18%	3.18%	3.18%	
15) Proposed Average Energy Efficiency Program charge per Dth including uncollectible recovery = (13) / (1-(14))	\$ 0.805	\$ 0.800	\$ 0.819	\$ 0.841	
15a) Proposed Residential Energy Efficiency Program charge per Dth including uncollectible recovery	\$ 0.888	\$ 0.882	\$ 0.903	\$ 0.928	
15b) Proposed Commercial & Industrial Energy Efficiency Program charge per Dth including uncollectible recovery	\$ 0.726	\$ 0.721	\$ 0.739	\$ 0.758	

PART C: PLAN TARGETS AND COST/LIFETIME Dth

16) Plan Target, Annual Dth	414,606	384,486	396,859	405,373	1,186,717
17) Plan Target, Lifetime Dth	4,945,564	4,391,662	4,553,143	4,682,906	13,627,710
<u>RI Test</u>					
18a) Total benefits	\$	\$ 97,702,163	\$ 101,369,221	\$ 104,184,334	\$ 303,255,718
19a) Net benefits = (18a) - (8)	\$	\$ 68,302,293	\$ 70,593,192	\$ 72,338,021	\$ 211,233,507
20) Customer Costs	\$	\$ 9,177,429	\$ 9,890,893	\$ 10,284,820	\$ 29,353,141
21a) Cost/lifetime Dth = ((8) + (20)-(7b)) / (17)	\$	\$ 8.47	\$ 8.62	\$ 8.68	\$ 8.91
22a) Benefit-Cost Ratio = (18a) / (8) + (20)	\$	\$ 2.53	\$ 2.49	\$ 2.47	\$ 2.50
23a) Utility Spending per lifetime Dth = ((6)+(7b)) / (17)	\$	\$ 6.55	\$ 6.62	\$ 6.66	\$ 6.61
<u>TRC Test</u>					
18b) Total benefits	\$	\$ 66,558,401	\$ 59,359,761	\$ 62,581,346	\$ 65,010,727
19b) Net benefits = (18) - (8)	\$	\$ 36,811,333	\$ 29,959,892	\$ 31,805,317	\$ 33,164,414
20) Customer Costs	\$	\$ 10,992,016	\$ 9,177,429	\$ 9,890,893	\$ 10,284,820
21b) Cost/lifetime Dth = ((8) + (20)-(7b)) / (17)	\$	\$ 7.96	\$ 8.47	\$ 8.62	\$ 8.68
22b) Benefit-Cost Ratio = (18b) / (8) + (20)	\$	\$ 1.63	\$ 1.54	\$ 1.54	\$ 1.54
23b) Utility Spending per lifetime Dth = ((6)+(7b)) / (17)	\$	\$ 5.89	\$ 6.55	\$ 6.62	\$ 6.66

Line Notes:

- 1 From the Company's Summer 2017 Gas Forecast. Includes projections for firm and non-firm customers, excludes exempt DG customers.
- 2 The Currently Effective Average Charge is illustrated as one charge, shared among residential and commercial customers. The charge is separated into separate charges by customer segment on lines 15a and 15b.
- 4a There are no commitments planned at this time.
- 4b Projected Entering Fund Balance source is the projected 2017 Year-End Fund Balance with actuals through June 2017. Fund balance assumed to be \$0 in 2019 and 2020 as part of Fully Reconciling Funding.
- 7b Target incentive is equal to 5.0% of program expenses
- 7c EERMC Expenses equal to 2% of total collections from customers' Energy Efficiency Program Charge, reduced by 1%.
- 7d OER Expenses equal to 2% of total collections from customers' Energy Efficiency Program Charge, reduced by 1%.
- The proposed charges by sector are an illustration for the first draft. The calculations will be updated for the final draft. 3YP is projected at a portfolio level therefore the split between residential and C&I charges is based of 2017 Annual Plan and 15a & 15b will be updated in subsequent Annual Plans.
- 21-26 21-26a reflects benefit/cost using the RI Test and 21-26b reflects benefit/cost using the TRC Test

Attachment 2: Evaluation updates to Recommended Targets for Electric and Natural Gas Energy Efficiency Programs

Information gathered in recent evaluations will have a significant impact on net savings and cost-effectiveness in the forthcoming Annual Plans and has therefore been illustrated in the Three-Year Plan. The following summaries explain a few of the recent evaluation results and how their application causes the Three-Year Plan Targets to deviate from the Targets in Docket 4684. The tables illustrate the deviation from the Docket 4684 Targets in order to illustrate the magnitude of the changes. Additional evaluations are anticipated to be completed for the 2018 Annual Plan and variances are anticipated.

Electric Evaluation Results and Changes

Energy Star Lighting

The EERMC has recommended a draft Connecticut residential lighting Free Ridership (FR) study, *R1615 LED Net-to-Gross Evaluation*, by NMR, Inc., EERMC consulting team as a guidance document for assessing the direction of NTG attribution in the market-driven program for 2018-2020. The draft study is available on the Connecticut Energy Efficiency website: <https://www.energizect.com/connecticut-energy-efficiency-board/evaluation-reports>. Although the Connecticut study recommends specific values for FR/SO, after discussion on the applicability of those results to the RI market, the collaborators decided to use an estimate of FR that is the mid-point between the Target values selected in Docket 4684 and the Connecticut study results. A study by the Massachusetts Program Administrators, including National Grid, is underway and results are anticipated in early 2018.

The FR rate used for the residential lighting program during Target selection was estimated to be 40% in 2018, 50% in 2019 and 60% in 2020 for standard (STD) units. STD units comprise approximately 95% of the program target savings. Furthermore, values ranging from 10% to 20% were estimated for hard to reach (HTR) units, which made up the remaining 5% of bulbs in the program. Table 1 illustrates the impact of the changes due to this evaluation.

The savings from the transformation of the residential lighting market are still very real. Customers are still reducing energy through efficient lighting and the benefits to customers and

the state through reduced consumption are being realized. However, National Grid will not attribute those savings to the programs.

National Grid is committed to continuing this transformation in other residential lighting products in order to delivering aggressive energy savings and benefits to customers. To increase attributable savings, National Grid plans to increase the number of specialty bulbs in 2018 and 2019 compared to what was assessed in the Docket 4684 Targets.

Table 1: Residential Lighting Evaluation Impacts

Change in Free-Ridership	2018	2019	2020
Target planning (STD)	0.4	0.5	0.6
Consultant recommendation (STD)	0.5	0.57	0.64
% impact (STD)	20%	12%	6%
Target goal (95% STD)	44,763	30,776	21,977
MWh/yr. Reduction (STD)	-8,953	-3,780	-1,374
Target planning (HTR)	0.1	0.15	0.2
Consultant recommendation (STD)	0.3	0.37	0.44
% impact (HTR)	67%	59%	55%
Target goal (5% HTR)	2,356	1,620	1,157
MWh/yr Reduction (HTR)	-1,571	-963	-631
Total Res ES Lighting MWh/yr reduction	-10,523	-4,743	-2,005

Residential Home Energy Reports

National Grid has completed an impact evaluation for the RI Home Energy Reports (HER). The study, *RI Home Energy Reports Impact Evaluation* by Illume Consulting was finalized in August 2017. The EERMC consulting team has reviewed the study. It will be filed with the PUC as part of the 2018 EE Annual Report and made publically available via the EERMC website. The study has determined new realization rates for the electric savings associated with RI Home Energy Reports will result in decrease in the electric savings by approximately 5% per year in 2018-2020.

In order to increase attributable savings to the program, National Grid plans to increase electric savings through several of the strategies described in the Home Energy Reports section. The

Three-Year Plan illustrates more savings compared to what was assessed in the Docket 4684 Target base potential.

Table 2: Electric HER RR Impact on Targets

	2018	2019	2020
Target Planning RR*	98%	98%	99%
2017 HER Evaluation RR	93%	93%	93%
% Impact	-5%	-5%	-6%
Approx. MWh/yr Reduction	-1,350	-1,300	-1,250

*Target Planning RRs represent the weighted average RR for 2017.

C&I Upstream Lighting Initiative

An Upstream Lighting impact evaluation is nearing completion for the Massachusetts Program Administrators, which includes National Grid. National Grid Rhode Island is working on a companion impact evaluation (*Rhode Island C&I Upstream Lighting Impact Evaluation by DNV-GL*), as well as working on the *C&I Free Ridership and Spillover*, by TetraTech, Inc. Upstream Lighting has been a large savings driver in both Massachusetts and RI and the program is implemented similarly in both states. The final study will be filed with the 2018 EE Annual Report and available via the EERMC website.

The evaluations are still being finalized and reviewed by National Grid and EERMC consultants. Based on the work completed to date, the evaluation contractor recommended a realization rate of 0.67 based on the similarity of Rhode Island early findings and Massachusetts findings. Over time, the RR is expected to rise, as program delivery and savings estimates become more aligned with the evaluation approach. Early impressions from the in-progress C&I free-ridership / spillover (FR/SO) study suggest that the FR has risen significantly to ~20% and SO has fallen significantly to ~5%, leading to another significant reduction in program savings. The net (1-FR+SO) factor is also expected to remain constant, as the Upstream program introduces more capital-intensive measures and moves away from “screw-in” type technologies that are simple replacements. The total effect on the C&I upstream lighting initiative is that overall net to gross values are dropping to roughly 50% of the values seen in recent history with screw in LEDs. The last line in Table 2 shows the total estimated evaluation impact from the two studies compared to savings estimated during the Targets.

Table 3: C&I Upstream Lighting Evaluation impacts

	2016	2018	2019	2020
Planning Realization Rate	0.95	0.67	0.75	0.8
Free-Ridership	0.088	0.2	0.2	0.2
Spillover	0.25	0.05	0.05	0.05
overall NTG	1.10	0.57	0.64	0.68
Targets MWh		24,000	25,000	26,000
Approximate MWh Reduction		-12,800	-11,700	-11,000

In order to aggressively transform the lighting market and deliver energy savings, National Grid will actively be promoting new products such as fixtures, troffers, exterior and linear products. The Company is also assessing increased efficacy in new TLED technologies which will increase savings.

Code Compliance Initiative

The *2017 Rhode Island Residential and Commercial Code Compliance Study* by NMR analyzes the energy impacts of compliance patterns found in 2016 relative to 2009 and 2012 International Energy Conservation Code (IECC). National Grid applies the modeled energy performance of the sampled buildings and the modeled energy performance of fully compliant buildings to the codes compliance calculator to estimate the technical savings potential for promoting code compliance in the commercial new construction sector. NMR also utilized the results to determine the relative importance (in terms of energy impacts) of the code provisions for the attribution analysis to the Codes Initiative. Unlike the previous Three-Year Plan, National Grid will not be able to claim savings for code compliance support for retrofit projects, which was the majority of savings. There is also rising compliance with the energy code without any accompanying update to the code pushing these minimum requirements higher. As such, the technical potential (difference between full compliance and current practice) has shrunk.

Table 4: Code Compliance impact on Targets

	2018	2019	2020
Codes Compliance Attribution Reduction MWh	-2,900	-2,900	-2,900

Gas Evaluations and Changes

Residential Gas Home Energy Reports

As stated above, the *RI Home Energy Reports Impact Evaluation* by Illume Inc. has been completed. This evaluation found a higher realization rate for the gas savings than estimated in the Targets. When applied, it results in an increase in the gas savings by approximately 15% per year in 2018-2020, illustrated in Table 3.

Table 5: Gas RR Impact on Targets

	2018	2019	2020
Target Planning RR*	94%	95%	95%
2017 HER Evaluation RR	110%	110%	110%
% Impact	16%	15%	15%
Approximate MMBtu/yr Increase	9,900	9,500	9,200

*Target Planning RRs represent the weighted average RR for 2017.

C&I Gas Retrofit

A Massachusetts study, *Steam Trap Evaluation, Phase 2* by DNV GL, was completed in 2016. The study will be filed with the PUC in the 2018 EE Annual Plan and available publically via the EERMC website. Steam traps have two types of measures within the C&I Retrofit program: custom and prescriptive. The custom savings use customer-specific inputs and are engineered – the study found the savings estimates were reasonable and recommended slightly modified savings estimation tool. The prescriptive savings used a deemed value. The study found that the deemed value should be updated. The deemed value will decrease from 257 therms/trap to 122 therms/trap. In 2016, prescriptive steam traps accounted for a significant percent savings in the RI C&I Retrofit gas program – savings that were used in the Target development as base potential. Applying the new deemed savings values decreases prescriptive steam traps savings by 14%. Table 4 illustrates the MMBtu change to the targets if the evaluated deemed savings value had been used.

Table 6: Gas RR Impact on Targets

	2018	2019	2020
Steam Trap Deemed savings reduction	-20,900	-20,800	-20,700

C&I Gas New Construction

A Massachusetts study of C&I condensing boilers (*Gas Boiler Market Characterization Study Phase II*, by DNV-GL) was completed in 2016. The study finds baseline boiler efficiency was increased to 85% versus the former baseline of 80%, reducing the claimable savings by approximately 50% compared to values used in Target development. Applying this result to the 2016 program savings, which were used as the Targets base potential, would reduce C&I Gas New Construction savings by 6%. It is illustrated in Table 5.

Table 7: C&I Gas New Construction (MMBTU/yr)

	2018	2019	2020
Condensing Boiler Baseline Savings reduction	-2,400	-2,400	-2,400

Code Compliance Initiative

As described above, the *2017 Rhode Island Residential and Commercial Code Compliance Study* by NMR also effects gas savings.

Table 8: Code Compliance Impact on Targets

	2018	2019	2020
Codes Compliance Attribution Reduction MMBTU/yr	-4,700	-4,700	-4,700

Attachment 3: AESC Non-Embedded CO₂ Values

The below exhibits are referenced in the Cost-Effectiveness section of this Plan and are from the Avoided Energy Supply Costs in New England: 2015 Report, by Tabors, Caramanis, and Rudkevich (TCR), April 3, 2015.

Exhibit 4-7. AESC 2015 Non-Embedded CO₂ Costs (2015 dollars per short ton CO₂)

	Marginal Abatement Cost	Allowance Price	Externality
	a	b	c = a - b
2015	\$100	\$6.28	\$93.72
2016	\$100	\$7.26	\$92.74
2017	\$100	\$7.87	\$92.13
2018	\$100	\$8.47	\$91.53
2019	\$100	\$9.32	\$90.68
2020	\$100	\$10.16	\$89.84
2021	\$100	\$12.54	\$87.46
2022	\$100	\$14.92	\$85.08
2023	\$100	\$17.30	\$82.70
2024	\$100	\$19.67	\$80.33
2025	\$100	\$22.05	\$77.95
2026	\$100	\$24.43	\$75.57
2027	\$100	\$26.80	\$73.20
2028	\$100	\$29.18	\$70.82
2029	\$100	\$31.56	\$68.44
2030	\$100	\$33.94	\$66.06

Exhibit 4-14. Annual Pollutant Emission Values by Sector (2015\$/MMBtu)

	Residential			Commercial			Industrial		
	NO _x	CO ₂	CO ₂ at \$100/ton	NO _x	CO ₂	CO ₂ at \$100/ton	NO _x	CO ₂	CO ₂ at \$100/ton
2015	\$0.000	\$0.37	\$5.88	\$0.000	\$0.37	\$5.88	\$0.001	\$0.37	\$5.88
2016	\$0.000	\$0.43	\$5.88	\$0.000	\$0.43	\$5.88	\$0.001	\$0.43	\$5.88
2017	\$0.000	\$0.48	\$5.88	\$0.001	\$0.48	\$5.88	\$0.001	\$0.48	\$5.88
2018	\$0.000	\$0.53	\$5.88	\$0.001	\$0.53	\$5.88	\$0.001	\$0.53	\$5.88
2019	\$0.000	\$0.59	\$5.88	\$0.001	\$0.59	\$5.88	\$0.001	\$0.59	\$5.88
2020	\$0.001	\$0.66	\$5.88	\$0.001	\$0.66	\$5.88	\$0.001	\$0.66	\$5.88
2021	\$0.001	\$0.83	\$5.88	\$0.001	\$0.83	\$5.88	\$0.001	\$0.83	\$5.88
2022	\$0.001	\$1.00	\$5.88	\$0.001	\$1.00	\$5.88	\$0.001	\$1.00	\$5.88
2023	\$0.001	\$1.19	\$5.88	\$0.001	\$1.19	\$5.88	\$0.001	\$1.19	\$5.88
2024	\$0.001	\$1.38	\$5.88	\$0.001	\$1.38	\$5.88	\$0.001	\$1.38	\$5.88
2025	\$0.001	\$1.57	\$5.88	\$0.001	\$1.57	\$5.88	\$0.001	\$1.57	\$5.88
2026	\$0.001	\$1.78	\$5.88	\$0.001	\$1.78	\$5.88	\$0.001	\$1.78	\$5.88
2027	\$0.001	\$1.98	\$5.88	\$0.001	\$1.98	\$5.88	\$0.001	\$1.98	\$5.88
2028	\$0.001	\$2.20	\$5.88	\$0.001	\$2.20	\$5.88	\$0.001	\$2.20	\$5.88
2029	\$0.001	\$2.43	\$5.88	\$0.001	\$2.43	\$5.88	\$0.001	\$2.43	\$5.88
2030	\$0.001	\$2.66	\$5.88	\$0.001	\$2.66	\$5.88	\$0.001	\$2.66	\$5.88

Exhibit 4-18. Value of Pollutant Emissions from Fuel Oil in 2015 (2015\$/MMBtu)

Sector	SO ₂	NO _x	CO ₂
Residential	\$0.0000	\$0.0001	\$8.16
Commercial	\$0.0000	\$0.0001	\$8.15
Industrial	\$0.0000	\$0.0001	\$8.15

Attachment 4: 2018-2020 System Reliability Procurement Plan

Background

The 2006 Act identified a unique opportunity for Rhode Island to systematically identify and procure customer-side resources that were not only cost-effective compared to traditional supply options, but that could also provide a cost-effective path to lower supply and delivery costs to ratepayers in Rhode Island. Least Cost Procurement might provide savings over time for customers and might lower the volatility and cost uncertainty of the larger energy and capacity markets in New England by securing sources of energy supply and capacity from in-state resources and/or by the deferral or avoidance of distribution system investments.

Traditionally, the solutions to problems such as overloaded facilities, low voltage, contingencies, loss of load, asset condition, and system losses have been provided by capital projects that enhance the utility's delivery systems: new circuits, new substations, or larger conductors. As developing technologies continue to make improvements in energy efficiency, load management, energy storage and distributed generation, the range of possible alternative solutions to traditional utility infrastructure can now increasingly consider demand side management, demand response, direct load control, distributed generation, energy storage, and dynamic pricing. As technologies and markets continue to mature and gain momentum, these "non-wires alternatives" (NWAs) are becoming increasingly cost-effective. Recognizing the potential economic benefits of cost-effective NWAs, R.I. Gen. Laws § 39-1-27.7(a)(1) requires that the standards for "system reliability" resources include, but not be limited to: distributed renewable energy resources; cost-effective combined heat and power systems; and demand response designed to provide local system reliability benefits through load control or using on-site generating capacity.

On June 7, 2011, the PUC approved significantly revised System Reliability Procurement Standards (Standards). The revised Standards established a procedure and funding options for systematically identifying customer-side and distributed resources that, if cost-effective, defer or avoid distribution upgrades, improve system reliability, and provide for better utilization of distributed resources. The revised Standards guided the Company's efforts toward integrating

analysis of NWAs into the Company's planning functions and evaluating the specific costs, benefits, and comparability of traditional and NWA solutions.

On June 11, 2014, the PUC approved minor enhancements to the 2011 Standards intended to broaden the range of methods and technologies that should be considered or utilized in the evaluation of NWA projects.

On April 27, 2017, the PUC approved additional enhancements to the 2014 Standards intended to further incorporate NWAs into the company's distribution planning process. The revised Standards allow the distribution company to investigate the application of NWAs to reduce or manage peak load at appropriate times and in specific areas, including, but not limited to, highly utilized distribution systems; where construction is physically constrained; and where some level of new electric growth is anticipated, to prolong the useful lifetime of existing systems.

Section 2.4 (A) of the System Reliability Procurement Standards states:

The distribution company System Reliability Procurement Plan (SRP Plan) submitted on September 1, 2017, and triennially thereafter on September 1, shall describe general planning principles and potential areas of focus for SRP for the three years of implementation, beginning with January 1 of the following year. Such SRP Plans shall include, but are not limited to:

- i. proposed evolutions to definitions, identification, and assessment of non-wires alternatives, which may include, but are not limited to:
 - a. observations and lessons learned from the most recent three-year period,
 - b. trends in distributed energy resource technology and analytics, either grid-side or customer-side, that may influence NWA planning over the three-year period;
- ii. anticipated scope of NWA deployment in the coming three-year period,
 - a. in-progress NWA projects projected to continue and a high-level timeline,

- b. projected areas of focus⁴⁶ for distribution planning review that may result in the identification of new NWA projects;
- iii. description of how the SRP Plan complements the objectives of Rhode Island's energy efficiency, renewable energy, and clean energy programs listed in 2.1.C; and
- iv. proposed shareholder incentive framework.

The 2018 – 2020 SRP Plan is being submitted consistent with those Standards and as a part of the larger Least Cost Procurement plan. This Plan describes National Grid's proposed approach to further integrate analysis of NWAs into the Company's transmission and distribution planning functions in Rhode Island. The Standards also stress, and the Company intends to uphold, the importance of continuing to integrate System Reliability Procurement with Energy Efficiency Procurement efforts wherever feasible, to manage demand and optimize grid performance.

The Company's established procedure for considering NWAs evaluates potential NWA solutions in parallel to traditional wires solutions. During the period of 2018 – 2020, the Company will continue to evaluate all transmission and distribution (T&D) projects that meet the screening criteria established in Section 2.3 of the 2017 Standards for potential NWA solutions that could reduce, avoid, or defer the traditional wires solution, or prolong the useful lifetime of an existing system.

Feasible NWAs will be compared to traditional wires solutions based on the following, among other, factors:

- Ability to meet the identified system needs;
- Anticipated reliability of the alternatives;
- Risks associated with each alternative;
- Potential for synergy savings based on alternatives that address multiple needs;
- Operational complexity and flexibility;
- Implementation issues; and,
- Customer impacts.

⁴⁶ It is not anticipated that this will include project specifics, which are dependent on needs and screening; those are expected in annual SRP Reports. In the absence of project specifics or budgets, this section is intended to give a picture of the expected size and scope of NWA efforts during the three-year period and a sense of whether it is expected to grow relative to current activities.

To facilitate the screening of potential NWA projects and traditional solutions, the Company will continue to utilize the analytical tools, existing evaluation reports and any relevant data available. For each need where an NWA is determined to be the preferred solution, the Company will develop an implementation plan that includes a detailed characterization of the need (in terms of both maximum kW peak reduction and annual required duration hours), the traditional wires solution, a description of the NWA, and an NWA investment scenario, as outlined in the Standards. This description of the need will include the location and the mix of customers within that location.

Separate from the SRP process, the Company also plans to submit a proposal in the upcoming rate case for the cost of developing and maintaining a RI System Data Portal with some similarities in the portal used for its NY subsidiary that will have a tab that will show a Heat Map as part of this Plan in accordance with the revised Standards. The Heat Map will provide further visibility into the distribution system by identifying highly utilized distribution systems where construction is physically constrained and/or demand growth is anticipated. The Heat Map will identify feeder locations where the deployment of NWAs and Distributed Energy Resources could provide benefits to the system by reducing or managing load. As in the past, annual system reliability procurement reports will continue to be submitted to the PUC for consideration on November 1, 2017, and on October 15 in each of the two years thereafter. The annual reports will include, among other information, a summary of where NWAs were considered, identification of projects where NWAs were selected as a preferred solution, an implementation and funding plan for selected and ongoing NWA projects, and recommendations for demonstration distribution or transmission projects for which the Company will use selected NWA reliability and capacity strategies. The annual Report will direct parties to the RI System Data Portal which will show the feeders identified through the Heat Map process, along with annual kW reduction and duration goals. Once the annual plan is approved by the PUC, the Company will provide quarterly updates on the progress of any approved demonstration project(s) to the EERMC and Collaborative Subcommittee.

The Company and its stakeholders are also exploring the possibility of considering NWA solutions earlier in the planning process and incorporating market solicitations to third parties for potential distributed energy resource solutions. This strategy is similar to the process employed

by the Company in its procurement of a battery storage solution for the Tiverton/Little Compton NWA in 2016/2017.

2018 – 2020 Areas of Focus

Tiverton and Little Compton, RI

The 2017 SRP Report (Docket No. 4655) marked the final implementation year of the DemandLink™ pilot in Tiverton and Little Compton, which the Company originally proposed in the 2012 System Reliability Procurement Report – Supplement (2012 SRP Report) Docket 4296. The purpose of the Pilot was to test the use of customer demand response and targeted energy efficiency as a means of managing local distribution capacity requirements during peak periods. The goal of the pilot is to create 1 MW of load relief by the end of 2017 in order to defer a new substation feeder until 2018.

As detailed in the 2017 SRP Report, the Company issued a Request for Proposals (RFP) in 2017 for additional load relief. The Company issued a contract to a proposal for a battery storage system, which the Company originally assumed would provide an additional 250 kW of load relief during the summer of 2017. Due to the procurement process, this project has been delayed; however, the Company anticipates that this project will provide load relief for the summer of 2018, and could offer load relief for up to two additional years if pricing can be provided that continues to meet the overall cost benefit analysis. Therefore, the savings for 2017 will continue to come from existing pilot initiatives such as incentives for Wi-Fi thermostats on central AC systems with demand response, heat pump water heaters, window AC purchases, and recycling, and targeted energy efficiency.

The Company will not know whether it met its 1 MW goal until the evaluation results are final in early 2018. However, even if the 1 MW goal is achieved and the new substation feeder can continue to be deferred, recent analysis shows the two feeders serving the area are still between 95% and 99% loading pending the severity of the summer weather. Loading remains high enough that continued load relief efforts in the pilot area would be beneficial. Depending on need, National Grid will engage customers via direct load control mechanisms already in place and described in the annual SRP reports. Additionally, the Company may extend or increase grid side solutions via its battery storage vendor or other Company controlled technologies.

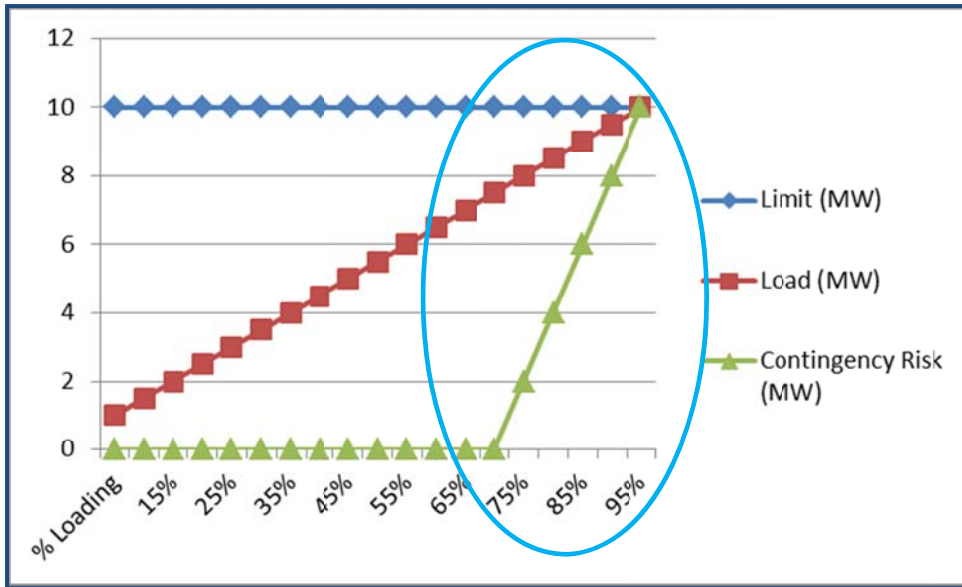
Heat Maps

Although the Company plans to continue screening transmission and distribution projects against the NWA criteria over the next three-years, it is possible that no projects will be identified due to minimal load growth in Rhode Island. Asset condition remains a key driver of infrastructure investment in Rhode Island. In an effort to further promote NWAs in accordance with the revised Standards, the Company will prioritize the development and deployment of the RI System Data Portal which will have a Heat Map component to identify opportunities where NWAs can be utilized to reduce or manage load in areas, including, but not limited to, highly utilized distribution systems; where construction is physically constrained; and where demand growth is anticipated, to prolong the useful lifetime of existing systems.

Highly utilized areas are those stations and circuits within a relatively compact geography that have loading near but not exceeding distribution planning mitigation guidelines under current forecasting scenarios. Often times they are linked to physically constrained construction areas (heavy urban environments). While such areas are not new to distribution planning they are becoming more widespread as state wide growth rates remain slightly above zero and do represent operational challenges. As the loading slowly increases, contingency issues increase as shown in the Chart 1 below. Additionally, the sudden application of modest customer loads could create a load impact equivalent to many years of annual growth.

The chart and table below illustrate how the risk of a contingency situation increases as the feeder nears 100% loading. As the feeder approaches that limit, the maximum annual load growth rate that can be accommodated is reduced. As a result, a 1MW customer coming on line late in the feeder's bandwidth will have a similar impact as a 10 or 20MW customer coming on line early in the feeder's bandwidth. These situations will become more prevalent if current growth rates continue and will result in an increased frequency of unexpected, short-term, system overloads which would require a significant infrastructure investment.

Chart 1 - Contingency Risk for Highly Loaded Systems



Case	1	2	3	4	5	6
% Loading	70%	75%	80%	85%	90%	95%
Maximum yearly growth rate that can be accommodated (10 year period)	3.6%	2.9%	2.3%	1.6%	1.1%	0.5%
Maximum per year growth (MW)	0.300	0.250	0.200	0.150	0.100	0.050
Years equivalent to a 1 MW customer	3.3	4.0	5.0	6.7	10.0	20.0

With customer service expectations ever increasing and the issues described above, a utility may be inclined to revise its guidelines to encourage infrastructure investment at lower system loading percentages. Instead, the Heat Map concept allows or encourages Distributed Energy Resources (DER), targeted energy efficiency, and demand reduction technologies to be deployed prior to a utility applying or changing distribution investment rules. There are a variety of potential benefits to be explored under this approach:

- Indefinite deferral of load relief related investment. With continued low growth rates, the successful deployment of cost-effective DER, energy efficiency, and demand response through the Heat Map would reduce the load relief component of any system plan. Over time, this would result in less new feeders and less equipment upgrades.

- The advanced or preemptive nature of the Heat Map concept allows the utility to observe DER performance and success before system risks become untenable.⁴⁷
- The Heat Map is an example of the type of information dissemination demonstrated by utilities across the United States to satisfy various energy policy and DER developer needs. This particular example is intended to link loading and time of day opportunities throughout the distribution system. An expected learning is the value or use of such information in faster determination and development of the DER solution to achieve the load reduction at the proper time.

In preparation for the 2018 SRP Report filing, the Company has taken the initial steps of developing a Heat Map by identifying highly utilized areas in Northwest Rhode Island. This process included typical study tasks such as circuit modeling and data gathering plus improved distributed generation modeling. With modeling complete, cases were developed to test the possible interpretation and uses of the heat map. The cases suggested further refinement is needed in end user simplicity to help indicate the best time, type, and distribution of the possible energy resources. Example figures are shown below demonstrating one of the interpretation challenges. A quick review of the figures indicates loading issues occur in close proximity to the substations while voltage issues occur furthest from the stations. The Company plans to test and observe whether the voltage information adds value indicating additional system benefits or simply confuses the end users.

An example of a feeder that was identified through this process is the 38F1 circuit in Northwest Rhode Island. This circuit is predicted to have approximately 2.5 miles of highly loaded (80%-100%) mainline within a 15 year study forecast horizon. Currently the feeder peaks during the summer at 5:30PM. To reduce loading below 80%, a peak reduction of 2,600 kilowatts is required. Generic solar distributed generation analysis shows a 27% nameplate contribution or reduction to peak for the 5 PM hour. Therefore 2,600 kilowatts at 5:30PM would require a 9,800 kilowatt solar generator. In this example, solar generation alone may not be the most economical solution. Perhaps targeted energy efficiency (street and neighborhood level targets), some form of distributed generation, and/or energy storage would address this issue and this is the purpose

⁴⁷ One of the Tiverton NWA learnings was the need for a backup plan should the DER customer participation lag or drop off from necessary levels. Due to infrastructure investment design, permitting, and construction timelines it is unreasonable to expect the utility to back up a DER plan without some advanced notice.

and expected learning from the Heat Map concept. The Company would weigh any proposed non wires solution, whether identified through a request for proposal or identified by the Company, on its ability to provide feeder load relief at the time of peak loading and duration and on its costs and benefits as required by the Standards.

Figure 1: Heat Map Example Loading

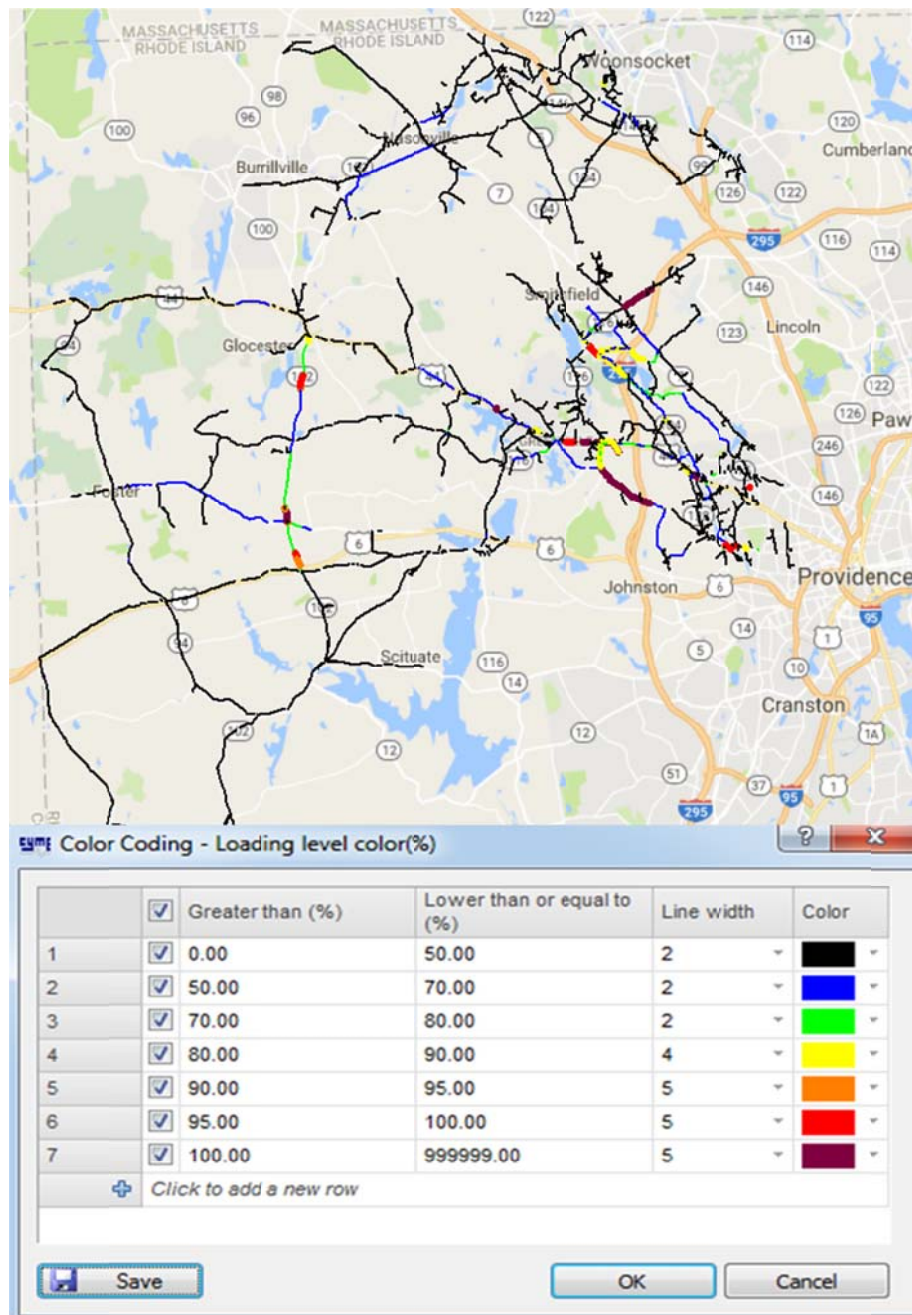
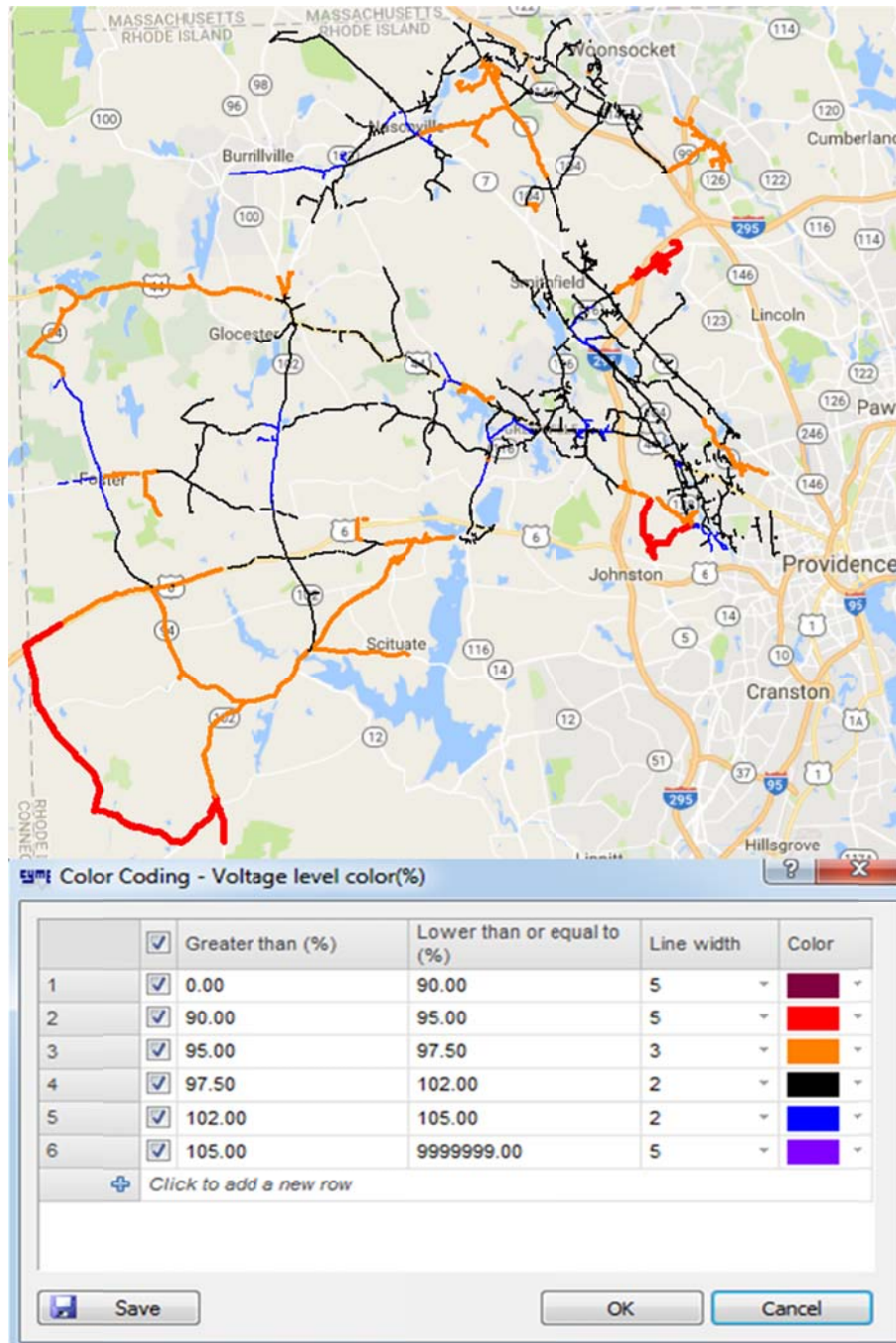


Figure 2: Heat Map Example Voltage



National Grid plans to control development costs of this concept through incorporation of the Heat Map within and existing ongoing distribution studies. In this manner, the Company can leverage data gathering, model development, and similar analysis steps to keep Heat Map costs

as low as possible. Once the learnings are achieved, the most efficient and effective state-wide deployment will be presented.

Partial NWAs

In 2015-2017, the Company began to explore the idea of deploying partial NWAs, which are NWAs developed to reduce the size or scope of a traditional investment rather than an entire project. In the 2016 SRP Report, the Company committed to reviewing the potential for integrating partial NWA consideration into its distribution planning process. In the 2017 SRP Report, the Company described a project in Bristol and Warren, RI that was reviewed as a potential partial NWA location. While the partial-project ultimately did not pass the NWA screening, the Company was successful in executing a process to review the project as a partial NWA. The Company will continue to implement this process for areas reviewed in the 2018-2020 timeframe.

NWA Technology Options

In 2015-2017, the Company continued deploying baseline energy efficiency, and geographically focused energy efficiency and demand response and introduced new technologies including, heat pump water heaters to replace traditional units, incorporating solar, and has begun the process for energy storage. Over the next three years, the Company will continue to explore new technologies to provide additional non-wires solutions listed below.

A. Customer-side NWAs:

1. energy efficiency baseline services,
2. peak demand and geographically-focused supplemental energy efficiency strategies,
3. distributed generation generally, including combined heat and power and renewable energy resources,
4. demand response,
5. direct load control including BYOT control capability,
6. energy storage,
7. electric vehicles and EV control technology,
8. controllable or dispatchable electric heat or cooling,
9. alternative metering and tariff options, including time-varying rates.

- B. Distribution company investment in grid-side tools and technologies.
- C. Grid-wide NWAs may include, but are not limited to:
 - 1. energy storage,
 - 2. voltage management,
 - 3. communications systems,
 - 4. grid-optimization technologies including Distributed System Platform,
 - 5. generation to provide, or in support of, any or all of B(ii)(1)-(4), consistent with Rhode Island General Laws.
- D. Combinations of NWAs (both customer-side and grid-side) and combinations of NWAs with traditional infrastructure investments.

Funding

As in the 2015-2017 Plan, this Plan does not project a three-year budget for SRP expenditures. Typically, NWAs are identified as the preferred solution to a system need on a rolling basis. The number of NWA projects that will be identified and implemented over the three-year period cannot be proactively determined. In addition, the components and structure of any given NWA solution, as well as its duration, are highly dependent on the situational characteristics of the system need for which it is being designed. The Company has identified the need for a RI System Data Portal to show potential Heat Map feeders in this plan but the incremental annual targets and potential solutions will not be known until the Annual filing. These unknowns make illustrative budgeting for System Reliability Procurement difficult and are why budgeting in this Plan is not required in Section 2.4 of the Standards.

However, as in the past, annual system reliability procurement budgets will be submitted to the PUC on November 1 of each year. Section 2.5 v. of the Standards for system reliability procurement approved by the PUC on April 27, 2017 describe five possible funding sources for system reliability investments, including:

- 1. capital funds that would otherwise be applied towards traditional wires based alternatives, where the costs for the NWA are properly capitalized under generally accepted accounting principles and can be properly placed in rate base for recovery in rates along with other ordinary infrastructure investments,

2. existing distribution company EE investments, as required in Chapter 1 of these Standards, and the resulting Annual Plans,
3. additional energy efficiency funds to the extent that the energy efficiency-related NWA can be shown to pass the cost-benefit test, as outlined in Chapter 1 of these Standards, and such additional funding is approved,
4. utility operating expenses, to the extent that recovery of such funding is explicitly allowed,
5. identification of customer contribution or third-party investment that may be part of a NWA based on benefits that are expected to accrue to the specific customers or third parties,
6. any other funding sources that might be required and available to complete the NWA;

Shareholder Incentive

Proposal

The Company is proposing a shareholder incentive mechanism in accordance with Section 2.4(A)(iv) and Section 2.6 of the Proposed Revisions to the Least Cost Procurement Standards included in the EERMC's - Proposed Energy Efficiency Savings Targets, 2018-2020 (Docket 4684), and approved at the Open Meeting on April 27, 2017.

The Company proposes to apply the current energy efficiency shareholder incentive mechanism to the SRP plan with minor adjustments. The energy efficiency incentive structure is a proven, transparent, simple, straightforward mechanism that is an appropriate model for SRP. Similar to energy efficiency, the SRP incentive structure can be modified in future annual filings as the energy landscape evolves.

Under the current energy efficiency incentive structure, the Company can earn a target based-incentive rate equal to 5.0% of the eligible spending budget in a program year for achieving electric and gas energy savings goals. The Company must attain a threshold level of 75% of its savings goal before it can earn an incentive.

The Company proposes to adopt the energy efficiency mechanism for SRP with an incentive level that will be, at a minimum, the percent of spend as per the energy efficiency programs, up

to a percentage of spend that would mirror a standard wires investment. The differential percentage between these two amounts would be determined in consultation with the parties to properly incent the Company to invest in non-wires opportunities in lieu of a capital investment made in the annual ISR filing. The aim of the percentage increase is to create equal emphasis on the development of both wires and non-wires solutions by mirroring what the Company can earn on infrastructure investments such as distribution projects.

The remaining aspects of the energy efficiency incentive structure will remain the same for SRP, including the threshold performance level of 75% and the mechanism for calculating how much of the above target incentive the Company can earn.

The threshold performance level for demand savings will be set at 75% of the annual kW goal. The Company must attain at least this threshold level of savings before it can earn an incentive. The Company will have the ability to earn an incentive for each kW saved, once threshold savings are achieved. The cap for the target incentive amount of kW savings will remain at 125%.

The ability to earn up to 125% of the target incentive is worthwhile because Rhode Island customers will realize additional benefits if the Company achieves a high level of demand savings performance. Given budget requirements, this feature will provide the Company with an incentive to improve the efficiency of its program implementation efforts while providing Rhode Island customers with value in excess of the incremental incentive that may be earned by the Company. That is, the Company will have an incentive to increase customers' savings and customers will realize an overwhelming majority of the savings.

In order to encourage the most efficient use of customer funds, the following mechanism from the energy efficiency incentive will also be applied to SRP. If the actual spending at year end is less than the planned spending by more than five percent, and if achieved savings exceed 100% of the target savings goal, the savings goal will be adjusted by the ratio of actual spend to the planned spend. Conversely, if the actual spend at year end is greater than the planned spend by more than five percent, and if achieved savings are less than 100% of the target savings goal, the savings goal will be adjusted by the ratio of actual spend to the planned spend.

The Company concludes that the SRP incentive proposal is in accordance with the 2017 Standards. It is clearly focused on achieving annual kW reduction goals with transparent metrics around determining performance. The design of the incentive is tied directly to spend only occurring in the SRP program and therefore ensures that there is no duplication of incentive across other Company filings.

Conclusion

The Standards approved by the PUC on June 7, 2011 and modified on June 11, 2014 and April 27, 2017 promote a framework for considering and integrating NWAs as possible solutions to planning and reliability issues. As in the past, in the annual SRP Reports, the Company will continue to report on Heat Maps and progress towards identified savings goals, projects where NWAs were considered, projects where NWAs were selected as a preferred solution, and recommendations on pilot distribution projects that will utilize NWA reliability and capacity strategies.