

# 2020 Evaluation, Measurement, and Verification Plan

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## 1. Introduction

Evaluation, Measurement and Verification (EM&V) is an integral and required part of National Grid's energy efficiency program planning process. EM&V provides independent verification of impacts to ensure that savings and benefits claimed by the Company through its energy efficiency programs are accurate and credible. EM&V provides insight into market characteristics and guidance on energy efficiency program design to improve the delivery of cost-effective programs.

The Company's EM&V Plan continues to focus on evaluating Rhode Island sites, markets, and energy efficiency programs while leveraging as many resources as possible from evaluation studies in other National Grid territories in order to maximize value for ratepayers while minimizing costs. These studies are commissioned by the Company. They are conducted by independent evaluation firms, whose goal is to produce an accurate, complete, and transparent review of Rhode Island's energy efficiency programs and markets. The entire evaluation process is overseen by the Company along with an oversight team that includes the Rhode Island Energy Efficiency & Resource Management Council (EERMC) consultant team and the Office of Energy Resources (OER). The oversight team follows each study closely and is involved in planning, work plan development, and review of study results.

The EM&V framework of the Company provides confidence among ratepayers and stakeholders that programs are effective and EM&V activities are independent and objective.

## 2. Evaluation Studies Completed in 2019

The Company, with oversight from the Rhode Island EERMC evaluation consultants and the OER evaluation staff, completed 10 evaluation studies in 2019 (see below). The research studies include impact evaluations, process evaluations and market studies in the residential and commercial and industrial (C&I) sectors as well as studies that are considered cross-cutting.

### Commercial & Industrial

1. RI-18-CG-CustGas - Impact Evaluation of PY2016 Custom Gas Installations (in progress)

2. RI-18-CE-CustElec - Impact Evaluation of PY2016 Custom Electric Installations (in progress)

### **Residential**

1. RI-19-RX-IESF - Process Evaluation of Income Eligible Single Family Program (in progress)
2. RI-19-RE-UpstrLight1a - Lighting Market Assessment: 2017 Sales Data Analysis
3. RI-19-RE-UpstrLight1b - Lighting Market Assessment: 2018 Sales Data Analysis (in progress)
4. RI-19-RE-UpstrLight2 - Lighting Market Assessment: 2018 Shelf Stocking Analysis (in progress)
5. RI-19-RE-AppRecycle - Residential Appliance Recycling Savings Update

### **Cross-Cutting**

1. RI-19-XX-Jobs - Jobs Study 2018
2. RI-18-XX-Piggybacking - Piggybacking Diagnostic Study (in progress)
3. RI-19-XX-DataCollect - Primary Data Collection for Potential Study (in progress)

Section 4 provides detailed descriptions, findings and recommendations of each of the studies listed above along with selected research studies completed in other regions and/or other National Grid jurisdictions. The results of the evaluations from other regions and National Grid jurisdictions, most commonly Massachusetts, have been judged by the Company and the oversight team to be applicable to Rhode Island's energy efficiency programs. The Company is adopting the results of these studies in 2020 program planning due to similarity, either in the measures offered, or program structure or delivery.

A complete list of historical research studies is provided in Section 5 along with a brief summary of the impact of those results in planning the Company's programs. Prior year studies that have been superseded by studies completed since the filing of the 2019 Energy Efficiency Plan have been removed from this list. These studies are available through the EERMC<sup>1</sup>, the Rhode Island Public Utilities Commission (PUC)<sup>2</sup>, and National Grid.

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<sup>1</sup> <https://rieermc.ri.gov/plans-reports/evaluation-studies/>

<sup>2</sup> <http://www.ripuc.org/>

### 3. 2020 Planned Evaluation Studies

This section describes planned studies that focus on areas of interest to the Rhode Island energy efficiency programs and build on the deep history of evaluation studies commissioned by the Company over numerous years. In order to optimize the use of evaluation resources, where programs are considered to be similar in program delivery and population served with those offered in Massachusetts, the studies will be done in conjunction with the Company's Massachusetts retail affiliate. The Company will also stay abreast of the voluminous Massachusetts evaluation activities that may be beneficial and applicable in Rhode Island.

Table 1 lists evaluation studies that the Company plans to conduct in 2020 to inform the next three-year planning cycle and/or the 2021 annual plan. Study labeling codes take the general form shown in Table 2. For example, RI-17-CG-CustGas refers to the Custom Gas Evaluation Study that started in 2017 in the commercial sector for gas while RI-18-RX-IESF refers to evaluation study started in 2018 of the income eligible single family program for electric and gas.

**Table 1. Planned Evaluation Studies in 2020**

Sector	Study Code	Type	Affected Programs	Study Name	State Lead
C&I	RI-20-CG-CustGasPY18	Impact	Custom	PY2018 Impact Evaluation of Custom Gas Installations	RI
C&I	RI-20-CG-CustGasPY19	Impact	Custom	PY2019 Impact Evaluation of Custom Gas Installations (sample design and begin install)	RI
C&I	RI-19-CE-CustElec	Impact	Custom	PY2018 Impact Evaluation of Custom Electric Installations (continued from 2019)	MA (with RI sites)
C&I	RI-20-CE-CustElecPY19	Impact	Custom	PY2019 Impact Evaluation of Custom Electric Installations	RI
C&I	RI-20-CX-FRSO	NTG	Multiple	C&I Free-Ridership and Spillover Study	RI
C&I	RI-20-CE-DwnstrLight	Impact	Prescriptive	Downstream Lighting Impact Analysis	MA (with RI sites)

Residential	RI-20-RX-EWSFImpact	Impact	EnergyWise Single Family	Impact Evaluation of EnergyWise Single Family Program	RI
Residential	RI-20-RX-EWSFProcess	Process	EnergyWise Single Family	Process Evaluation of EnergyWise Single Family Program	RI
Residential	RI-20-RX-EWMFImpact	Impact	EnergyWise Multifamily	Impact Evaluation of EnergyWise Multifamily Program	RI
Residential	RI-20-RX-IEMFImpact	Impact	Income-Eligible Multifamily	Impact Evaluation of Income-Eligible Multifamily Program	RI
Residential	RI-20-RX-EWMFProcess	Process	EnergyWise Multifamily	Process Evaluation of EnergyWise Multifamily Program	RI
Residential	RI-20-RX-IEMFProcess	Process	Income-Eligible Multifamily	Process Evaluation of Income-Eligible Multifamily Program	RI
Residential	RI-20-RX-HERImpact	Impact	Behavior	Impact Evaluation of Home Energy Reports Program	RI
Residential	RI-20-RE-UpstrLight	Market	Upstream Lighting	Residential Lighting Market Assessment	MA
Residential	RI-20-RE-MSHP	TBD	Multiple	Evaluation of Ductless Mini-Split Heat Pumps	RI
Cross-cutting	RI-19-XE-HPmarket	Market	Multiple	Heat Pump Market Assessment (continued from 2019)	RI
Cross-cutting	RI-20-XX-Jobs	Market	Multiple	Job Impacts Analysis Study	RI
Cross-cutting	RI-20-XG-GasPeak	Impact	Multiple	Gas Peak Demand Savings	RI
Cross-cutting	RI-20-XX-CSNC	Impact	Multiple	Residential and Commercial New Construction and Code Compliance Study	RI
Cross-cutting	RI-20-XX-CSDev	Impact	Multiple	Code and Standards Development Study	RI
Cross-cutting	RI-19-XX-M&VLegislation	Impact/Process	Multiple	Legislated M&V Study	RI
Pilot	RI-20-CX-SEM	Impact	C&I Retrofit	Strategic Energy Management Demonstration Evaluation	RI
Pilot	RI-19-CG-GasDR	Impact	Pilot	Gas Demand Response (continued from 2019)	RI

**Table 2. Study Labeling Code Format**

[State]	-	[Year Study Conducted]	-	[Sector]	[Fuel]	-	[Keyword]
RI		18		R = residential	E = electric		
		19		C = commercial	G = gas		
		⋮		X = cross sector	X = electric & gas		

The EM&V team will follow the Company's standard procurement policy that cuts across programs and jurisdictions in order to achieve the lowest cost procurement of required external services while enabling the Company to minimize administrative costs, deliver on program commitments and meet time-sensitive regulatory deadlines.

The proposed budget for evaluation study expenditures in 2020 is approximately \$2.8 million (\$1.8 million for electric and \$1.0 million for gas) excluding internal staffing costs. The proposed budget for EM&V comprises approximately 2% of the total portfolio budget in 2020

Final reports along with graphical executive summaries will be made publicly available upon completion of the evaluation studies. All complete graphical executive summaries will be provided as a handout at EERMC meetings and posted on the EERMC website.<sup>3</sup>

### **3.1 Commercial and Industrial Planned Evaluation Studies in 2020**

#### **a. RI-20-CG-CustGasPY18 – Impact Evaluation of PY2018 Custom Gas Installations**

The objective of this impact evaluation is to provide verification of natural gas energy savings estimates for a sample of custom gas projects through site-specific inspection, metering, and analysis. The results of this study will be used to determine the realization rates for custom gas energy efficiency offerings based on installations from 2018. This will be the third year of 'rolling' evaluations in coordination with evaluation efforts in Massachusetts, where the first year was a 'full' study (as has historically been done every 3 years), while subsequent years will evaluate roughly 1/3 of the number of sites, which will keep the realization rates updated yearly.

#### **b. RI-20-CG-CustGasPY19 – Impact Evaluation of PY2019 Custom Gas Installations**

The objective of this impact evaluation is to provide verification of natural gas energy savings estimates for a sample of custom gas projects through site-specific inspection, metering, and analysis. The results of this study will be used to determine the realization rates for custom gas energy efficiency offerings based on installations from 2019. This will

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<sup>3</sup> <https://rieermc.ri.gov/plans-reports/evaluation-studies/>

be the fourth year of ‘rolling’ evaluations in coordination with evaluation efforts in Massachusetts, where the first year was a ‘full’ study (as has historically been done every 3 years), while subsequent years evaluate roughly 1/3 of the number of sites, which will keep the realization rates updated yearly.

**c. RI-19-CE-CustElec – Impact Evaluation of PY2018 Custom Electric Installations (continued from 2019)**

The objective of this impact evaluation is to provide verification of electric energy savings estimates for a sample of both lighting and non-lighting custom electric projects through site-specific inspection, metering, and analysis. The results of this study will be used to determine the final realization rates for custom electric energy efficiency offerings based on installations from 2018. This will be the second year of ‘rolling’ evaluations in coordination with evaluation efforts in Massachusetts, where the first year was a ‘full’ study (as has historically been done every 3 years), while subsequent years evaluate roughly 1/3 of the number of sites, which will keep the realization rates updated yearly.

**d. RI-20-CE-CustElecPY19 – Impact Evaluation of PY2019 Custom Electric Installations**

The objective of this impact evaluation is to provide verification of electric energy savings estimates for a sample of both lighting and non-lighting custom electric projects through site-specific inspection, metering, and analysis. The results of this study will be used to determine the final realization rates for custom electric energy efficiency offerings based on installations from 2019. This is the third year of ‘rolling’ evaluations in coordination with evaluation efforts in Massachusetts, where the first year was a ‘full’ study (as has historically been done every 3 years), while subsequent years evaluate roughly 1/3 of the number of sites, which will keep the realization rates updated yearly.

**e. RI-20-CX-FRSO – Commercial and Industrial Free-Ridership and Spillover Study**

C&I free-ridership and spillover values will be updated based on an assessment of the behavior of both participants and nonparticipants of C&I energy efficiency programs. The results will assist in quantifying the net impacts of C&I electric and natural gas energy efficiency programs in Rhode Island. This study will include both custom and prescriptive measures from new construction and retrofit programs.



**f. RI-20-CE-UpstrLight – Upstream Lighting Impact Analysis - Cont.**

The objective of this impact evaluation is to provide verification of electric energy savings estimates for a sample of upstream lighting projects through site-specific inspection, metering, and analysis. The results of this study will be used to determine the impact savings factors that will apply to upstream lighting offerings. This study will leverage a parallel Massachusetts study, and the final sample will include projects at National Grid customer sites in both Rhode Island and Massachusetts. This study began in 2019 and is rolling into 2020.

**3.2 Residential Planned Evaluation Studies in 2020****a. RI-20-RX-EWSFImpact – Impact Evaluation of EnergyWise Single Family Program**

The objective of this impact evaluation is to verify energy savings estimates for measures offered through the EnergyWise Single Family program. The program offers instant saving measures by installing efficient lighting, low flow showerheads, faucet aerators, programmable thermostats and smart strips during the no-cost home energy assessment and promotes weatherization measures to eligible customers. The results of this study will be used to update savings assumptions for each electric, natural gas, propane and oil measures and/or measure groups installed from 2017 and/or 2018. This study will update findings of the 2016 impact evaluation and will be bid out jointly with the other residential retrofit evaluations.

**b. RI-20-RX-EWSFProcess – Process Evaluation of EnergyWise Single Family Program**

The goal of this study is to assess the overall delivery of the EnergyWise Single Family program. The study will assess the effectiveness of program delivery procedures including the enhanced landlord incentive to promote equity and determine barriers to program delivery and participation. This evaluation will also assess free-ridership/spillover rates, offer a qualitative complement to the EnergyWise impact evaluation and identify practical approaches to improve the overall effectiveness of the program in order to reach higher

participation rates and deeper savings. This study will update findings of the 2016 process evaluation and will be bid out jointly with the other residential retrofit evaluations.

**c. RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise  
Multifamily Program**

The purpose of this impact evaluation is to verify energy savings estimates for measures offered through the EnergyWise Multifamily program. The program provides incentives for installing energy efficient measures in common areas and tenant-occupied dwelling units. Offerings include efficient lighting, low flow showerheads, faucet aerators, programmable and smart thermostats, smart strips, weatherization, and heating and water heating equipment. Results will be used to update savings assumptions for electric, natural gas, propane and oil measures offered through the program in 2017 and/or 2018. This study will update findings of the 2016 impact evaluation and will be bid out jointly with the other residential retrofit evaluations.

**d. RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible  
Multifamily Program**

The goal of this impact evaluation is to verify energy and demand savings estimates for measures offered through the Income-Eligible Multifamily program. The program offers low-income eligible customers no-cost measures such as efficient lighting, low flow showerheads, faucet aerators, programmable and smart thermostats, smart strips, weatherization measures, and heating and water heating equipment. The outcome of the study will be used to update savings assumptions for electric, natural gas, propane and oil measures offered in 2017 and/or 2018. This study will update findings of the 2016 impact evaluation and will be bid out jointly with the other residential retrofit evaluations.

**e. RI-20-RX-EWMFProcess – Process Evaluation of EnergyWise  
Multifamily Program**

The process evaluation will examine customer participation, vendor participation, and overall program processes of the EnergyWise Multifamily program. The study will assess effectiveness of program delivery procedures, determine barriers to program delivery and participation, and explore ways to improve the overall effectiveness of the program to reach higher participation rates and deeper savings. This evaluation will also assess free-ridership/spillover rates, offering a qualitative complement to the EnergyWise

Multifamily impact evaluation. This study will be bid out jointly with the other residential retrofit evaluations.

**f. RI-20-RX-IEMFProcess – Process Evaluation of Income Eligible Multifamily Program**

The objective of this process evaluation is to study landlord and tenant participation, Community Action Agencies, vendor participation, and overall program processes of the Income-Eligible Multifamily program. The study will assess effectiveness of program delivery procedures, determine barriers to program delivery and participation, and will include research on free-ridership/spillover rates, offering a qualitative complement to the Income-Eligible impact evaluation. This study will also help identify practical approaches to help improve overall effectiveness of the program to reach higher participation rates and deeper savings. This study will be bid out jointly with the other residential retrofit evaluations.

**g. RI-20-RX-HERImpact – Impact Evaluation of the Home Energy Reports Program**

The Home Energy Reports (HER) program provides personalized reports on energy consumption designed to change customer behavior. The goal of this study is to verify electric and natural gas savings from the HER program. This study will produce net savings estimates for each wave of participating customers and compare those savings to implementer reported savings for periods 2017 through 2019. The study will also assess how the HER program impact participation in other energy efficiency programs. The results of this study will be used to update the realization rates for program planning in 2021 and beyond. This study will update findings of the 2017 impact evaluation.

**h. RI-20-RE-UpstrLight – Residential Lighting Market Assessment**

A broad range of market assessment studies have been conducted in Massachusetts and Rhode Island to gather insights on how the lighting market is evolving in the two states. The results of these studies showed that the lighting market in Rhode Island is similar to the market in Massachusetts and the Company programs have had a strong impact on LED adoption in both states. The Company will continue to leverage lighting market assessment studies conducted in Massachusetts for application in Rhode Island and

conduct a Rhode Island specific study, if necessary. This study will support potential research studies needed to inform planning activities for both retail and direct install lighting in 2021 and beyond.

**i. RI-20-RE-MSHP – Evaluation of Ductless Mini-Split Heat Pumps**

This study will include a process evaluation of the current Rhode Island residential ductless mini-split heat pump offering. This study may include a literature review of impacts if needed by the program.

### **3.3 Cross-Sector/Other Planned Evaluation Studies in 2020**

**a. RI-19-XE-HPmarket – Heat Pump Market Assessment (continued from 2019)**

This study will evaluate the current status of the heat pump market and assess potential for future growth of heat pumps in Rhode Island for displacing electric heat and for fuel switching for space heating and resulting cooling. The study will collect data from heat pump owners, contractors, manufacturers and distributors and review existing research and evaluation in the small commercial and residential markets to understand the current status of both supply-side and demand-side markets, trends, and perceptions.

**b. RI-20-XX-Jobs – Workforce Associated with Rhode Island Energy Efficiency Programs Analysis Study**

The study will identify the workforce associated with National Grid's energy efficiency programs and services delivered in Rhode Island electricity and natural gas customers. Similar to the workforce studies conducted from 2013 to 2018, the study will survey the Company, vendors, distributors, partners, and market players to quantify the number of jobs and amount of business activities associated with energy efficiency programs in 2019.

**c. RI-20-XG-GasPeak – Gas Peak Demand Savings**

The objective of this evaluation study is to determine the percentage of gas energy savings that occur during peak days and possible peak hours. The study (or studies) will include both the C&I and Residential sectors and will bucket savings into end use categories of heating, water heating, cooking and other. The results of this study will be

used to determine the peak gas savings that occur due to energy efficiency activity by applying the end use percentage of gas peak energy savings to actual end use gas savings that occur in future years.

**d. RI-20-XX-CSNC – Residential and Commercial New Construction and Code Compliance Study**

The objective of this study is to project the savings projected to be achieved by the Code Compliance program for the 2021-2023 period by updating the 2017 residential and commercial code compliance potential savings and attribution studies. The methodology used will be determined when the policy decision has been made on whether or not to deem savings for Code Compliance program.

**e. RI-20-XX-CSDev – Codes and Standards Development Study**

This study would develop an evaluation framework for the Company's codes and standards development support. Previous efforts from states like California and Massachusetts will be leveraged along with local stakeholder input to produce clear guidance on how any future Codes and Standards development support will be evaluated.

**f. RI-19-XX-M&V Legislation – Legislated M&V Study (continued from 2019)**

The objective of this study is to verify claimed energy savings from the Company's energy efficiency programs and review the Company's evaluation process as required by the M&V legislation in Rhode Island. The study will be managed by the Office of Energy Resources. The Company is providing full cooperation and will consider the findings when developing future evaluation plans.

**g. RI-20-CX-SEM – Strategic Energy Management Demonstration Evaluation**

The objective of this evaluation is to review the methodologies and processes used to obtain and calculate the savings claimed. The results of this study will assist in monitoring and making continuous improvements to the demonstration.

**h. RI-19-CG-GasDR – Gas Demand Response Pilot Evaluation Study  
(continued from 2019)**

The goal of the Gas Demand Response Pilot is to reduce peak period gas consumption of large commercial customers during the winter season. It is planned to run in the winter of 2018-2019 and the winter of 2019-2020. The gas DR pilot will be evaluated in the spring/summer of 2019 and 2020. In 2019, this study will evaluate pilot performance for benefits to the customer and the distribution system and to determine if it has a pathway to be cost effective at scale.

## 4. Evaluation Study Findings

(This section will be completed in the second draft of the EE Plan)

**Study name:**

**Type of Study:**

**Evaluation Conducted by:**

**Date Evaluation Conducted:**

**Evaluation Objective and High-Level Findings:**

**Programs to which the Results of the Study Apply:**

**Evaluation Recommendations included in the study:**

**Explain Whether or Not National Grid Decided to Adopt Recommendations from the Study:**

**Savings Impact:**





These studies are available through the EERMC<sup>4</sup>, the PUC<sup>5</sup>, and National Grid.

2019	
Study	Impact Descriptions
NMR, Residential Appliance Recycling Impact Factor Update. April 2019	This study updated gross savings, realization rate and net savings estimates for refrigerator and freezer recycling offered through ENERGY STAR Products program.
NMR, Delta Watts Update. April 2019. (Leveraged study from MA)	This MA study updated delta watts for general service lamps, specialty and reflectors. Rhode Island adopted the results to update gross savings calculation for its Residential Upstream Lighting program.
NMR, RLPNC 17-9 2019-21 Planning Assumptions: Lighting Hours-of-Use and In-Service Rate. July 2018. (Leveraged study from MA)	This study recommended planning values for hours of use and in-service rates for general service lamps, specialty and reflectors. Rhode Island adopted the results to update impacts for its Residential Upstream Lighting program.
NMR, RLPNC 17-3 Advanced Power Strip Metering Study (Revised). March 2019. (Leveraged study from MA)	This study yielded recommended gross electric savings and realization rates from advanced power strips offered through the Home Energy Services and upstream programs. Rhode Island adopted the result from this study to inform savings for Tier 1 and Tier 2 advanced power strips offered through its Retail Products program.
Navigant, Wifi Thermostat Impact Evaluation Secondary Research Study. September 2018. (Leveraged study from MA)	This study recommended annual savings values of 31 therms for combustion heating, 97 kWh for electric resistance heating, and 64 kWh for central air conditioning for Wifi thermostats. Rhode Island adopted these results to update savings assumptions for Wifi thermostats in HVAC and residential retrofit programs.
DNV-GL, Impact Evaluation of PY2016 Custom Gas Installations. August 2019.	The study updated realization rates for custom gas projects, as part of a study leveraging the MA study of the same program element.
DNV-GL, Impact Evaluation of PY2016 Custom Electric Installations. August 2019.	The study updated realization rates for custom electric projects, as part of a study leveraging the MA study of the same program element.
2018	
Study	Impact Descriptions

<sup>4</sup> <https://rieermc.ri.gov/plans-reports/evaluation-studies/>

<sup>5</sup> <http://www.ripuc.org/>

Energy & Resource Solutions, Two-Tier Steam Trap Savings Study. April 2018.	This MA study recommends a two-tier approach for prescriptive steam traps. It calculates deemed savings to be 8.4 MMBtu/yr for system operating pressure $\leq 15$ psig, and 35.6 MMBtu/yr for system operating pressure is $>15$ psig.
DNV GL, Impact Evaluation of PY 2015 Rhode Island Commercial and Industrial Upstream Lighting Initiative. September 2018.	The study updated impact factors for the Upstream Lighting initiative. The RI study leveraged the MA study of the same initiative.
DNV GL, Rhode Island Commercial & Industrial Impact Evaluation of 2013-2015 Custom Comprehensive Design Approach. October 2018.	The study updated the realization rate for the CDA initiative. The RI study leveraged the MA study of the same initiative.
DNV GL, Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I. June 2019.	The study updated impact factors for the Small Business initiative. The RI study leveraged the MA study of the same initiative.
DNV GL, Prescriptive C&I Loadshapes of Savings. March 2018.	This MA study pooled known sources of 8,760 savings loadshapes in an interactive tool to estimate general prescriptive measure loadshapes over customizable time periods.
DNV GL, P78 Upstream LED Net-to-gross Analysis. August 2018.	This MA study updated net-to-gross values for the C&I Upstream Lighting initiative for 2019, 2020, and 2021.
DNV GL, P86 Lighting Hours of Use Study. April 2019.	This MA study used lighting hours of use data from several previous studies to determine hours of use by building type for the C&I Upstream Lighting program.
DNV GL, P81 Process Evaluation of C&I Upstream Lighting Initiative. September 2018.	The MA study updated in-service rates for the C&I Upstream Lighting initiative.
Illume Advising LLC, Rhode Island Statewide Behavioral Evaluation: Savings Persistence Literature Review. January 2018.	This study reviewed the existing research on the persistence of savings generated by HERs with particular attention to the applicability of each study to Rhode Island. The study explored potential impacts on the HER program when reducing the cadence of reports.
Synapse Energy Economics, Avoided Energy Supply Components in New England 2018 Report. March 2018.	This study developed new estimates of avoided costs associated with energy efficiency measures for program administrators throughout New England States. Rhode Island used the avoided costs of energy, capacity, natural gas, fuel oil, environmental costs and demand reduction induced price effects resulting from this study for 2019 program planning.
Navigant, 2017 Seasonal Savings Evaluation. March 2018.	This study evaluated the Nest thermostat optimization program offered in Massachusetts and Rhode Island. The study found that the program achieved energy and demand savings of 57 MWh and 134 kW, respectively, in Rhode Island

<p>Navigant, 2017 Residential Wifi Thermostat Demand Response. April 2018.</p>	<p>This study evaluated the controllable thermostats as a demand response technology offered through Massachusetts and Rhode Island ConnectedSolutions programs. The study found average demand savings of 0.44 kW per thermostat in Massachusetts and 0.52 kW per thermostat in Rhode Island.</p>
<p>NMR, Rhode Island Lighting Market Assessment. July 2017</p>	<p>This Residential study estimated lighting saturation and other critical market indicators in Rhode Island and included a detailed comparison to Massachusetts. The study concluded that the two markets are substantially similar, therefore Rhode Island can use the results from the recently completed net-to-gross consensus study in MA to inform program planning for the Residential Upstream Lighting program.</p>
<p>Research Into Action, Rhode Island HEAT Loan Assessment. December 2018</p>	<p>This study assessed the extent to which HEAT Loan encourages uptake of weatherization and HVAC projects through the EnergyWise program. Findings from this study will be used to inform program planning and support future potential studies in Rhode Island.</p>
<p>NMR, Rhode Island Residential Appliance Saturation Survey. October 2018</p>	<p>This study developed an inventory of residential end-uses, including appliances, consumer electronics, heating and cooling equipment, thermostats, water heating, and building characteristics. Findings from this study will be used to inform program planning and support future potential studies in Rhode Island.</p>
<p>Cadeo, Rhode Island Impact Evaluation of Income Eligible Services Single Family Program, August 2018</p>	<p>This study deemed savings values and realization rates for electric and gas participants using billing and engineering analysis. The Company adopted the deemed savings values in the 2019 program plan.</p>
<p>NMR, RLPNC 17-11 LED Net-to-Gross Consensus Panel Report. June 2018. (Leveraged study from MA)</p>	<p>This study yielded recommended prospective net-to-gross ratios for 2019 to 2021 for the Residential Upstream Lighting program in MA. Rhode Island adopted the NTG established for 2019 and 2020 due to similarity in lighting market condition.</p>
<p>NMR, RLPNC 18-5 Home Energy Assessment LED Net-to-Gross and EUL Consensus. July 2018 (leveraged study from MA)</p>	<p>The study yielded recommended net-to-gross and estimated useful life for direct installed LED bulbs offered through the Home Energy Services Initiative in Massachusetts. Rhode Island adopted the results from this study to inform 2019 and 2020 planning for the Residential EnergyWise program.</p>

NMR, RLPNC 18-4 Products Net-to-Gross Consensus Study, August 2018. (Leveraged study from MA)	This study yielded prospective net-to-gross for Residential Retail products for 2019 to 2021 in Massachusetts. Rhode Island adopted the results from this study to inform 2019 and 2020 planning for the Residential Products program.
Navigant, MA Residential Electric Loadshape and Baseline Study (Heating and Cooling Season report). July 2018. (Leveraged study from MA)	This study collected saturation, penetration and usage behavior data for all major electric and gas appliances in Massachusetts. Rhode Island adopted the end use load shapes determined by this study.
NMR, RLPNC 17-4/17-5 Products Impact Evaluation of In-service and Short-term Retention Rates Study. March 2018. (Leveraged study from MA)	This study yielded estimates of in-service rates (ISRs) and short-term retention rates for products currently offered through the Residential Consumer Products Core Initiative or the Mass Save® Home Energy Assessment (HEA) Programs. Rhode Island adopted the result from this study to inform savings for measures offered through Residential Products program.
NMR/Tetra Tech, TXC34 Massachusetts Residential HVAC Net-to-Gross and Market Effects Study. July 2018. (Leveraged study from MA)	This study yielded recommended net-to-gross ratios for selected heating, cooling, and water heating measures that will receive Mass Save® Standard rebates in 2019-2021. Rhode Island adopted the result from this study to inform savings for measures offered through Residential HVAC/HEHE programs.
Tetra Tech, Market-Rate Multifamily NEI – Phase I Final Memo. March 2018.	This MA study reviewed non-energy impacts associated with market-rate multifamily properties, including whether or not any additional NEIs should be applied, whether NEI values differ based on type and ownership of building, and whether there is double counting of NEIs.
Tetra Tech, Non-Energy Impact Framework Study Report. January 2018.	This MA study reviewed the current status of NEIs and had the following recommendations: do not count existing property value NEIs, review the BCR-model-related differences highlighted in the study and determine whether there is a reason for each, and, in cases where an NEI for one initiative or measure is applied to a different initiative or measure, provide clear public documentation of how the decision was made.

<p>DNV GL, NMR Group, Tetra Tech, Massachusetts Commercial and Industrial Upstream HVAC/Heat Pump and Hot Water NTG and Market Effects Indicator Study. September 2018.</p>	<p>This MA study updated NTG for the following upstream equipment:</p> <ul style="list-style-type: none"> <li>• Ductless mini-split heat pumps</li> <li>• Electric water-source heat pumps</li> <li>• Air-cooled unitary/split central air conditioning (&gt;5 tons)</li> <li>• Gas-fired storage water heaters between 76,000 and 300,000 BTU/hour</li> <li>• Gas-fired tankless water heaters between 180,000 and 199,900 BTU/hour</li> </ul>
<p>DNV GL, Evaluation of 2017 Demand Response Demonstration: C&amp;I ConnectedSolutions. February 2018.</p>	<p>This MA study reviewed the baseline application and impacts calculated by the AutoGrid system, examine the effectiveness of the Connected Solution baseline, and assess ex-post impacts. It was also designed to understand customer acceptance and experience with the intervention, readiness of systems for larger deployment, and PA and vendor success in delivery.</p>
<b>2017</b>	
<b>Study</b>	<b>Impact Descriptions</b>
<p>ILLUME Advising, LLC, Rhode Island Home Energy Report Program Impact and Process Evaluation. August 2017</p>	<p>This study estimated realization rates for electric and gas savings for program years 2014 to 2016 using a billing analysis. The realization rates from this study were adjusted to remove potential double counted savings from HER and other energy efficiency programs.</p>
<p>Navigant, Rhode Island Energy Efficiency Program Customer Participation Study – Phase 1, October 2017</p>	<p>The study characterized participants and non-participants in several energy efficiency programs and identified customers that can be potentially targeted to increase participation.</p>
<p>NMR, 2017 Rhode Island Single-Family Code Compliance/Baseline Study, July 2017</p>	<p>This study yielded the final agreed upon baseline values to update the User Defined Reference Home (UDRH) in Rhode Island</p>
<p>ICF, 2017 Rhode Island Residential Code Savings Analysis</p>	<p>This study found that the average Rhode Island home could attain annual electric savings of 3,690 kWh and gas savings of 10 MMBtu if it fully complied with the state’s building energy code.</p>
<p>NBI, 2017 Rhode Island Commercial Code Savings Analysis</p>	<p>This study found that the average Rhode Island commercial building could attain annual electric savings of 0.73 kWh/sf and gas savings of 0.90 MMBtu/sf if it fully complied with the state’s building energy code.</p>

NMR, 2017 Rhode Island Code Compliance Enhancement Initiative Attribution and Savings Study	The study found residential and commercial attribution factors of 23% and 46, respectively, which were used along with study results on average savings as well as construction activity projections to calculate the CCEI's projected savings from 2018-2020.
Peregrine Energy Group, Analysis of Job Creation from 2016 Expenditures for Energy Efficiency in Rhode Island by National Grid, April 2017	A study of the job impacts of National Grid's energy efficiency programs delivered to Rhode Island electricity and natural gas customers in 2016. The study estimated that 702 FTE workers, across 923 companies and agencies were employed in 2016 as a result of investments energy efficiency programs in Rhode Island.
New Buildings Institute, Energy Impacts of Commercial Building Code Compliance in Rhode Island, July 2017	This study quantified the energy impacts of energy code compliance patterns from field data collection and analysis of building characteristics.
The Cadmus Group, Inc., Ductless Mini-Split Heat Pump Impact Evaluation, 2016	This study estimated savings from various types of heat pumps.
DNV-GL, Impact Evaluation of 2014 Custom HVAC Installations, September 2017	The study updated realization rates for custom electric HVAC projects, as part of a study leveraging the MA study of the same program element.
DNV-GL, 2014 RI Custom Process Impact Evaluation, December 2017	The study updated realization rates for custom process projects, as part of a study leveraging the MA study of the same program element.
TetraTech, C&I Programs Freeridership & Spillover Study, September 2017	This study updated free-ridership and spillover values for the C&I electric and gas programs.
DNV-GL, MA C&I Steam Trap Evaluation Phase 2, Feb, 2017	This study updated steam trap savings estimates.
DNV-GL, Gas Boiler Market Characterization Study Phase II: Final Report, March 2017	This study updated C&I condensing boiler savings estimates.
DNV-GL, MA45 Prescriptive Programmable Thermostats, March 2017	This study updated programmable thermostat deemed gas savings for C&I programs.
<b>2016</b>	
<b>Study</b>	<b>Impact Descriptions</b>
DNV-GL, Impact Evaluation of 2014 Custom Gas Installations in Rhode Island Final Report, July 2016	This study yielded an energy realization rate for Custom Gas projects.
DNV-GL, Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations Final Report, July 2016	This study yielded an energy realization rate for prescriptive compressed air compressors, dryers, and EE accessories.
DNV-GL, Impact Evaluation of 2012 National Grid-Rhode Island Prescriptive Chiller Program Final Report, July 2016	This study yielded an energy realization rate for prescriptive chillers.

<p>DNV-GL, Multifamily Impact Evaluation, National Grid Rhode Island, January 2016</p>	<p>This study estimated realization rates for electric and gas savings for 2013 participants using a billing analysis. The results include a low level of precision and thus the realization rates are not applicable. The Company has been improving tracking, savings estimations and verification processes in line with the study’s recommendations.</p>
<p>Research Into Action, National Grid Rhode Island EnergyWise Single Family Process Evaluation, August 2016</p>	<p>This study surveyed customers, vendors, contractors, and lending agencies to order to assess customer experience, HEAT Loan lender perspectives on the program, performance of the lead vendor and sub-contractors and lessons learned from programs elsewhere in the country.</p>
<p>DNV-GL, Impact Evaluation of 2014 EnergyWise Single Family Program, National Grid Rhode Island, August 2016</p>	<p>This study estimated deemed savings values and realization rates for electric and gas 2014 participants using billing and engineering analysis. The Company adopted the deemed savings values in the 2017 program plan.</p>
<p>Massachusetts Special and Cross-Cutting Research Area: Low-Income Single-Family Health- and Safety-Related Non-Energy Impacts (NEIs) Study. Prepared by the NMR Group and Three3, Inc. for the Massachusetts Program Administrators. August 5, 2016.</p>	<p>This study developed Non Energy Impacts for low income programs, based on USODE’s Weatherization Assistance Program tailored to MA context. Dollar benefits rose substantially over prior values primarily based on avoidance of deaths due to thermal stress.</p>
<p>Cadmus Group; Large Commercial and Industrial On-Bill Repayment Program Evaluation, September, 2016</p>	<p>National Grid commissioned this study to evaluate the financing component of the large commercial and industrial (LCI) energy efficiency program. Cadmus evaluated the program design, performance, and sustainability; the overall market for the program; and the program’s penetration of that market to date.</p>
<p>Ductless Mini-Split Heat Pump (DMSHP) Final Heating Season Results; Ductless Mini-Split Heat Pump (DMSHP) Cooling Season Results, COOL SMART Impact Evaluation Team, 2015 / 2016</p>	<p>Heating and cooling memos that describe the number of full load hours found with field installed systems in MA and RI; these hours were used with historic data on incentivized systems to come up with average savings per unit.</p>
<p>DNV GL, Stage 2 Results—Commercial and Industrial New Construction Non-Energy Impacts Study—Final Report, prepared for the Massachusetts Program Administrators, March 2016</p>	<p>The purpose of this study was to quantify the dollar value of participant NEIs for C&amp;I NC projects completed in 2013, and to estimate gross NEIs per unit of energy savings resulting from NC electric and gas measures separately.</p>
<b>2015</b>	
<b>Study</b>	<b>Impact Descriptions</b>
<p>DNV-GL, Rhode Island Small Business Energy Efficiency Program Prescriptive Lighting Study: Final Report, July 2015</p>	<p>This study is RI-specific and yielded an energy realization rate for prescriptive lighting measures.</p>

Cadmus, Inc., High Efficiency Heating Equipment Impact Evaluation: Final Report, March 2015	The study determined revised deemed savings values for each furnace and boiler measure, including condensing boilers and early replacement of heating equipment. The study also reflected the increasing baseline for standard efficiency heating equipment.
DNV-GL, Retrofit Lighting Controls Measure Summary of Findings: Final Report (MA), October 2014	The study examined trends in lighting control savings and noted a decrease in savings over previous program years. It recommended updated coincidence factors as well as potential program and technology areas that may yield higher savings. Finally, the study recommended a change in the savings calculation algorithm for lighting controls.
Tabors Caramanis Rudkevich, Avoided Energy Supply Costs in New England: 2015 Report, April 2015	This study developed new estimates of avoided costs for application in 2016 through 2018 energy efficiency programs throughout the six New England states. Avoided costs were developed for natural gas, electric energy, electric capacity, demand reduction induced price effects (DRIPE), other fuels (oil, propane and wood), and carbon.
DNV-GL, Massachusetts 2013 Prescriptive Gas Impact Evaluation; Steam Trap Evaluation Phase 1, March 2015	The study concluded that there should continue to be both prescriptive and custom pathways for steam trap retrofit incentives, and further recommended that a group convene to review and revise the deemed savings estimate for steam traps. The study also recommended the use of a six year lifetime for steam traps.
Cadmus, Inc., LED Incremental Cost Study – Modeling LightTracker LED and Halogen Pricing Data, June 2015	This memo summarizes selected findings from the LightTracker LED, CFL, and halogen pricing data modeling effort and the resulting state-level price forecast through 2020 for LED, CFL, and halogen bulbs. These results are based on light bulb price data from 25 states that lacked LED programs from 2009 to 2014.
Cadmus, Inc., Cool Smart Incremental Cost Study: Final Report, July 2015	This incremental cost study estimates how manufacturing production costs (MPCs) and purchase prices of residential air conditioning (AC) and heat pump (HP) equipment change as equipment efficiency increases. The results support Cool Smart program enhancements and cost-effectiveness analysis, as well as potential upstream residential upstream heating, ventilation and air conditioning (HVAC) incentive programs.



<p>Cadmus, Inc., Lighting Interactive Effects Study Preliminary Results – Draft, April 2015</p>	<p>This memo details the preliminary findings of the Lighting Interactive Effects study evaluated for the Massachusetts (MA) Program Administrators to better understand and report the true impact of energy efficient lighting retrofits. It recommended factors for electric and gas energy to be applied to residential program savings.</p>
<b>2014</b>	
<b>Study</b>	<b>Impact Descriptions</b>
<p>DNV GL, 2014 , Impact Evaluation of National Grid Rhode Island C&amp;I Prescriptive Gas Pre-Rinse Spray Valve Measure</p>	<p>The evaluation examined the gas and water savings associated with the installation of reduced-flow pre-rinse spray valves. The results are based on site measurements from MA and RI facilities. The final gross gas and water savings are 11.4 MMBtu and 6,410 gallons per spray valve respectively.</p>
<p>DNV GL, 2014 Impact Evaluation of National Grid Rhode Island Custom Refrigerator, Motor and Other Installations</p>	<p>Three custom electric end-uses, Refrigerator, Motor, and Other, were evaluated to provide updated realization rates. The RI results were combined with MA results from a parallel study in order to increase the statistically significance of the final results. The final energy realization rate is 84.8%</p>
<p>DNV GL, 2014 Impact Evaluation of Rhode Island Commercial and Industrial Upstream Lighting Program</p>	<p>This study examined the performance of lighting systems that were discounted at the distribution level. The evaluation included metering at Rhode Island project sites that was combined with the results of metering done in MA to yield more accurate impacts for lighting offered in this upstream initiative. The final energy realization rate is 80.3% for LEDs and 109.5% for fluorescents.</p>
<p>NMR Group, Inc., Northeast Residential Lighting Hours-of-Use Study</p>	<p>This multi-State study provided updated hours-of-use assumptions for residential lighting programs in various room types.</p>
<p>The Cadmus Group, Impact Evaluation: Rhode Island Income Eligible Services, Volume II   The Cadmus Group, National Grid Income Eligible Services Process Evaluation</p>	<p>This RI-specific impact evaluation focused on the electric and gas savings resulting from the participation of these dwellings in in-home retrofit of electrical components and weatherization of electric, gas, and fossil fuel heated homes. It used billing analysis, engineering reviews, and interviews for the process components.</p>

<p>National Grid, Macroeconomic Impacts of Rhode Island Energy Efficiency Investments  REMI Analysis of National Grid’s Energy Efficiency Programs</p>	<p>This study quantifies the macroeconomic impacts of National Grid’s 2014 EE Program Plan for Rhode Island and provides updated economic impact multipliers to quantify the benefits of future EE programs in the Rhode Island economy. This updates the multipliers from an economic impact study conducted by Environment Northeast (ENE) in 2009.</p>
<p><b>2013</b></p>	
<p><b>Study</b></p>	<p><b>Impact Descriptions</b></p>
<p>KEMA, Inc., Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations   KEMA, Inc., Impact Evaluation of 2011 Rhode Island Custom Lighting Installations</p>	<p>The Custom and Prescriptive Lighting studies involved the impact evaluation of components of the Large Commercial and Industrial electric efficiency programs. The studies included on-site engineering and end-use metering of a statistically drawn random sample of participants. The custom portion of the study was coupled with the results of the 2013 Massachusetts Custom Lighting study.</p>
<p>KEMA, Inc., Impact Evaluation of 2011 Prescriptive Gas Measures</p>	<p>On-site monitoring and verification of installation provided updated impacts for four major prescriptive gas measures. Programs and measures are similar between National Grid affiliates in MA and RI, and results are applied to RI. The overall realization rate for the four measures was approximately 102% and the relative precision was about ±15%.</p>
<p>KEMA, Inc., and DMI, Inc., Impact Evaluation of 2011-2012 Prescriptive VSDs</p>	<p>This evaluation provided a new estimate of the impacts of prescriptive variable speed drives, based on pre-post metering of measures installed in 2011 and 2012. Programs and measures are similar between National Grid affiliates in MA and RI, and results are applied to RI. Key findings include an annual kWh realization rate was 94% with a relative precision of +/- 23%, and identification of factors that influenced the realization rate.</p>
<p>The Cadmus Group, Inc., 2012 Residential Heating, Water Heating, and Cooling Equipment Evaluation: Net-to-Gross, Market Effects, and Equipment Replacement Timing</p>	<p>The results of this study yielded updated net-to-gross factors and estimates of the timing of equipment replacement for residential heating and cooling measures. Programs and measures are similar between National Grid affiliates in MA and RI, and results are applied to RI.</p>
<p>KEMA, Inc., Process Evaluation of the 2012 Bright Opportunities Program</p>	<p>This study provided net-to-gross ratios for the Commercial Upstream Lighting initiative offered in MA and RI, as well as a process assessment of this generally successful initiative.</p>

KEMA, Inc., Impact Evaluation of 2010 Prescriptive Lighting Installations	The RI Prescriptive lighting study listed above did not examine case lighting separately from other lighting systems. To complement the RI-specific results, this MA study provided impact updates on case lighting.
Opinion Dynamics (2013). Massachusetts Cross-Cutting Behavioral Program Evaluation Integrated Report.	This study provided an updated realization rate for savings from gas customers who participate in the Opt-out channel of the Home Energy Reports program.
<b>2012</b>	
<b>Study</b>	<b>Impact Descriptions</b>
KEMA, Inc., Impact Evaluation of the 2010 Custom –Industrial Process and Compressed Air impact evaluation, September, 2012	Study produced realization rates for energy, seasonal demand, and percent energy on peak for both programs. The RI results were combined with MA results from a parallel study in order to increase the statistical significance of the final results. The final energy realization rate is 92.7%.
TetraTech, Final Report – Commercial and Industrial Non-Energy Impacts Study, (prepared for Massachusetts Program Administrators), June 29, 2012	This report provides a comprehensive set of statistically reliable Non-energy impact (NEI) estimates across the range of C&I prescriptive and custom retrofit programs offered by the MA electric and gas Program Administrators (Pas). The analytical methods used allow this report’s findings to be applicable to RI.
<b>2011</b>	
<b>Study</b>	<b>Impact Descriptions</b>
KEMA, Inc., Impact Evaluation of the 2009 Custom HVAC and 2008-2009 Custom CDA Installations, September 1, 2011	Study produced realization rates for energy, seasonal demand, and percent energy on peak for both programs. The RI results were combined with MA results from a parallel study in order to increase the statistical significance of the final results. The final energy realization rate for Custom HVAC is higher than the PY 2011 realization rate by about 10% (increased from 100.5% to 110.4%). The final energy realization rate for Custom CDA is higher than the PY 2011 realization rate by about 20% (increased from 97.2% to 119.6%).

<p>KEMA, Inc., C&amp;I Lighting Loadshape Project, Prepared for the Regional Evaluation, Measurement, and Verification Forum, June 2011.</p>	<p>A compilation of lighting loadshape data from the Northeast. The study provided updated coincidence factors for the Energy Initiative and Small Business Lighting programs. The Small Business program summer coincidence factor went from 0.80 to 0.79, while the Energy Initiative summer coincidence went from 0.88 to 0.89</p>
<p>KEMA, Inc., C&amp;I Unitary HVAC Loadshape Project Final Report, Prepared for the Regional Evaluation, Measurement, and Verification Forum, June 2011.</p>	<p>From end use metering, the study produced updated diversity and equivalent full load hours for unitary HVAC measures</p>
<b>2010</b>	
<b>Study</b>	<b>Impact Descriptions</b>
<p>ADM Associates, Inc., Residential Central AC Regional Evaluation, Final Report, October 2009</p>	<p>KWh and kW savings figures for the installation of efficient residential CAC systems</p>
<b>2007</b>	
<b>Study</b>	<b>Impact Descriptions</b>
<p>RLW Analytics, Small Business Services Custom Measure Impact Evaluation, March 23, 2007</p>	<p>Verification of energy savings from custom lighting projects in the Small Business Services program.</p>
<p>RLW Analytics, Impact Evaluation Analysis of the 2005 Custom SBS Program, May 29, 2007</p>	<p>Realization rates for the Small Business Services program</p>