

# 2022 Evaluation, Measurement, and Verification Plan

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## Table of Contents

1.	Introduction .....	1
2.	Evaluation Studies Completed in 2021 .....	2
3.	2022 Planned Evaluation Studies .....	3
3.1	Commercial and Industrial Planned Evaluation Studies in 2022 .....	7
a.	RI-21-CG-CustGasPY20 – Impact Evaluation of PY2020 Custom Gas Installations (continued from 2021).....	7
b.	RI-21-CE-CustElecPY20 – Impact Evaluation of PY2020 Custom Electric Installations (continued from 2021).....	7
c.	RI-22-CG-CustGasPY21 – Impact Evaluation of PY2021 Custom Gas Installations .....	7
d.	RI-22-CE-CustElecPY21 – Impact Evaluation of PY2021 Custom Electric Installations .....	8
e.	RI-22-CX-FRSO – C&I Free-Ridership and Spillover Study.....	8
f.	RI-22-CX-Proc – Small Business Process Evaluation .....	8
g.	RI-22-CX-Codes – C&I New Construction Baseline Study .....	8
h.	RI-21-CE-LightMar – C&I Lighting Market Characterization Study (continued from 2021) .	8
i.	RI-22-CX-Presc – C&I Prescriptive Non-Lighting Impact Evaluation .....	9
j.	RI-22-CX-RTUOpt – Automated RTU Optimization Demonstration Evaluation.....	9
3.2	Residential Planned Evaluation Studies in 2022 .....	9
a.	RI-21-RX-NPStudy – Non-Participant Market Barrier Study (continued from 2021) .....	9
b.	RI-21-RE-SolarDRDemo – Solar Inverter Power Factor Correction Demonstration Evaluation (continued from 2021).....	10
c.	RI-21-RG-GasHPDemo – Gas Heat Pump Demonstration Evaluation (moved to 2022) .	10
d.	RI-21-RX-CSNC - Residential New Construction Baseline and Code Compliance Study (continued from 2021).....	10
e.	RI-22-RX-SecondaryHeat – Follow-up Research on Secondary Heating in EnergyWise Single Family Program .....	10
f.	RI-22-RE-HPMeter – Mini-Split/Central Heat Pump Metering Study.....	11
g.	RI-22-RX-ModerateNEI – Moderate Income NEI Study.....	11
3.3	Cross-Sector/Other Planned Evaluation Studies in 2022.....	11

a.	RI-22-XX-Workforce – Workforce Associated with Rhode Island Energy Efficiency Programs Analysis Study.....	11
b.	RI-22-XX-WorkDev – Rhode Island Energy Efficiency Workforce Development Needs Assessment.....	11
4.	Evaluation Study Findings.....	13
5.	Historical Evaluation Studies .....	56
6.	EM&V Legislated Study.....	70

## 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 also 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 projects, 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 types of evaluation may include (but not limited to) the following:

- **Impact Evaluations:** Comparisons of claimed savings against actual realized savings using methods such as literature review, billing analyses, engineering methods and onsite data logging as a means of verification.
- **Process Evaluations:** Broad examinations of existing practices, such as program delivery methods, for the purpose of gathering information to draw conclusions about effectiveness of existing processes, highlight best practices, and offer suggestions for future improvements.
- **Market Assessment Studies:** Broad studies aimed at assessing changes in market conditions, such as evolving adoption rates of current energy efficiency technologies.
- **Net-to-Gross Evaluations:** Studies aimed at quantifying the rate of free-ridership and spillover associated with energy efficiency participants and non-participants. The free-ridership rate is the percentage of savings attributable to participants who would have installed the measures in the absence of program intervention while spillover includes the effects of two components:
  1. Participants in the program who install additional energy efficient measures outside of the program as a result of participating in the program, and
  2. Non-participants who install the installation of energy efficient measures as a result of being aware of the program

The study methodologies and savings assumptions from evaluation studies are documented in the Rhode Island Technical Reference Manual (TRM). The TRM is reviewed and updated annually to reflect changes in technology, baselines and evaluation results.

The entire evaluation process is managed by the Company in consultation with the Rhode Island Energy Efficiency & Resource Management Council (EERMC) and the Office of Energy Resources (OER). The EERMC and OER follows each study closely and is involved in planning, work plan development, and review of interim work products and study results.

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

## **2. Evaluation Studies Completed in 2021**

The Company, with input from EERMC and OER, expects to complete 8 Rhode Island-specific evaluation studies in 2021 (see below). The research studies include impact evaluations, process evaluation, 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-19-CE-UpstrLight - Impact Evaluation of PY2019 Upstream Lighting Program
2. RI-20-CG-CustGasPY19 - Impact Evaluation of PY2019 Custom Gas Installations
3. RI-19-CE-CustElec - Impact Evaluation of PY2018 Custom Electric Installations
4. RI-20-CE-CustElecPY19 - Impact Evaluation of PY2019 Custom Electric Installations

### **Residential**

1. RI-19-RE-HEM - Residential Home Energy Monitoring (Sense) Demonstration Process Evaluation
2. RI-21-RE-AppRecycling - Appliance Recycling Impact Factor Update

### **Cross-Cutting**

1. RI-20-XG-GasPeak - Gas Peak Demand Savings
2. RI-21-XX-Jobs - Workforce Associated with Rhode Island Energy Efficiency Programs Analysis Study

### 3. RI-19-XE-Rhode Island Strategic Electrification Study

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, in consultation with EERMC and OER, to be applicable to Rhode Island's energy efficiency programs. The Company is adopting the results of these studies in 2022 program planning due to similarity, either in the measures offered, or program structure or delivery.

In addition to the studies listed above, the OER hired an energy consulting firm to independently verify the energy savings of National Grid's energy efficiency programs and to review the evaluation, measurement, and verification (EM&V) process to ensure quality data, rigorous methods, and appropriate assumptions are being used. This study was legislated in Senate Bill 2500, enacted in June 2018.<sup>1</sup> This study and the Company's response to its recommendations are discussed in Section 6.

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 2021 Energy Efficiency Plan have been removed from this list. These studies are available through the request of the EERMC<sup>2</sup>, the Rhode Island Public Utilities Commission (PUC)<sup>3</sup>, and National Grid.

## 3. 2022 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. 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 Mass Save Program Administrators when possible. The Company will also stay abreast of the voluminous Massachusetts evaluation activities that may be beneficial and applicable in Rhode Island and will use the guidelines provided by the Rhode Island Piggybacking Diagnostic Study to inform this strategy. A protocol for these efforts will be developed in 2022, with the goal of continuing and improving upon the benefits of this relationship.

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<sup>1</sup> <http://webserver.rilin.state.ri.us/PublicLaws/law18/law18079.htm>

<sup>2</sup> <https://rieermc.ri.gov/plans-reports/evaluation-studies/>

<sup>3</sup> <http://www.ripuc.org/>

Table 2 lists evaluation studies that the Company plans to conduct in 2022 to inform the 2023 Annual Plan and future planning cycles. Barring changes to the 2023 Annual Plan schedule, studies that will be incorporated into the Annual Plan must be completed by August 2022. Study labeling codes take the general form shown in Table 1. 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. Study Labeling Code Format**

[State]	[Year Study Conducted]	[Sector]	[Fuel]	[Keyword]
RI	19 20 21	R = residential C = commercial X = cross sector	E = electric G = gas X = electric & gas	

**Table 2. Planned Evaluation Studies in 2022**

Sector	Study Code	Type	Affected Programs	Study Name	State Lead
C&I	RI-21-CG-CustGasPY20	Impact	C&I Gas	Impact Evaluation of PY2020 Custom Gas Installations (continued from 2021)	RI
C&I	RI-21-CE-CustElecPY20	Impact	C&I Elec	Impact Evaluation of PY2020 Custom Electric Installations (continued from 2021)	RI
C&I	RI-22-CG-CustGasPY21	Impact	C&I Gas	Impact Evaluation of PY2021 Custom Gas Installations	RI
C&I	RI-22-CE-CustElecPY21	Impact	C&I Elec	Impact Evaluation of PY2021 Custom Electric Installations	RI
C&I	RI-22-CX-FRSO	NTG	C&I	C&I Free-Ridership and Spillover Study	RI
C&I	RI-22-CX-Proc	Process	C&I	Small Business Process Evaluation	RI
C&I	RI-22-CX-Codes	Codes	C&I	C&I New Construction Baseline Study	RI

C&I	RI-22-CE-LightMar	Market	C&I Electric	C&I Lighting Market Characterization Study	RI
C&I	RI-22-CX-Presc	Impact	C&I	C&I Prescriptive Non-Lighting Impact Evaluation	MA
C&I	RI-22-CX-RTUOpt	Impact	C&I	Automated RTU Optimization Demonstration Evaluation	RI
Residential	RI-21-RX-NPStudy	Market	Multiple	EE Non-Participant Study (continued from 2021)	RI
Residential	RI-21-RE-SolarDRDemo	Impact	DR	Solar Inverter Power Factor Correction Demonstration Evaluation (continued from 2021)	RI
Residential	RI-21-RG-GasHPDemo	Impact	HVAC Demo	Gas Heat Pump Demonstration Evaluation	RI
Residential	RI-21-RX-CSNC	Impact	RNC/Codes	Residential New Construction and Code Compliance Study (continued from 2021)	RI
Residential	RI-22-RX-SecondaryHeat	Impact	EWSF	Follow-up Research on Secondary Heating in EnergyWise Single Family Program	RI
Residential	RI-22-RE-HPMeter	Impact	Energy Star HVAC - Electric	Mini-Split/Central Heat Pump Metering Study	MA
Residential	RI-22-RX-ModerateNEI	NEI	EWSF	Moderate Income NEI study	MA
Cross-cutting	RI-22-XX-Workforce	Policy	Multiple	Workforce Associated with Rhode Island Energy Efficiency Programs Analysis Study	RI
Cross-cutting	RI-22-XX-WorkDev	Policy	Multiple	Rhode Island Energy Efficiency Workforce Development Needs Assessment	RI

The evaluation pathway for pilots, demonstrations, and assessments is based on each effort’s scale, budget, scope, and the availability of external data. The Company’s EM&V team will provide guidance beginning at the Plan stage for all pilots, demonstrations, and assessments, to ensure design and data collection are suitable to allow for effective evaluation. In cases where an independent evaluation is appropriate, the EM&V team will run the evaluation. For guidelines on the stakeholder review process and which pilots, demonstrations, and assessments will receive an independent evaluation, please see Attachment 8. The evaluation will follow the same established evaluation framework used in evaluations of established programs. This includes management of the independent evaluation vendor by the Company’s

EM&V team in consultation with the EERMC and OER. See Attachment 8 for further details on pilots, demonstrations, and assessments.

The EM&V team will follow the Company's standard procurement policy that cuts across programs 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 Company's standard procurement policy is supported and enforced by stand-alone internal procurement function. Contract characteristics below certain thresholds are eligible for sole-sourcing while contract characteristics above thresholds require competitive procurement unless it can be demonstrated to the procurement organization that securing multiple bids is not possible or practical.

The proposed budget for evaluation study expenditures in 2022 is approximately \$2.8 million (\$2.1 million for electric and \$0.7 million for gas), excluding internal staffing costs. The proposed budget for EM&V comprises approximately 1.8% of the total portfolio budget in 2022.

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>4</sup>

There were several additional studies that were discussed for inclusion in the 2022 Plan. A list of these studies is shown below.

- Impact Evaluation of Income Eligible Services Program.
- Process Evaluation of Home Energy Reports Program.
- Residential Appliance Saturation Survey.
- REMI Analysis.

These four studies were discussed with OER and the EERMC Consultants and considered for inclusion in the 2022 annual plan. These impact evaluation studies are intentionally being delayed in the 2022 plan to avoid spurious/not applicable effects caused by the pandemic. The Company will continue to discuss and consider these plans for inclusion in the 2023 plan. Some specific study reasons are included below.

For Home Energy Report, the program delivery may change since it will be out to bid. Due to this, it was decided that it would be more appropriate to wait for this vendor to be selected before evaluating.

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



For the Residential Appliance Saturation Survey, the study will not be needed in 2022 because there will not be a full-blown Technical Potential Study in 2022.

### **3.1 Commercial and Industrial Planned Evaluation Studies in 2022**

#### **a. RI-21-CG-CustGasPY20 – Impact Evaluation of PY2020 Custom Gas Installations (continued from 2021)**

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 2020. This will continue 'rolling' evaluation efforts, where each year will evaluate roughly 1/3 of the number of sites needed for a full sample and results will be combined with results from the previous two years, which will keep the realization rates updated yearly. This study is scheduled to begin in late 2021 and continue into 2022.

#### **b. RI-21-CE-CustElecPY20 – Impact Evaluation of PY2020 Custom Electric Installations (continued from 2021)**

The objective of this impact evaluation is to provide verification of electric energy savings estimates for a sample of non-lighting custom electric projects through site-specific inspection, metering, and analysis. The results of this study will be used to determine the realization rates for custom electric energy efficiency offerings based on installations from 2020. This will continue 'rolling' evaluation efforts, where each year will evaluate roughly 1/3 of the number of sites needed for a full sample and results will be combined with results from the previous two years, which will keep the realization rates updated yearly. This study is scheduled to begin in summer 2021.

#### **c. RI-22-CG-CustGasPY21 – Impact Evaluation of PY2021 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 2021. This will continue 'rolling' evaluation efforts, where each year will evaluate roughly 1/3 of the number of sites needed for a full sample and results will be combined with results from the previous two years, which will

keep the realization rates updated yearly. This study is scheduled to begin in late 2022 and continue into 2023.

**d. RI-22-CE-CustElecPY21 – Impact Evaluation of PY2021 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 realization rates for custom electric energy efficiency offerings based on installations from 2020. This will continue 'rolling' evaluation efforts, where each year will evaluate roughly 1/3 of the number of sites needed for a full sample and results will be combined with results from the previous two years, which will keep the realization rates updated yearly. This study is scheduled to begin in summer 2022.

**e. RI-22-CX-FRSO – C&I 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. The study will begin in late 2022 and continue into 2023.

**f. RI-22-CX-Proc – Small Business Process Evaluation**

The objective of this study is to assess the overall delivery of the Small Business Direct Install program. The study will assess the effectiveness of program delivery procedures. This evaluation will identify practical approaches to improve the overall effectiveness of the program in order to reach higher participation rates and deeper savings.

**g. RI-22-CX-Codes – C&I New Construction Baseline Study**

The objective of this study is to gather market data on new construction practices in Rhode Island. This data will be used to inform industry standard practice development and/or adoption, develop new construction baselines, and potentially to determine savings resulting from code compliance efforts. This study will be discussed in further detail in the second draft.

**h. RI-21-CE-LightMar – C&I Lighting Market Characterization Study (continued from 2021)**

The primary objective of this study is to calculate the adjusted measure lives (AML) for C&I custom and prescriptive lighting measures. To understand the future baselines needed to calculate the AMLs, this study will convert an existing stock turnover model, utilized in

Massachusetts and Connecticut, with Rhode Island specific inputs. The model will be calibrated using annual market share (% of sales) estimates. Rather than collecting primary sales data from distributors, this study will seek to collect primary interviews and/or convene a consensus group to determine market share estimates in Rhode Island. If using the consensus group approach, the study team will provide the consensus group with recent market share estimates and demographic data from Massachusetts and Connecticut to inform the discussion. In addition to producing future baselines for AMLs, the model results will help the study team understand the current and historical Rhode Island lighting saturation by submarket and technology, forecast the Rhode Island C&I lighting market trajectory, and estimate the remaining opportunities to generate program savings.

**i. RI-22-CX-Presc – C&I Prescriptive Non-Lighting Impact Evaluation**

The objective of this impact evaluation is to provide verification or re-estimation of electric energy and demand and/or natural gas savings estimates for a subset of prescriptive projects through site-specific inspection, monitoring, and analysis. The results of this study will be used to determine new deemed savings values and/or savings parameters for selected prescriptive energy efficiency offerings. The specific measures to include in this study are still to be determined and will follow the lead of the Massachusetts Program Administrators, per Piggybacking Study guidance.

**j. RI-22-CX-RTUOpt – Automated RTU Optimization Demonstration Evaluation**

The objective of this demonstration project is to verify savings for the automated RTU optimization product described in Attachment 8, section 4.2. The demonstration will install new smart thermostats and provide the software integration for 10-15 sites. The evaluation will collect data provided by the software, billing data, and potentially on-site metering for an independent assessment of the savings above and beyond the thermostat savings. The results of the study will be used to develop deemed savings, if possible. This study will kick off in spring 2022 and expected to conclude in 2023 to allow for assessment of heating savings.

### **3.2 Residential Planned Evaluation Studies in 2022**

**a. RI-21-RX-NPStudy – Non-Participant Market Barrier Study (continued from 2021)**

The study will provide in-depth research on non-participants to characterize customers that have not participated in the programs, assess barriers to participation and identify engagement opportunities. The study will use multi-mode surveys (web, phone, mail) and in-depth interviews designed to understand non-participants' attitudes, needs and perceptions. This

study will build on the Residential Non-Participant Market Characterization and Barriers Study<sup>5</sup> recently conducted in Massachusetts.

**b. RI-21-RE-SolarDRDemo – Solar Inverter Power Factor Correction Demonstration Evaluation (continued from 2021)**

This study will assess the solar inverter direct load control demonstration offering. The goals of this study are to determine the effectiveness of adjusting the power factor in order to minimize the losses associated with converting the solar power to real power that can be used for electricity, evaluate energy savings, and determine if this technology is ready to be offered as a full demand response program offering.

**c. RI-21-RG-GasHPDemo – Gas Heat Pump Demonstration Evaluation (moved to 2022)**

This study will assess the savings potential for a possible new measure offering, gas heat pumps. The savings will be used to determine if the measure is cost effective. Furthermore, the study will review and determine if this technology is market ready and should be considered as a measure to be included as a full program offering. Some key questions will be how efficiently these units work at different temperatures, do they perform close to their rated efficiency and can they be the sole heating source of a home.

**d. RI-21-RX-CSNC - Residential New Construction Baseline and Code Compliance Study (continued from 2021)**

The objective of this research is to conduct a baseline study of Rhode Island homes built after the 2018 IECC code cycle and to develop a new User Defined Reference Home (UDRH). The study will assess gross savings for REM/Rate-modeled program homes against the new UDRH and will evaluate compliance rates used to estimate attribution for Codes programs.

**e. RI-22-RX-SecondaryHeat – Follow-up Research on Secondary Heating in EnergyWise Single Family Program**

This follow-up study aims to explore the potential impact of secondary heat sources on evaluated savings in the EnergyWise Single Family Program. This study may include literature review, analysis of program data and participant surveys to understand the prevalence of secondary heating in participating homes and to assess any impacts that may not be accounted for in the previous EnergyWise impact evaluation.

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<sup>5</sup> [http://ma-eeac.org/wordpress/wp-content/uploads/MA19R04-A-NP-Nonpart-MarketBarriersStudy\\_Final.pdf](http://ma-eeac.org/wordpress/wp-content/uploads/MA19R04-A-NP-Nonpart-MarketBarriersStudy_Final.pdf)

**f. RI-22-RE-HPMeter – Mini-Split/Central Heat Pump Metering Study**

The goals for this study would be to update the savings estimates for the current rebate offerings for heat pumps. The study would include detailed metering of participating customers in order to update results that are currently over 5 years old. This study would be in collaboration with MA and possible other states in the New England area. The study goal would be looking to update the savings for mini-split heat pumps, both going from standard heat pumps to high efficiency heat pumps and electric resistance to heat pumps, and ducted heat pumps going from standard heat pumps to high efficiency heat pumps in RI

**g. RI-22-RX-ModerateNEI – Moderate Income NEI Study**

The objective of this study is to quantify non energy impacts related to weatherization that may apply to moderate income customer group. This study will involve a literature review of NEI studies for moderate income offering and an analysis of NEI among program participants and non-participants if unable to derive NEIs from the literature review. This study will be in collaboration with MA.

### **3.3 Cross-Sector/Other Planned Evaluation Studies in 2022**

**a. RI-22-XX-Workforce – 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 to electricity and natural gas customers. Similar to the workforce studies conducted from 2013 to 2020, 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 2021. This study addresses the requirements of General Law 39-2-1.2, enacted by the Rhode Island General Assembly in 2012, and is conducted annually.

**b. RI-22-XX-WorkDev – Rhode Island Energy Efficiency Workforce Development Needs Assessment**

The objective of the report is to inform the Company on where to direct future workforce development investments that will prepare the present and future labor pool to reach the state’s energy efficiency goals. Specifically, the report will: identify energy efficiency employer needs; identify certification requirements for different energy efficiency job markets; develop an inventory of energy efficiency training programs across the state; survey primary energy efficiency job types for education and training, career satisfaction and advancement, possible barriers to advancement, typical feeder and promotion occupations and, compensation and

employment benefits; understand the preferences and priorities for the pipeline of potential workers; and, examine diversity in the energy efficiency workforce and how to expand diversity across energy efficiency occupations. The data, key findings, and recommendations in this report will be based on a combination of data from surveys of energy efficiency employers, the current energy efficiency workforce, and the potential energy efficiency talent pipeline, as well as other public data.

## 4. Evaluation Study Findings

### Impact Evaluation of PY2019 Rhode Island C&I Upstream Lighting Initiative

**Type of Study:** Impact

**Evaluation Conducted by:** DNV

**Date Evaluation Conducted:** 7/15/21

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

DNV carried out the Impact Evaluation of the Project Year 2019 Rhode Island C&I Upstream Lighting Initiative for National Grid from December 2020 to June 2021. The study’s overall purpose was to build on prior research to understand the extent to which program performance is meeting program and policy goals and objectives.

The study was designed to answer the following research questions in three categories:

#### **Baseline information:**

- Was the site new construction or a major renovation event?
- What type, wattage, and count of lamps/fixtures were replaced by measures supported by the initiative? This question includes the proportion of T12 systems or lamps replaced by program measures

#### **Savings factor results and their application:**

- What are the updated savings factors for National Grid to use prospectively?
- How much savings can be attributed to controls induced by the initiative?
- How has the quantity of light fixtures/lamps increased or decreased since participating in the program? For example, where TLEDs were installed, were extra linear T8s installed to make up for the less than expected light output?
- Update the building type HOU values

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

The results of this study are applicable to the Upstream Lighting measures alone.

#### **Evaluation Recommendations included in the Study:**

The study team proposed updated ISR, and kW saved per unit. When applied and combined with existing and unchanging HVAC interactive effects, and Delta Watts adjustment factors, the new RR values are show in the following table:

Category	kWh RR	Summer kW RR	Winter kW RR	Non Electric RR
Screw-In LEDs	50.47%	57.82%	46.06%	50.47%
LED Stairwell Kits	86.00%	86.00%	86.00%	86.00%
Linear LEDs	97.92%	110.40%	95.04%	97.92%
Linear LEDs w/ Controls	98.94%	111.55%	96.03%	98.94%

<b>Linear Fixtures LEDs</b>	99.96%	112.70%	97.02%	99.96%
<b>Linear Fixture LEDs w Controls</b>	99.96%	112.70%	97.02%	99.96%
<b>High Bay / Low Bay</b>	92.82%	104.65%	90.09%	92.82%
<b>Exterior LEDs</b>	95.00%	95.00%	95.00%	95.00%
<b>High Bay / Low Bay w Controls</b>	92.82%	104.65%	90.09%	92.82%
<b>Exterior LEDs w Controls</b>	95.00%	95.00%	95.00%	95.00%

**Explain Whether or Not National Grid Decided to Adopt Recommendations from the Study:**  
National Grid is adopting these results.

**Savings Impact:**

These realization rates are broadly an increase across all categories, hold screw-in lighting applications.



**RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019**

**Custom Electric Installations**

**Type of Study:** Impact

**Evaluation Conducted by:** DNV

**Date Evaluation Conducted:** September 2021

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

The objective of this impact evaluation was to provide verification or re-estimation of energy (kWh) savings for a sample of custom electric projects through site-specific inspections, end-use monitoring, and analysis. The site-specific results were aggregated to determine realization rates for National Grid’s custom electric installations in RI.

<b>Lighting</b>	<b>PY2016</b>	<b>PY2018</b>	<b>PY 2019</b>	<b>PY2016+PY2018+PY2019</b>
Tracking Energy Savings (kWh)	19,142,741	13,294,077	17,498,949	49,935,767
Sample Size (n)	3	10	10	23
RR	99.9%	94.3%	91.4%	95.4%
Relative precision@ 90% CI	±5.6%	±21.7%	±18.4%	±9.2%

<b>Non-Lighting</b>	<b>PY2016</b>	<b>PY2018</b>	<b>PY 2019</b>	<b>PY2016+PY2018+PY2019</b>
Tracking Energy Savings (kWh)	21,044,847	12,910,679	12,804,067	46,759,593
Sample Size (n)	8	14	15	37
RR	69.3%	77.6%	104.1%	81.1%
Relative precision@ 90% CI	±26.0%	±12.3%	±18.4%	±13.2%

The PY2018 study was scheduled to be completed in 2020, but due to onsite restrictions resulting from COVID-19, onsite work did not begin until late 2020. Due to this delay, both the PY2018 and PY2019 studies were completed in 2021. As a three-year rolling scheme is used to determine custom realization rates, the overall realization rates from this study combine results from PY2016, PY2018, and PY2019 studies.

For some sites, collecting metered data was not possible due to pandemic-related changes in facility operation or site access. For these sites, assessment of non-operational factors was performed, and a historical operational adjustment factor was used to estimate the site operation.

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

Electric—Large Commercial New Construction

Electric—Retrofit

**Evaluation Recommendations included in the Study:**

DNV GL recommends applying the combined result of 95.4% RR for lighting and 81.1% RR for non-lighting for 2021.

Other recommendations will be produced when the study is finalized.

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

National Grid adopted the results of this study.

**Savings Impact:**

This study will result in an increase in claimable savings from both lighting and non-lighting Large Commercial Custom Electric projects.

**RI-20-CG-CustGasPY19 - Impact Evaluation of PY2019 Custom Gas Installations**

**Type of Study:** Impact

**Evaluation Conducted by:** DNV

**Date Evaluation Conducted:** September 2021

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

The objective of this impact evaluation was to provide verification or re-estimation of energy (therms) savings for a sample of custom gas projects through site-specific inspections, end-use monitoring, and analysis. The site-specific results were aggregated to determine realization rates for National Grid's custom gas installations in RI.

Parameter	PY2017	PY2018	PY2019	PY2017+PY2018+PY2019
Tracking Savings (therms)	1,948,383	2,350,739	1,944,204	6,243,326
Sample Size	6	6	10	22
Realization Rate (RR)	92.7%	83.3%	85.3%	86.9%
Relative Precision @ 80% CI (%)	±2.3%	±22.6%	±4.5%	±6.8%

As a three-year rolling scheme is used to determine custom realization rates, the overall realization rate from this study combines results from PY2017, PY2018, and PY2019 studies.

For some sites, collecting metered data was not possible due to pandemic-related changes in facility operation or site access. For these sites, assessment of non-operational factors was performed, and a historical operational adjustment factor was used to estimate the site operation.

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

Gas—Large Commercial New Construction

Gas—Retrofit

**Evaluation Recommendations included in the Study:**

DNV GL recommends applying the combined result of 86.9% RR.

Other recommendations will be produced when the study is finalized.

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

National Grid adopted the results of this study.

**Savings Impact:**

This study will result in an increase in claimable savings from Large Commercial Custom Gas projects.

**MA19C08-B-NRNCMKT - NRNC Market Characterization Study**

**Type of Study:** Market

**Evaluation Conducted by:** DNV

**Date Evaluation Conducted:** June 2021

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

1. Assess and/or inform Industry Standard Practices (ISPs) where possible based on the data collection.
2. Assess energy code compliance for select code measures.

**Conclusions**

1. Current standard practice is better than code for many of the measures examined in this study. Clear indications of ISP were found for the following measures:
  - **Interior LPD.** The DNV team determined that interior LPD design was  $0.60 \pm 0.08$  of the code requirements (40% better than code) for buildings permitted under IECC 2015.
  - **Exterior LPD.** The DNV team examined exterior lighting design and found that standard practice for exterior lighting design was  $0.67 \pm 0.10$  of the code requirements (33% better than code) for buildings permitted under IECC 2015.
  - **Boilers.** The NRNC Study found that standard practice for boilers is to specify condensing boilers, while the code efficiency levels reflect a baseline of a non-condensing boiler. The study results suggest that the median boiler specified in NRNC are 15% better than code requirements.
  - **Heat pumps.** Standard practice was observed to be better than code, suggesting that the median ineligible specified heat pump is 3% and 6% better than code for cooling and heating respectively. Additional implementation details are beyond the scope of this study and may require further collaboration between implementers and evaluators.
  - **Warm air furnaces and direct expansion (DX) AC.** The median units for both of these equipment types were determined to be specified at code.
  - **Chillers.** The median unit was determined to be specified 1% better than code.
2. Mechanical equipment is largely compliant with the energy code efficiency requirements, though compliance is difficult to assess for mechanical equipment controls. This is consistent with prior code compliance study findings and reflects the market aligning with the code such that it is difficult to purchase equipment that does not comply with code requirements. For mechanical equipment controls, the presence of controls can be identified, but this study was not designed to provide insights regarding control commissioning or operations, key components of successful control strategies. ISPs developed from this study are based on stated equipment efficiencies from construction drawings. Actual equipment and controls performance cannot be determined from plan review and would require on-site evaluation.
3. Opportunities remain for improving code compliance and assessing building performance. While this study focused on individual measures in lieu of whole building compliance,

opportunities remain to improve compliance for select measures such as slab insulation/thermal break requirements, air barrier documentation, and daylighting. Additionally, many benefits of code compliant systems rely on proper installation of components and system commissioning, particularly for controls and envelope sealing/insulation requirements, which were not assessed as part of this study.

4. The recruitment approach in this study effectively mitigated self-selection bias and provides results reflective of the NRNC market. Prior code compliance studies likely suffered from self-selection bias in that building designers and owners who are knowingly not adhering to code could decline participation. The NRNC Study mitigated this bias by recruiting directly from municipal building departments and ensuring that sites included in the study represented a broad range of municipalities.

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

Electric—Large Commercial New Construction

**Evaluation Recommendations included in the Study:**

1. Adopt the ISP values summarized in the table below. The product of a code adjustment factor and the code specified minimum efficiency yields the ISP baseline efficiency to be used for calculating savings. These values reflect the best available ISP data.

Equipment Type	Code Adj. Factor	Notes
Interior lighting	0.60	Applicable to the IECC 2015 values
Exterior lighting	0.67	
Hot water boilers	1.15	
Warm air furnaces	1.02	
Heat pumps – heating	1.06	Includes all heat pumps (air, water, and ground source) except for packaged terminal heat pumps. Applies to heat pump baselines but not fuel switch baselines.
Heat pumps – cooling	1.03	Includes all heat pumps (air, water, and ground source) except for packaged terminal heat pumps. Applies to heat pump baselines but not fuel switch baselines.
Air conditioning	1.00	ISP is at code.
Chillers	1% better than code	This finding will be combined with other research to determine the chiller code adjustment factor in the ISP Market Research Memo.

2. Determine a chiller code adjustment factor by combining the results of this study and the concurrent chiller ISP study. The chiller ISP study collects market actor estimates of equipment market share as a different approach to determining chiller ISP. The final combined chiller code adjustment factor will be reported in the chiller ISP study.
3. Focus energy code training on targeting code provisions that are not readily complied with and/or require proper installation to capture energy benefits. This study showed that

compliance opportunities remain for building envelope components such as slab design and lighting measures such as daylighting. Additionally, many building components require proper installation to achieve benefits (e.g. envelope insulation, air barriers, mechanical and lighting controls). Focused training on these measures can improve code official and market knowledge of proper design and installation to improve compliance and building performance.

4. Account for new baselines. Other program, evaluation, and analysis methods should account for the baseline revisions, including attribution research and equipment costs used in benefit cost analysis.

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

RI adopted the interior and exterior LPD ISP findings from this study. Due to code and market differences between the states, RI is not adopting any other results from this study and will conduct independent research in 2022 to investigate these issues.

**Savings Impact:**

The results of this study will result in a decrease in claimable savings for electric Large Commercial New Construction.

**MA20C03-B-EMSISP - Energy Management System ISP Study**

**Type of Study:** ISP

**Evaluation Conducted by:** DNV

**Date Evaluation Conducted:** March 2021

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

The primary objectives of this study were to:

- Identify Industry Standard Practices (ISPs) for Energy Management Systems (EMS) systems in existing buildings including: a) How end use customers use their systems; b) whether their systems are under-utilized or in need of repair; c) Whether their systems have failed
- Use this information from primary sources (both EMS vendor/RCx provider interviews and customer site visits) to recommend: a) Criteria for distinguishing a measure event type as either replace-on failure (ROF) or early replacement (ER) b) ISPs for EMS systems in ROF scenarios c) Areas for further EMS research
- Using this primary information to recommend evidentiary standards for defining EMS systems as having failed. If possible, such standards should account for differences in the compliance capabilities of C&I customers of different sizes.
- Determining whether current Mass Save eligibility guidelines for EMS incentives are reasonable based on current standard practices; and
- Allowing the evaluation team to test the feasibility of identifying the age, condition, and operating parameters of an EMS system through both virtual and in-person site visits.

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

Electric and Gas—Commercial and Industrial

**Evaluation Recommendations included in the Study:**

The following are the DNV team's conclusions and recommendations:

- This study supports assertions from the EMS-IWG memo that there are energy savings opportunities with existing EMS/BAS systems. Most importantly the 2020 EMS-IWG memo asserted that whole EMS system replacements, partial EMS system replacements, and component replacements should be eligible for program incentives with the baseline being the pre-existing operating condition of the EMS.
- However, challenges remain in being able to characterize the baseline operating conditions of the existing systems to support savings claims.
- Energy saving opportunities for EMS/BAS systems in new construction scenarios are limited.
- Increase customer and vendor education and support concerning ASHRAE guideline 36.
- Do more marketing of the EMS incentive program.

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

National Grid is adopting the results of this study.

**Savings Impact:**

The results of this study will likely result in a net increase in claimable savings.



**MA20C07-E-DUN - Franchise Controls Deemed Savings Study**

**Type of Study:** Impact

**Evaluation Conducted by:** DNV

**Date Evaluation Conducted:** March 2021

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

The purpose of this study was to develop measure-level deemed savings estimates for a building automation system (BAS) measure offered for small franchise coffee and donut shops, which are often installed with multiple other efficiency measures such as lighting retrofits and refrigeration controls. The measure applies time switch-based scheduling of small individual food service appliances (e.g., toasters and coffee makers), and often HVAC setback and exterior lighting controls. The study leveraged three different recent evaluation studies, where results from those studies were used as a basis to determine the optimal deemed savings estimate for the BAS measure. The recent studies include billing analysis in study P71, and impact evaluation work for PY2017 small business (MA19C03-E-SBIMPCT) and PY2017/2018 custom electric (MA19C07-E-CUSTELEC). To narrow focus on the BAS measure, DNV isolated five sites that only installed BAS systems that controlled appliances and overlapped in both the M&V and billing analysis samples.

The study provides the following key findings:

- The five sites common to the three studies have similar average impacts, at 9,651 kWh and 9,135 kWh and of the same magnitude when viewed as a percent of consumption.
- Given the DNV team's confidence in the representativeness of the small sample, the methods to develop the measurement and verification (M&V) baseline, and that the billing analysis does not present evidence the M&V savings are incorrect, the team deemed the M&V results reasonable.
- The similarity of savings as a percent consumption between the pre-post billing analysis and M&V savings results among the overlapping subset indicates the two analyses are in agreement regarding individual site-level effects. The full billing analysis, incorporating far more sites and a comparison group, produces a result that is grounded in both more participant data and a consideration of non-program, exogenous trends. Given the parallels between the two analyses, but the ultimate overall strength of the billing analysis result, DNV recommends using the overall billing analysis study results to inform the deemed savings estimate.

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

Electric—Large Commercial Retrofit

**Evaluation Recommendations included in the Study:**

The following recommendations were made by the evaluators conducting this study.

- Recommendation 1: Given the similarity of savings as a percent of consumption between pre-post billing analysis and M&V savings results among this subset and the

- larger billing analysis study, use the overall billing analysis study results to inform the deemed savings estimate.
- Recommendation 2: Ensure the appliances planned to be packaged into the BAS are appropriate for the control measure, rather than applying the controls to the eight greatest loads. Appliances such as ice machines, which do not benefit from controls, and appliances that were previously controlled in a similar fashion before the BAS installation should not be included in the BAS package.
  - Recommendation 3: The overall recommendation for the deemed savings estimate per BAS installed in a franchise site is 5,344 kWh, or 4.0% of site consumption.

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

National Grid RI adopted the results of this study.

**Savings Impact:**

The results of this study will result in a decrease in claimable savings for electric Large Commercial Retrofit.

**MA20C15-B-GSHP - Ground Source Heat Pump eTRM Measure Review**

**Type of Study:** Technology Evaluation

**Evaluation Conducted by:** DNV

**Date Evaluation Conducted:** March 2021

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

The purpose of this study was to determine the accuracy of the values in the Massachusetts Technical Reference Manual (eTRM) for estimating savings for ground source heat pumps (GSHP). The main objectives were to provide guidance to the PAs on possible adjustments to the eTRM savings calculations as they are presented for this measure; the need for estimating whole system savings, as opposed to savings from the heat pump unit only; and measure life estimates, including unit lifetimes vs. whole system lifetime.

The study provides the following key findings:

- The current GSHP offering is sufficient for the limited event type offering. However, it does not accurately reflect the benefits of GSHP installation for wider event types.
- GSHPs are high-performing, supplying 3.1 to 4.1 units of energy to the building as heat for every one unit of energy used to power the system.

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

All Large Commercial and Industrial

**Evaluation Recommendations included in the Study:**

The following recommendations were made by the evaluators conducting this study:

- Recommendation 1: To more accurately reflect savings from this measure, GSHPs should be broken out from air source heat pumps (ASHPs) into their own category offering. This will allow the program to attribute savings, baselines, and lifetimes in a more defensible way.
- Recommendation 2: Baseline considerations: The measure should allow baselines to reflect pre-existing and similar code efficiencies to maximize savings for two different event types (new equipment and early replacement/retrofit).
- Recommendation 3: Algorithmic considerations: Further algorithms should be considered to include fossil fuel impacts when replacing fossil fuel-fired heating systems. When a desuperheater is included in the system, domestic hot water impacts should be included for either electric or gas dependent on the hot water heating system on-site.
- Recommendation 4: Lifetime considerations: The lifetime of the measure should be updated from 12 years to match the U.S. Department of Energy's expected lifetime of 25 years for the indoor portion of the GSHP.

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

National Grid RI is adopting Recommendation 4 and is considering other recommendations.

**Savings Impact:**

Adoption of Recommendation 4 will result in an increase in claimable savings for Large Commercial and Industrial programs.

**MA20X08-B-CIHVACNTG - C&I HVAC NTG & Market Effects Measurement**

**Type of Study:** NTG

**Evaluation Conducted by:** DNV

**Date Evaluation Conducted:** June 2021

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

The goal of the study was to establish Net to Gross Ratios (NTGRs) for six technologies supported by the Upstream HVAC Initiative.

The recommended NTGRs are as follows:

Technology	NTGR
Volume Water Heater	44%
Instantaneous Water Heater	38%
VRF	30%
Package (AC, HP)	55%
Storage Water Heater	29%
Indirect Water Heater	36%

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

Electric and Gas—Large Commercial New Construction

**Evaluation Recommendations included in the Study:**

The evaluation recommends adopting the NTGRs as outlined in the table above.

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

National Grid is adopting the results of this study.

**Savings Impact:**

The impact of this study on claimable savings varies and is dependent on the measure type.

**RI-19-RE- HEM - Residential Home Energy Monitoring (Sense) Demonstration**

**Type of Study:** Process

**Evaluation Conducted by:** DNV GL

**Date Evaluation Conducted:** 11/19/2019

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

The purpose of this study was to conduct a process evaluation of National Grid's Sense pilot program that provided residential customers with a device for their homes. This device, the Sense Monitor, connected to the customer's circuit box, and was designed to help residential customers better control their energy consumption through knowledge of where their energy is being used on a real-time basis. Participants and nonparticipants were surveyed as part of this study which produced the following key findings:

- There was mixed evidence whether the Sense Monitor may be encouraging energy-saving behaviors in the use of non-lighting and non-HVAC energy-using equipment.
- There was very limited evidence that the Monitor is encouraging energy-saving behaviors in the use of HVAC equipment.
- Nonparticipants reported energy-saving lighting behaviors more frequently than the participants.
- 74% of participants were satisfied with the pilot program and 67% were satisfied with the Sense Monitor.
- While interest in using the Monitor has declined overtime, most participants still check the Monitor daily or weekly.
- Some participants found other benefits from the Monitor such as home security and power outage detection.
- 90% of nonparticipants said they would be interested in participating in a pilot with a free Monitor or similar device.

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

N/A

**Evaluation Recommendations included in the Study:**

If National Grid expands the Sense pilot to a full-scale program, more customer education will be needed. National Grid will also need to consider subsidizing some of the costs of the Monitors for customers.

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

No recommendations were adopted as part of this evaluation.

**Savings Impact:**

N/A

**RI-21-RE-AppRecycling - Appliance Recycling Impact Factor Update**

**Type of Study:** Impact and NTG  
**Evaluation Conducted by:** NMR, Cadeo  
**Date Evaluation Conducted:** August 3, 2021

**Evaluation Objective and High-Level Findings:** This study calculated gross and net savings estimates for refrigerators and freezers recently recycled through the National Grid Rhode Island Recycling Programs. The savings are based on program tracking data from and participant survey results from prior and in-progress studies of a similar program in Massachusetts. The study results yield the retrospective gross and adjust gross program savings reported in Table 1.

**Table 1: Current and Recommended TRM and PSD Values**

Savings Input	Freezer		Refrigerator	
	Current	Recommended	Current	Recommended
<b>Rhode Island</b>				
<b>Gross Savings (kWh)</b>	724	754	1,004	983
<b>Realization Rate</b>	0.68	0.83	0.88	0.90
<b>NTG Ratio</b>	0.56	0.50	0.44	0.46

**Programs to which the Results of the Study Apply:**  
Energy Star Products

**Evaluation Recommendations included in the Study:**  
The study recommends incorporating the values in Table 1 into the next revision of the Rhode Island Technical Reference Manual (TRM)

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

**Savings Impact:** Net savings increase for both measures.

**RI-19-XE-Rhode Island Strategic Electrification Study**

**Type of Study:** Market Assessment Study

**Evaluation Conducted by:** Cadmus

**Date Evaluation Conducted:** December 2020

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

The Rhode Island Strategic Electrification Study assesses the cold-climate heat pump market, optimum pathways for heat pump adoption, and opportunities to facilitate market growth. Combining a detailed market assessment with modeling analysis, the study finds that there are significant opportunities for heat pump implementation in the Rhode Island market.

In line with previous research, the study finds there to be generally low awareness of heat pump technology among both residential and commercial customers

As found in prior research, the high cost of heat pump installation also presents a major barrier to adoption, with the average customer noting they were “not very likely” to install a heat pump without incentives. Providing sufficient incentives is therefore needed to encourage customers to consider the technology.

Heat pump costs have been increasing over the last several years at an average of 0.6 – 1.7% per year. The study finds that this is partially attributable to increasing efficiency, new technologies, and the increased adoption of multi-zone ductless systems.

Scenario modeling found that, across building typologies, heat pumps are cost-effective for both customers and program administrators when displacing oil, propane and electric resistance heating, even when new cooling loads are added to a building.

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

Residential EnergyStar HVAC

C&I Lost Opportunity

**Evaluation Recommendations included in the Study:**

There were no formal recommendations provided for this study.

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

N/A

**Savings Impact:**

N/A



## **RI-20-XG-GasPeak – Residential Gas Peak Demand Savings**

**Type of Study: Impact – Gas Load Shape**

**Evaluation Conducted by: Guidehouse**

**Date Evaluation Conducted: June 2021**

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

The Evaluation Team derived natural gas end-use consumption estimates for National Grid customers in RI by applying adjustment factors to models originally developed using metered data in Massachusetts. This work produced average consumption estimates by time period (annual, monthly, coldest observed day) and day type (weekday vs. weekend/holiday) for boilers, furnaces, domestic hot water (DHW) and clothes dryers.

This research had several key findings:

- Heating end uses account for the vast majority of gas consumption during the Coldest Day; therefore, programs addressing peak demand should focus on furnaces and boilers first
- Heating also accounts for most annual consumption, though DHW has a larger share; therefore, programs for energy efficiency may benefit from including DHW as well
- Clothes dryers account for an insignificant amount of Coldest Day and annual consumption but may be worth including in demand response programs due to ease of shifting their load to a different time of day.

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

All Residential Gas Programs

### **Evaluation Recommendations included in the Study:**

**Recommendation 1:** If consumption estimates with greater precision, hourly load shapes, or multifamily results are desired, a metering study would be needed to collect detailed consumption data specific to RI.

**Recommendation 2:** If design day consumption estimates are desired, further analysis involving building simulation modeling could be used to produce those results. The value added by producing design day estimates depends on the intended use of the study. If the objective is to manage peak demand in a typical year, then the coldest observed day values are appropriate to use. However, if consumption estimates for extreme weather events are needed (e.g. for use in system planning), then design day values would be necessary.

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

These recommendations are under consideration and will be reviewed if and/or when another study is completed to determine their applicability.

**Savings Impact:** No direct savings impact.

## **RI-20-XG-GasPeak – C&I Gas Peak Demand Savings**

**Type of Study: Impact – Gas Load Shape**

**Evaluation Conducted by: DNV-GL**

**Date Evaluation Conducted: January 2021**

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

The study was designed to answer the following research questions:

- 1. What are the peak demand to annual usage ratios associated with the EE or DR measures previously identified for the Gas Potential for National Grid – Rhode Island?
- What are the 8,760-hourly and 365-day load shape savings ratios to apply to each end use component and DSM potential measure?

The load shape library developed for this study provides a solid basis for National Grid – Rhode Island to use in tracking peak gas demand and savings.

- The methods and formats of load shapes developed for the study can be easily applied to upgrade the end use load shapes as additional sources are identified, including any future load studies conducted by National Grid for Rhode Island or any of its regional service areas.
- Other uses for this load shape library include:
  - Conversion of DSM Potential and other annual end use estimates for baseline and energy savings to any peak definition
  - Provide a baseline on which to project, estimate and evaluate demand response programs targeted at specific appliances.
  - Use of 8,760 end use load shapes for production cost model inputs to calculate system or distribution model effects
- Industrial load shapes were not developed for process loads (production or manufacturing application) since these are very industry-specific and subject to operating hours for specific industrial facilities and such data was not readily available for National Grid – Rhode Island customers. The portion of industry customer loads for heating and non-process loads for water heating, cooking, laundry and dishwashing can be taken from the warehouse segment end uses, which are considered applicable, given no other specific data sources.

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

All C&I Gas Programs

### **Evaluation Recommendations included in the Study:**

Recommendation 1: National Grid should consider additional studies of existing interval load data, such as the 628 interval load data points used in this study, as well as take advantage of forthcoming interval data made possible from electric and gas Automated Metering Infrastructure (AMI) data, as those systems are expanded within the regional service areas of National Grid.

Recommendation 2: National Grid should consider investing in some additional end use load studies, including both electric and gas end uses (where the same technology but a different fuel is used). Given the importance and dominance of heating end uses in the service area and its key role in the peak, heating should be the primary target of end use load studies. Other end uses, especially water heating, dryers and cooking, could also be “borrowed” from electric studies of their end use counterparts, given the similar operating hours, and would be more cost-effectively metered

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

These recommendations are under consideration and will be reviewed if and/or when another study is completed to determine their applicability.

**Savings Impact:**

No direct savings impact.

**Net-to-Gross Research of RCD and Select Products Measures (MA20R28)**

**Type of Study: Impact – NTG Study**

**Evaluation Conducted by: Guidehouse**

**Date Evaluation Conducted: August 2021**

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

This study applied new from the net-to-gross (NTG) results of RCD and select Residential Retail measures in Massachusetts. This research included single-family and multifamily participant surveys, and participating contractor interviews. The team provides a summary of the NTG scores calculated through this research effort, along with the scores that the PAs are currently using. For RI, the study applied new NTG results for the residential gas and electric HVAC programs.

Fuel Type	Measure Group	Number of Useable Participant Survey Responses	Number of Useable Contractor or Survey Responses	Weighted FR (measure level)	Participant SO (program level)	Contractor or SO (measure level)	BCR Model NTG*	Current Study NTG
<b>From Current NTG Study</b>								
Electric	Direct Install**	1	-	25%	12%	-	100%	87%
	Electric HVAC	159	50	34%	12%	10%	78%	88%
	Non-Electric HVAC**	26	53	33%	12%	1%	80%	80%
	Thermos tats	53	-	13%	12%	-	83%	99%
	Water Heaters*	38	19	19%	12%	0%	81%	93%
	Weatherization	50	30	27%	12%	6%	123%	90%
Natural Gas	Direct Install**	14	-	3%	12%	-	100%	109%

Non-Electric HVAC	140	53	36%	12%	1%	86%	76%
Thermos tats	82	-	25%	12%	-	83%	87%
Water Heaters	58	19	34%	12%	0%	79%	77%
Weather ization	60	30	35%	12%	6%	126%	83%
<b>From Energy Optimization Study</b>							
Electric Heat Pumps, fuel switchin g	320	50	31%	12%	10%	87%	91%

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

Electric Energy Star HVAC and Gas Energy Star Heating System

**Evaluation Recommendations included in the Study:**

There were no formal recommendations provided for this study.

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

N/A - Though not a formal recommendation, the results included above were applied to the electric Energy Star HVAC and gas Energy Star Heating System.

**Savings Impact:**

For the electric Energy Star HVAC, savings increased due to applying the updated NTG results. For the gas Energy Star Heating System, savings were reduced due to applying the updated NTG results.

**RCD Virtual Assessment Study**

**Type of Study:** Market Characterization or Assessment Evaluation

**Evaluation Conducted by:** Guidehouse

**Date Evaluation Conducted:** 03/12/2021

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

In response to COVID-19 social distancing requirements, the Massachusetts Program Administrators transitioned the Residential Coordinated Delivery (RCD) initiative’s in-person home energy assessments (HEA) to virtual home energy assessments (VHEA). The study identified lessons learned from the transition to VHEAs so the PAs can apply them to future RCD cycles and maximize the value of this new delivery mechanism.

The key findings are:

1. Most VHEA participants were satisfied with their virtual experience.
2. VHEA-based scopes of work are less accurate, which has adverse implications for contractors.
3. In-service rates are much lower for self-installed measures.
4. VHEAs are a viable, yet imperfect, delivery method.

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

Residential EnergyWise Single Family Program

**Evaluation Recommendations included in the Study:**

The evaluation team recommends using the weighted In-Service Rates by measure:

Measure	In-Service Rate (ISR)			Overall ISR
	HEA	VHEA (HPC)	VHEA (LV)	Weighted (By Assessment Type and Assessor)
LED lightbulbs	100%	63%	83%	<b>87%</b>
Showerheads	100%	38%	53%	<b>66%</b>
Faucet aerators	100%	54%	59%	<b>74%</b>
Smart power strip	76%	65%	78%	<b>73%</b>
Thermostats	100%	53%	59%	<b>79%</b>

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

National Grid adopted the results of this study with some adjustments to account for programmatic differences between the RI EnergyWise and MA HES programs. National Grid calculated the weighted ISRs based on the VHEA (LV) in-service rates from this study and the RI-specific in-service rates for EnergyWise direct install measures (see below).

Measure	In-Service Rate (ISR)			Overall ISR
	EWSF	VHEA (HPC) <sup>1</sup>	VHEA (LV)	Weighted (By Assessment Type and Assessor) <sup>2</sup>
LED lightbulbs	100%	NA	83%	<b>95%</b>
Showerheads	98%	NA	53%	<b>85%</b>
Faucet aerators	98%	NA	59%	<b>86%</b>
Smart power strip	84%	NA	78%	Not a direct install measure. Kept ISR at 84% based on recent RI EWSF study
Thermostats	100%	NA	59%	<b>88%</b>

<sup>1</sup> NA means Not Applicable. The EnergyWise Single Family program is delivered through a lead vendor and does not use Home Performance Contractors (HPCs)

<sup>2</sup> The weighted in-service rates are based on National Grid forecast of 30% virtual audits and 70% in-person audits in 2022.

**Savings Impact:**

The application of this study reduced claimable savings.

**MA19R17-B-TRM Comprehensive TRM Review**

**Type of Study:** Impact

**Evaluation Conducted by:** Guidehouse

**Date Evaluation Conducted:** 04/12/2021

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

This study reviewed the quality of assumptions and values in the Massachusetts Technical Reference Manual (TRM) to ensure that relevant data from the RES 1 Baseline Study and other recent studies are incorporated into the TRM. The study prioritized TRM parameters that were based on older data sources, data sources outside MA or New England, or those that contribute significantly in EE programs. Table 1 summarizes the measures and recommended TRM updates based on this study.

**Table 1: Summary of Recommended TRM Parameter Value Updates**

Measure Name	Parameter Name	Unit	Existing Value	Proposed Value
	Effective Useful Life (EUL)	Years	20	23
Boiler, Gas Forced Hot Water (RES-HVAC-BGFHW)	Baseline Efficiency, ER	AFUE	80.0% nameplate 77.4% actual	85.5% nameplate 77.4% actual
	Baseline Efficiency, ROF	AFUE	82.0% nameplate 79.3% actual	86.5% nameplate 83.7% actual
Boiler, Oil/Propane Forced Hot Water (RES-HVAC-BFHW)	Baseline Efficiency, Oil, ROF	AFUE	83.0%	Through 2020: 83.0% 2021 and on: 86.0%
	Baseline Efficiency, Propane, ROF	AFUE	82.0% nameplate 79.3% actual	86.5% nameplate 83.6% actual
Central Air Conditioning (RES-HVAC-CAC)	Baseline Efficiency, ER	SEER	10.0	13.5 nameplate 12.0 actual
	Baseline Efficiency, ROF	SEER	13.0	14.0
Central Ducted HP Fully Displacing Existing Furnace (RES-HVAC-FSHP)	Baseline Efficiency, Oil, ER	AFUE	78%	79%
Central Ducted HP Partially Displacing Existing Furnace (RES-HVAC-FSHP-P)	Baseline Efficiency, Oil, ER	AFUE	78%	79%
Clothes Dryer (RES-A-CD)	EUL, Electric	Years	12	16
	EUL, Gas	Years	12	17
	Baseline % Split of Indirect vs Storage Water Heater (WH)	%	80% Indirect, 20% Storage	24% Indirect, 76% Storage



Measure Name	Parameter Name	Unit	Existing Value	Proposed Value
Combo Condensing Boiler/Water Heater (RES-HVAC-CCBWH)	Baseline Efficiency, Boiler, ER	AFUE	80.0% nameplate 77.4% actual	85.5% nameplate 77.4% actual
	Baseline Efficiency, Boiler, ROF	AFUE	82.0% nameplate 79.3% actual	86.5% nameplate 83.7% actual
	Baseline Efficiency, WH, ER Blended Medium-, High-Draw	UEF	0.55	0.58
Dehumidifier (RES-PL-DH)	Capacity	Pints/Day	35	Remove
	Efficiency	Liters/kWh	Retirement: 1.0 Baseline: 1.5 Measure: 2.0	Retirement: 1.6 Baseline: 2.8 Measure: 3.3
	Hours of Operation	Hours/Year	Undocumented	Remove
	Dehumidification Load	Liters/Year	n/a	1,520
	Energy Savings	kWh/Year	New: 167.6 Retirement: 152.7	New: 82.3 Retirement: 407.1
	Demand Savings	kW	New: 0.04 Retirement: 0.04	New: 0.02 Retirement: 0.10
	EUL	Years	12	17
ECM Circulator Pump (RES-HVAC-ECMCP)	CF <sub>WP</sub>	-	0.16	0.53
Furnace, Gas (RES-HVAC-FG)	EUL	Years	18	17
	Baseline Efficiency, ER	AFUE	78.0% nameplate 78.9% actual	85.0% nameplate 81.0% actual
	Baseline Efficiency, ROF	AFUE	85.0%	89.0% nameplate 90.1% actual
Furnace, Oil/Propane (RES-HVAC-FOP)	Baseline Efficiency, Propane, ROF	AFUE	85.0%	89.0% nameplate 90.1% actual
Heat Recovery Ventilator (RES-HVAC-HRV)	HRV Gas Savings	MMBtu	7.7	8.6
	HRV Electricity Savings	kWh	-133	-171
	HRV Demand Savings	kW	-0.10	-0.02
	ERV Gas Savings	MMBtu	-	8.8
	ERV Electricity Savings	kWh	-	-127
	ERV Demand Savings	kW	-	-0.014
Insulation (RES-BS-I)	Heating Degree-Days, Cooling Degree-Hours	HDD, CDH	Varies by City, see <b>Error! Reference source not found.</b>	

Measure Name	Parameter Name	Unit	Existing Value	Proposed Value	
Low-Flow Showerhead (RES-WH-S)	EUL	Years	7	15	
	EUL	Years	7	15	
Low-Flow Showerhead with Thermostatic Valve (RES-WH-STV)	Electric (Single Family)	kWh	372	247	
	Electric (Single Family)	kW	0.08	0.06	
	Gas (Single Family)	MMBtu	1.84	1.22	
	Oil (Single Family)	MMBtu	2.09	1.32	
	Other (Single Family)	MMBtu	1.84	1.22	
	Electric (Multi-family)	kWh	335	183	
	Electric (Multi-family)	kW	0.09	0.04	
	Gas (Multi-family)	MMBtu	1.66	1.41	
	Oil (Multi-family)	MMBtu	1.88	1.44	
	Other (Multi-family)	MMBtu	1.66	1.41	
Pool Pump (RES-MAD-PP)	Operating Days per Year	Days/Year	91	122	
	Pool Size	Gallons	20,000 to 23,000	22,000	
	Flow Rates	gpm	Baseline: 64 2S: 66 high, 33 low VS: 50 high	Baseline: 97 2S: 97 high, 48 low VS: 77 high, 31 low	
	Daily Operating Hours	Hours/day	Baseline: 8.5 2S: 2 high, 12.5 low VS: 2 high, 18 low	Baseline: 5.7 2S: 2 high, 9.5 low VS: 2 high, 15.7 low	
	Energy Factor	EF	Baseline: 2.1 2S: 2.0 high, 5.2 low VS: 4.0 high, 8.8 low	Baseline: 2.0 2S: 1.9 high, 5.3 low VS: 2.9 high, 10.5 low	
	Energy Savings	kWh/year	2S: 842, VS: 1,062	2S: 639, VS: 1,284	
	Demand Savings	kW	2S: 0.87, VS: 1.12	2S: 0.67, VS: 1.35	
	EUL	Years	10	6	
	Programmable Thermostat (RES-HVAC-PT)	EUL	Years	15	19
		EUL	Years	15	19
Quality Installation with Duct Modification (RES-HVAC-QIDM)	Energy Savings	kWh/year	513	230	
	Demand Savings	kW	0.85	0.18	
Room Air Cleaner (RES-PL-RAC)	Energy Savings	kWh	391	Varies; see <b>Error!</b> <b>Reference source not found.</b>	

Measure Name	Parameter Name	Unit	Existing Value	Proposed Value
Room Air Conditioner (RES-PL-ROOMAC)	EUL	Years	8	12
Stand Alone Water Heater (RES-WH-SASWH)	Baseline Efficiency, ER	UEF	Medium Draw: 0.52 High Draw: 0.58 Blended: 0.55	Medium Draw: 0.56 High Draw: 0.60 Blended: 0.58
	EUL	Years	13	10
Thermostatic Valve (RES-WH-TV)	EUL	Years	7	15
Variable Frequency Drive (RES-MAD-VFD)	Energy Savings	kWh/HP	Varies by type; see <b>Error! Reference source not found.</b>	
	Demand Savings, Summer	kW/HP <sub>SP</sub>	Varies by type; see <b>Error! Reference source not found.</b>	
	Demand Savings, Winter	kW/HP <sub>WP</sub>	Varies by type; see <b>Error! Reference source not found.</b>	

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

- Residential EnergyStar Products
- Residential EnergyStar HVAC
- Residential EnergyWise Electric and Gas – Multifamily programs
- Residential Income-Eligible Electric and Gas –Multifamily programs
- Residential New Construction Electric
- C&I Multifamily Gas

**Evaluation Recommendations included in the study:**

The evaluation team recommends the PAs adopt updated TRM values

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

National Grid adopted the results of this study.

**Savings Impact:**

The savings impact depends on the measure. See Table 1 for more details.

**Low Income Multifamily Health NEI (TXC 50)**

**Type of Study:** Impact

**Evaluation Conducted by:** NMR Group

**Date Evaluation Conducted:** 8/12/2021

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

The objective of this study was to quantify and monetize the health- and safety-related NEIs attributable to improvements in the energy efficiency of multifamily buildings served through the Mass Save® income-eligible coordinated delivery initiative. Monetization entails valuing the impacts of weatherization services on program recipients by calculating money saved, or the dollar value of costs avoided, due to changes in health issues and household budgets resulting from weatherization. For ease of reading, this report refers to the population that is the focus of study as *low-income* households living in *multifamily* buildings.

Four of the NEIs this study explored – Arthritis, Thermal Stress (Cold), Home Productivity, and Reduced Fire Risk – met the adoption criteria that were set in advance:

- The NEI accrues at the household level, which is the level at which the PAs are currently able to claim NEIs.
- The NEI is not derived from energy bill savings and so do not risk double-counting.
- For NEIs that rely on primary data, both the results of the difference in means analysis (unadjusted estimate) and the coefficient of the weatherization variable in the regression model (regression-adjusted estimate) are statistically significant at p-value <.10 for the outcome of interest. For the one NEI that relies on secondary data only (Reduced Fire Risk), there is sufficient incidence rate and risk factor data from secondary sources to monetize the NEI from these sources.

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

The findings of this study are applicable to all Air sealing, Insulation, and Heating measures provided in the Low Income multifamily program. It is important to note that these multifamily values are unique to this type of housing and are not applicable to single family values.

**Evaluation Recommendations included in the Study:**

The Arthritis, Thermal Stress (Cold), Home Productivity, and Reduced Fire Risk NEIs meet all criteria described above. The study team recommends that the PAs adopt the monetized value of these four LIMF health-and-safety-related NEIs. The annual values for each NEI are Arthritis, \$49; Thermal Stress (Cold), \$1,426; Home Productivity, \$49; and Reduced Fire Risk, \$13. The total annual value of the recommended household NEI values per unit, excluding societal benefits, is \$1,537.

**Estimated Annual Values for Recommended NEIs Per Housing Unit, with VSL**

<b>NEI Values</b>	<b>Per Year</b>
Arthritis	\$49
Thermal Stress (Cold)	\$1,426
Home Productivity	\$49
Reduced Fire Risk	\$13
<b>Annual Total of Recommended NEIs per Weatherized Housing Unit</b>	<b>\$1,537</b>

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

National Grid is adopting these values for both Massachusetts and Rhode Island

**Savings Impact:**

Annual per unit \$ values increased to the above recorded values.

**Residential New Construction Quick Hit NEI Study (MA20X14-RNCNEI)**

**Type of Study:** Impact Study  
**Evaluation Conducted by:** NMR Group  
**Date Evaluation Conducted:** 3/5/2021

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

The primary goal of this quick hit study was to use secondary data to identify and propose possible updates to the NEI values associated with the MA PAs’ Residential New Homes and Renovations initiative where possible. A secondary goal of the study was to identify potential additional NEIs that are not currently claimed.

Overall, the evaluator reviewed 41 studies to inform current NEI updates, monetizing new NEIs with secondary data and identifying potential NEIs for future research. The literature review did not yield any new energy-efficiency program evaluations which included primary research for RNC-related NEIs, nor did it yield any evaluations that attempted to monetize RNC NEIs using primary or secondary data.

The evaluation team therefore recommended adjusting the NEIs that the RNC program currently claims for inflation as a short-term solution to the lack of new research monetizing these NEIs in new residential buildings. The adjustment led to an increase in thermal comfort and noise reduction NEIs from a total value of \$117 to \$139 per home per year.

**Recommended Update to RNC NEI Values (Based on Inflation Adjustment)**

RNC NEI Values	Date	Value
2011 RNC NEI Study Value <sup>1</sup>	August 2011	\$117
2021 Inflation Adjustment	May 2021	\$139

The team monetized additional NEIs to account for gas stove impacts on asthma, totaling \$3.28 per home per year. An additional NEI was monetized for the impact of reduced formaldehyde due to mechanical ventilation with heat or energy recovery (ERV or HRV), which leads to fewer asthma-related emergency room visits, totaling \$0.02 per home per year.

**Short Term Recommended Asthma Related RNC NEIs**

Measure	Non-Energy Impact	Value Suggested
Electric Stoves (NO <sub>2</sub> )	Childhood asthma prevention, occupant lifetime	\$0.65 per household per year
	Adult asthma symptom reduction	\$2.21per household per year
	Childhood asthma symptom reduction	\$0.42 per household per year
ERV/HRV <sup>1</sup> (formaldehyde)	Reduced asthma ED visits	\$0.02 per household per year
<sup>1</sup> Energy Recovery Ventilator/Heat Recovery Ventilator.		

NMR found that updated program requirements or pathways, such as an all-electric pathway, are potential avenues to increase monetized NEIs for asthma-related impacts and should be explored further.

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

Residential New Construction Single Family and Renovations and Additions offerings.

**Evaluation Recommendations included in the Study:**

In the short term, the study recommends adopting a total NEI of **\$142.33** per home per year. This is based on an inflation adjustment approach that updated the RNC NEI values currently claimed by the MA PAs from \$117 to \$139. In addition, the study also recommended that PAs adopt an asthma related RNC NEI of \$3.30 per household per year in the short term.

Based on literature review findings, the evaluation team also identified the following areas PAs should explore for a future RNC NEI study involving primary research.

<b>NEI Category</b>	<b>Summary of Research Recommendation</b>
Thermal Comfort	Update the 2011 Thermal Comfort NEI with new field research and occupant surveys rather than simply adjusting for inflation.
Summer Overheating and Winter Underheating	Account for the potential that PH construction in particular can lead to uncomfortable indoor temperatures in summer and winter.
Noise	Update the 2011 Noise NEI with new field research and occupant surveys rather than simply adjusting for inflation.
Respiratory Health and Sick Building Syndrome (SBS)	Measure additional respiratory impacts from air pollutants not covered in the asthma algorithms, as well as SBS symptoms.
Operations and Maintenance	Document the amount of maintenance and operational costs required for high-performance compared to baseline homes.
Productivity	Survey occupants and incorporate secondary literature on the impacts of improved air quality on productivity for residents who work from home.
Avoided Deaths due to Air Pollution	Measure indoor and outdoor particulate matter and infiltration rates to quantify reductions in exposure and excess mortality.

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

Yes

**Savings Impact:**

Annual Per Unit \$ value increased from \$117 to \$142.33.

**Low-rise Residential New Construction Net-to-Gross Study**

**Type of Study:** Net-to-Gross

**Evaluation Conducted by:** NMR Group

**Date Evaluation Conducted:** 7/24/2020

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

The first goal of the study was to estimate retrospective NTG ratios for single-family and low-rise multifamily homes permitted in 2017-2019. The second objective of the study was to determine annual prospective NTG ratios for single-family and low-rise multifamily homes permitted in 2022-2024. The evaluation provided estimated retrospective and prospective net savings for single-family and low-rise multifamily homes split by program participation and building code.

The study reported that Single-family NTG has decreased due to high program penetration, reducing the population for spillover. Multifamily NTG is higher than single-family NTG because there is much lower program penetration in the multifamily market in Massachusetts.

<b>Year</b>	<b>Single-family</b>	<b>Multifamily</b>	<b>Overall</b>
2022	0.30	1.02	0.49
2023	0.29	0.84	0.43
2024	0.27	0.71	0.38

Findings show that PAs' RNC efforts had the greatest impact on duct leakage, air leakage, foundation walls, and electric water heaters. However, the overall impact of the RNC efforts, as estimated by the Delphi panel, decreased across most measures since the previous study, most notably for lighting, duct leakage, and air leakage.

Duct and air leakage are still identified as the top two measures most impacted by the RNC efforts. Delphi panelists also indicated that the RNC efforts had substantial impact on insulation Grade (i.e., installation quality).

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

Residential New Construction Single Family and Low-Rise offerings.

**Evaluation Recommendations included in the Study:**

The study recommends adopting the prospective net-to-gross ratio for 2022. The study also recommended that PAs should explore new ways to generate savings in the RNC market. Moving forward PAs should claim net savings from the code promulgation efforts separately from other RNC efforts examined in this study.



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

Using learnings from the MA Study, National Grid and C-Team negotiated a 75% NTG ratio which will be applied prospectively in 2022 to RI RNC Single Family and Low-Rise initiatives.

**Savings Impact:**

Net-to-Gross decreased from 100% to 75%.

**Renovations and Additions Net-to-Gross Study**

**Type of Study:** Net-to-Gross

**Evaluation Conducted by:** NMR Group

**Date Evaluation Conducted:** 9/28/2020

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

The purpose of this study was to establish retrospective Net-to-Gross ratios for 2019 and prospective NTG ratios to inform planning for the 2022-2024 program cycle for the Renovations and Additions Residential New Construction offering. The study sought to account for programmatic changes in the baseline when determining the prospective NTG ratio. The study also attempted to analyze results of survey questions to better understand topics such as program experience, NEIs, program satisfaction, COVID-19 impacts, and barriers to participation.

The study produced the following retrospective and prospective NTG ratios:

**Prospective 2022 to 2024 NTG Results**

	<b>FR</b>	<b>PSO</b>	<b>NPSO</b>	<b>Prospective NTGR</b>
Retrospective 2019	34%	2%	17%	85%
Prospective 2022 to 2024	22%	2%	12%	92%

The evaluation reported that participant satisfaction and likelihood of recommending program are high. Homeowners also reported increased comfort of their home and reduced noise from the water heater, heating and cooling equipment, and outside the home.

The study found that there are still significant barriers to participation, however. Lack of awareness of the initiatives and the extra hassle of participating were the main barriers preventing more contractors from participating in the Renovations and Additions offerings.

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

Residential New Construction Renovations and Additions offerings/initiatives.

**Evaluation Recommendations included in the Study:**

PAs should use the recommended prospective Net-to-Gross ratios for 2022, and for 2023 and 2024 if the MA PAs do not measure NTG again before then. In addition, the study recommended that moving forward implementation contracts should track project contact information for both the homeowner and primary contractor.

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

The prospective Net-to-gross ratio (92%) from MA study will be applied to RI Renovations and Additions initiatives for 2022.

**Savings Impact:**

Net-to-Gross decreased from 100% to 92%.

**Residential Downstream/Upstream Products Net-to-Gross Study**

**Type of Study:** Net-to-Gross Evaluation, Impact Evaluation

**Evaluation Conducted by:** NMR Group, DNV

**Date Evaluation Conducted:** 6/8/2021

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

The study goals were to establish retrospective net-to-gross ratios (NTGRs) and in-service rates (ISRs) for 2019 and develop prospective NTGRs and ISRs for 2022 to 2024 for eight products that are supported through the Residential Retail and Residential Coordinated Delivery initiatives.

The studied methods included the following:

- a literature review to examine recent ISR and NTGR findings from other jurisdictions for all eight products
- a participant survey of households that had purchased or received advanced power strips (APSS) or dehumidifiers through the residential initiatives
- consensus process to review the results, estimate retrospective 2019 ISRs and NTGRs, and recommend prospective ISRs and NTGRs for 2022 to 2024

Because the consensus process yielded the same ISRs for 2019 as for 2022 to 2024, the study also suggests applying the ISRs to 2020 and 2021. The table below presents the consensus derived ISRs and NTGRs.

**Table 1: Consensus Derived ISRs and NTGRs**

Product	BCR IDs	Delivery Methods	Consensus Derived Values			
			ISR	NTGR		
			2019, 2022 to 2024	2022	2023	2024
APSS	E19A2c073 E19A2c0744	Online Upstream	83%	91%	90%	88%
APSS	E19A2a008	Leave Behind	Addressed in MA20R26-B-VHEA	95%	95%	93%
APSS	E19A2a008 <sup>3</sup>	Mailed Kits	Addressed in MA20R26-B-VHEA	93%	92%	91%
Clothes Dryers	E19A2c077	Rebate Form	99%	53%	52%	52%
Dehumidifiers	E19A2c075	Online Rebate Form In-store Rebate	99%	49%	47%	45%
Pool Pumps <sup>4</sup>	E19A2a001 E19A2a002	Midstream	100%	89%	87%	84%
Room Air Cleaners	E19A2c072	In-store Rebate	97%	63%	61%	60%

Room Air Cleaners	E19A2c072 <sup>3</sup>	Online Rebate Form	97%	70%	68%	66%
Room Air Conditioners	E19A2c086	Online Rebate Form In-store Rebate	100%	56%	54%	52%
TSVs and Low-flow Showerheads with TSVs	E19A2c082 though E19A2c085	Online Upstream	78%	97%	96%	96%

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

Energy Star Products

**Evaluation Recommendations included in the Study:**

The following recommendations were made by the evaluators conducting this study.

- The Program Administrators (PAs) should use the ISRs and NTGRs in Table 1 to inform planning for the 2022 to 2024 program cycle.
- The PAs should apply the ISRs in Table 1 starting in 2020 and use them until future research or information suggests updates to the estimates.
- The PAs should apply the NTGRs in Table 1 starting in 2022 and use them until future research or information suggests updates to the estimates.

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

National Grid plans to adopt the recommendations.

**Savings Impact:**

The savings impact depends on the measure. See Table 1 for more details.

**Impact Analysis of Residential Wi-Fi Thermostats (Draft)**

**Type of Study:** Impact

**Evaluation Conducted by:** Guidehouse

**Date Evaluation Conducted:** 06/30/ 2021

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

The primary goal of this study is to estimate electric and gas savings from Wi-Fi and programmable thermostats delivered through direct install programs and retail channels. Table 1 summarizes the measures and recommended savings values based on the draft results of this study.

**Table 1. Recommended savings values**

<b>Delivery Channel</b>	<b>Rebated Thermostat</b>	<b>Replaced Thermostat</b>	<b>Savings</b>	<b>Savings Unit</b>
Retail	Wifi	All	27.9	Therms per device
Direct Install	Wifi	Manual	45.1	Therms per device
Direct Install	Wifi	Programmable	24.4	Therms per device
Direct Install	Wifi	Wifi	0	Therms per device
All	Programmable	All	20.7	Therms per device

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

- Residential EnergyStar HVAC
- Residential EnergyWise – Single Family and Multifamily programs
- Residential Income-Eligible – Single Family and Multifamily programs
- C&I Multifamily

**Evaluation Recommendations included in the Study:**

See Table 1.

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

National Grid adopted the recommended savings values in the 2022 Plan.

**Savings Impact:**

The application of this study reduced claimable savings.

**RI-21-XX-Jobs - Workforce Associated with Rhode Island Energy Efficiency Programs Analysis Study**

**Type of Study:** Economic Impact

**Evaluation Conducted by:** Guidehouse

**Date Evaluation Conducted:** 2021

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

National Grid engaged Guidehouse to estimate the workforce associated with implementation of National Grid Rhode Island's electric and gas energy efficiency programs delivered in 2020. This study addresses the requirements of General Law 39-2-1.2, enacted by the Rhode Island General Assembly in 2012. In 2020, National Grid spent a combined \$112,665,924 on the Rhode Island programs that saved 157,346 annual megawatt hours (MWh) of electricity and 318,845 million British thermal units (MMBtu) of natural gas.

The focus of the Energy Efficiency Workforce Analysis Report is to quantify the workforce that was involved in delivering National Grid's Rhode Island programs in 2020. The workforce analysis reports the number of jobs associated with the programs and compares them to past years. The study also provides narrative context for those findings and observations. 827.5 full-time equivalent (FTE) workers associated with National Grid spending in 2020 for Rhode Island gas and electric energy efficiency programs.

**Summary of FTEs (2015-2020)**

	2015	2016	2017	2018	2019	2020
<b>Electric Programs</b>						
Commercial and Industrial	210.0	241.1	263.5	250.0	265.0	203.7
Residential Income Eligible	37.0	42.3	46.0	45.8	65.1	59.1
Residential Non-Income Eligible	125.4	104.0	98.1	168.9 <sup>6</sup>	284.8 <sup>7</sup>	263.7
<b>Gas Programs</b>						
Commercial and Industrial	32.0	36.1	34.4	31.9	28.7	19.8
Residential Income Eligible	43.8	41.4	36.5	39.4	56.2	38.5
Residential Non-Income Eligible	172.1	159.3	174.9	191.6	212.6	189.2
<b>Other</b>						
CAP Agencies <sup>8</sup>	34.0	38.0	35.0	35.0		
National Grid <sup>9</sup>	41.6	39.9	38.2	39.5	43.3	44.4
Marketing <sup>10</sup>					9.0 <sup>11</sup>	9.0
COVID-19 Training						0.3
<b>Total</b>	<b>695.8</b>	<b>702.2</b>	<b>726.5</b>	<b>802.1</b>	<b>964.6</b>	<b>827.5</b>

*Source: Guidehouse analysis and 2018 study*

<sup>6</sup> The total for Residential Non-Income Eligible Electric FTEs in 2018 was incorrectly totaled from the component programs and was shown in previous reports at 170.9, when it should have been 168.9. With this correction, the total number of FTEs in 2018 is 802.1. This change has been reflected in Table 2.

<sup>7</sup> Guidehouse updated the 2019 EnergyWise and EnergyWise Multifamily FTEs based on interviews with RISE on February 24, 2021, March 2, 2021 and written communication with RISE on April 1, 2021. RISE indicated there were 224 FTEs from trade allies associated with the EnergyWise program in 2019. Guidehouse believes these FTEs were not accurately captured in 2019 and in the years prior. This has caused the significant increase in FTEs from 2018 to 2019. RISE indicated there were 20 FTEs from RISE and 15 FTEs from subcontractors associated with the gas and electric EnergyWise Multifamily program in 2019. Guidehouse adjusted the 2019 gas and electric FTEs associated with the EnergyWise Multifamily program to align with the information received from RISE in the 2021 interview. Although this re-estimation of FTEs might also be associated with analyses prior to 2019, since Guidehouse did not prepare these analyses, it did not change any FTEs associated with the EnergyWise program prior to 2019.

<sup>8</sup> Note that for the 2019 and 2020 analysis, CAP Agency staff were included within the Residential Income Eligible program under both Electric and Gas.

<sup>9</sup> In years prior to 2019 a 2,016-hour work year was assumed when calculating FTEs. National Grid changed this assumption in recent years to a 1,768-hour work year. This new assumption was implemented beginning in 2019 and resulted in a slight increase in FTEs.

<sup>10</sup> Beginning in 2019, marketing was contracted to a new vendor, resulting in an increase in jobs, these are therefore shown separately.

<sup>11</sup> In the interview with the marketing agency, Mower, on March 12, 2021, Guidehouse discovered there had been a miscommunication in the number of FTEs during the interview with Mower in 2020. Mower had provided the number of FTEs for National Grid programs across all the states the programs run in, not just Rhode Island. There was no change in the number of FTEs associated with the Rhode Island National Grid Rhode Island energy efficiency programs in 2020 when compared to 2019, so Guidehouse adjusted the 2019 value to 9 FTEs.



**Key Findings:**

- 827.5 full-time equivalent (FTE) workers associated with National Grid spending in 2020 for Rhode Island gas and electric energy efficiency programs
- The number of FTEs decreased from 964.6 in 2019, because of decreased program spending
- The size of the workforce and how it did its work in 2020 were highly influenced by the COVID pandemic.
- FTEs reported are for the end of 2020 and capture only enduring changes in FTEs, not temporary layoffs or furloughs.
- As the pandemic persists, vendors and the workforce continue to adapt to the limitations on customer interactions while still responding to a sustained demand for energy efficiency.
- In a counterfactual analysis, if not for the pandemic, the number of FTEs would have increased about 2% relative to 2019, to 986.2 FTE.
- The interviews indicated that there were no reported cases of COVID transmission due to interactions between program implementers and customers.
- 71% of these entities are either headquartered or have a physical presence in Rhode Island.

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

This is an overall indicator of economic impact and is not applied to a specific program.

**Evaluation Recommendations included in the study:**

N/A

## 5. Historical Evaluation Studies

Sector	Program	Study type	2014	2015	2016	2017	2018	2019	2020	2021	2022 Plan
Residential	EnergyWise SF	Impact									
	EnergyWise SF	Process					HEAT Loan				
	Income Eligible SF	Impact									
	Income Eligible SF	Process									
	EnergyWise MF	Impact									
	EnergyWise MF	Process									
	Income Eligible MF	Impact									
	Income Eligible MF	Process									
	Home Energy Reports	Impact									
	Home Energy Reports	Process									
	EnergyStar Lighting	Impact/Market									
	EnergyStar Products	Impact									
	HVAC	Impact									Demo
	HVAC	Process/Market									
Cross-cutting/ Special	Connected Solutions	Impact/Process									
	Potential study	Market									
	Workforce	Impact/Market									
	Avoided Cost	Benefits									
	REMI	Benefits									
	Participation	Market									
	Non-Participant	Market									
	RASS	Market									
	Gas Peak Demand	Impact									
	Piggybacking Study	Process									
	Heat Pumps Study	Market									
	ES Homes/Codes&Standards	Impact/Market									
	Legislated M&V Study	Market									
	C&I Electric	Custom	Impact								
HVAC		Impact									
Industrial Process		Impact									
CAIR		Impact									
Refrigeration, Motors, Other		Impact									
Custom Lighting		Impact									
Street Lighting		Impact									
CDA		Impact									
CHP		Impact									
Prescriptive Lighting		Impact									
Upstream Lighting		Impact									
Upstream Lighting		Process									
Prescriptive HVAC		Impact				chillers					
Prescriptive VSD		Impact									
Prescriptive CAIR	Impact										
C&I Gas	Connected Solutions	Impact									
	All	NTG									
Small Business	Custom	Impact									
	Prescriptive	Impact		steam trap		steam trap	steam trap				
	All	NTG									
	All	NTG									
Small Business	Lighting	Impact		presc.							
	Non-Lighting Electric	Impact									
	All	Process									
	All	NTG									

These studies are available through the EERMC<sup>12</sup>, the PUC<sup>13</sup>, and National Grid.

<sup>12</sup> <https://rieermc.ri.gov/plans-reports/evaluation-studies/>

<sup>13</sup> <http://www.ripuc.org/>

**Table 3: Completed Evaluation Studies Applicable in 2022**

2021	
Study	Impact Descriptions
DNV, Impact Evaluation of PY2019 Upstream Lighting Program, July, 2021	This study updated prospective realization rates and impact factors for the C&I Upstream lighting program. The values reflect decreasing ISR values for Screw-in products and increasing ISRs for linear products. These will be applicable for 2022, 2023, and beyond.
DNV, Impact Evaluation of PY2019 Custom Gas Installations, September 2021	The study updated realization rates for custom gas projects, as part of a rolling effort that incorporated results from PY2017, PY2018, and PY2019.
DNV, Impact Evaluation of PY2018 Custom Electric Installations, September 2021	The study updated realization rates for custom electric projects, as part of a rolling effort that incorporated results from PY2016, MA PY2017/18, and PY2018.
DNV, Impact Evaluation of PY2019 Custom Electric Installations, September 2021	The study updated realization rates for custom electric projects, as part of a rolling effort that incorporated results from PY2016, PY2018, and PY2019.
Cadeo, Appliance Recycling Impact Factor Update, June 2021	This study updated the gross kWh savings, realization rates and NTG factors for refrigerator and freezer recycling measures.
DNV, Franchise Controls Deemed Savings Study, March 2021 (Leveraged study from MA)	This study recommended a deemed savings value of 5,344 kWh for a building automation system (BAS) measure that controls small individual food service appliances.
DNV, Lifetime Gross AML Adjustment Analyses, July, 2021 (Leveraged study from MA)	This study updated Adjusted Measure Lives (AML) for lighting applications, excluding New Construction and stand-alone controls. Overall the programs are seeing decreased AMLs as market adoption accelerates.
DNV, Upstream Lighting NTG, June, 2021 (Leveraged study from MA)	This study updated NTG values for upstream lighting technologies, and adjusted the values down significantly due to heavy free-ridership.
DNV, Ground Source Heat Pump eTRM Measure Review, March 2021 (Leveraged study from MA)	This study recommended that GSHPs be broken out from ASHPs into their own category offering in order to allow the program to attribute savings, baselines, and lifetimes in a more defensible way. It also recommended the GSHP lifetime be updated to 25 years.

<p>DNV, NRNC Market Characterization Study, June 2021 (Leveraged study from MA)</p>	<p>This study produced factors to be applied to IECC 2015-based code LPD to determine baseline LPD requirements.</p>
<p>DNV, Energy Management System ISP Study, 2021 (Leveraged study from MA)</p>	<p>This study identified industry standard practices for energy management systems, with a particular focus on criteria for determining when an existing system should be considered failed.</p>
<p>DNV, C&amp;I HVAC NTG &amp; Market Effects Measurement, 2021 (Leveraged study from MA)</p>	<p>This study established Net to Gross Ratios for six technologies supported by the Upstream HVAC Initiative.</p>
<p>Guidehouse, RCD Virtual Assessment Study, March 2021 (Leveraged study from MA)</p>	<p>This study found that in-service rates are lower for self-installed measures. Rhode Island leveraged results from this study to update the in-service rates for instant savings measures in the EnergyWise Single Family program.</p>
<p>Guidehouse, Comprehensive TRM Review, April 2021 (Leveraged study from MA)</p>	<p>This study updated savings assumptions and effective useful lives (EUL) of several residential measures in MA. Rhode Island adopted the results from this study to update savings and EUL assumptions for several measures in the residential programs.</p>
<p>NMR, Low Income Multifamily Health NEI (TXC 50), July 2021 (Leveraged study from MA)</p>	<p>This study produced NEI values associated with energy efficiency programs in Income Eligible, Multifamily buildings. A total of 4 health and safety NEIs were monetized as part of this study. Arthritis, Thermal Stress (cold), Home Productivity, and reduced fire risk were all found to have Annual Per unit values of \$49, \$1,426, \$49, and \$13, respectively, totaling \$1536. These values are allocated to all applicable air sealing, insulation, and heating measures.</p>
<p>NMR, Residential New Construction Quick Hit NEI Study (MA20X14-RNCNEI), September 2021 (Leveraged study from MA)</p>	<p>The study produced updated NEI values for heating related measures offered through the Residential New Construction program. The total Heating NEIs for RNC went from an Annual Per Unit value of \$117 to \$142.33 due to increases in thermal comfort and noise reduction related impacts.</p>
<p>NMR, Residential Downstream/Upstream Products Net-to-Gross Study, June 2021 (Leveraged study from MA)</p>	<p>This study yielded prospective net-to-gross ratios and retrospective and prospective in-service rates for products supported by the Residential Retail or Residential Coordinated Delivery Initiatives. Rhode Island adopted the results from this study to update 2022 planning assumptions for ENERGY STAR Products program.</p>

NMR, Low-rise Residential New Construction Net-to-Gross Study, July 2021 (Leveraged study from MA)	This study yielded prospective and retrospective net-to-gross ratios for measures supported by the Low Rise Residential New Construction offering. Rhode Island adopted the results from this study to update 2022 planning assumptions.
NMR, Renovations and Additions Net-to-Gross Study, July 2021 (Leveraged study from MA)	This study yielded prospective and retrospective net-to-gross ratios for measures supported by the Renovations and Additions Residential New Construction offering. Rhode Island adopted the results from this study to update 2022 planning assumptions.
Guidehouse, Impact Analysis of Residential Wi-Fi Thermostats, Jun 2021 Results Presentation (Leveraged study from MA)	This study updated savings assumptions for programmable and Wi-Fi thermostats delivered through retail and direct install channels. Rhode Island adopted the draft results from this study to update savings for programmable and Wi-Fi thermostat measures in the residential HVAC and retrofit programs.
RI-20-XG-GasPeak – C&I Gas Peak Demand Savings	This study supplied peak gas demand daily percentages of energy consumption by end use and building type for the C&I sector. These results could be used to calculate the gas daily energy savings that have occurred as a result of C&I program activity.
RI-20-XG-GasPeak – Residential Gas Peak Demand Savings	This study supplied peak gas demand daily percentages of energy consumption by end use for the residential sector. These results could be used to calculate the gas daily energy savings that have occurred as a result of residential program activity.
Net-to-Gross Research of RCD and Select Products Measures (MA20R28)	For RI, the study applied new NTG results for the residential gas and electric HVAC programs.
<b>2020</b>	
<b>Study</b>	<b>Impact Descriptions</b>
Cadeo, Impact and Process Evaluation of EnergyWise Single Family Program, September 2020.	This study updated gross savings, in-service rates and net-to-gross ratios for the EnergyWise Single Family program.
Cadeo, Impact and Process Evaluation of EnergyWise Multi Family Program, September 2020.	This study updated gross savings, realization rates, in-service rates and net-to-gross ratios for the EnergyWise Multi Family program.

Cadeo, Impact and Process Evaluation of Income Eligible Multi Family Program, September 2020.	This study updated gross savings, realization rates and in-service rates for the Income-Eligible Multi Family program.
Cadeo, Impact Evaluation of Home Energy Reports Program 2017-2019, September 2020.	This study updated realization rates for the Home Energy Reports program.
NMR, Lighting Hours of Use Study, March 2020. (Leveraged study from MA)	This study reviewed and updated the HOU used to calculate the lighting savings measures in MA. Rhode Island adopted the results to update savings assumptions for the lighting measures in RI.
NMR, LED Delta Watts Update, March 2020. (Leveraged study from MA)	This MA study updated delta watts for lighting measures. Rhode Island adopted the results to update gross savings calculation for its Residential Lighting measures.
Guidehouse, Residential Wi-Fi Thermostat DR Evaluation, April 2020. (Leveraged study from MA)	This study reviewed and updated the savings being used In MA for the Wi-Fi DLC program offering. Rhode Island adopted the results to update savings for Wi-Fi DLC offering in RI.
Guidehouse, 2019/2020 Residential Energy Storage Demonstration, February 2020. (Leveraged study from MA)	This study reviewed and verified the savings being used In MA were accurate for the Residential demand response battery storage offering. Rhode Island adopted the results for residential battery storage demand response offering in RI.
ERS, Evaluation of 2019-2020 Cross-State DR Program, February 2020. (Leveraged study from MA)	This study reviewed and updated the summer demand realization rate being used In MA for the C&I targeted dispatch program offering. Rhode Island adopted the results for the C&I targeted dispatch demand response offering in RI.
DNV GL, Impact Evaluation of PY2017 Custom Gas Installations. May 2020.	The study updated realization rates for custom gas projects, as part of a rolling effort that incorporated results from PY2016 and PY2017.
DNV GL, Impact Evaluation of PY2018 Custom Gas Installations. September 2020.	The study updated realization rates for custom gas projects, as part of a rolling effort that incorporated results from PY2016, PY2017, and PY2018.
DNV GL, Impact Evaluation of PY2018 Custom Electric Installations. Interim Findings August 2020.	The study updated realization rates for custom electric projects, as part of a rolling effort that incorporated results from RI PY2016, MA PY2017-18, and RI PY2018.

DNV GL, Impact Evaluation of 2017 Small Business Electric Installations. March 2020.	The study updated electric non-lighting impact factors for the Small Business initiative. RI leveraged the MA study of this initiative.
DNV GL, C&I Measure Life Study. March 2020.	This study informed Effective Useful Lives and Remaining Useful Lives for key C&I energy efficiency measures, updating the commercial boiler EUL. RI leveraged the MA study of this initiative.
Tetra Tech, C&I Free-Ridership and Spillover Study. Anticipated September 2020.	This study updated free-ridership and spillover rates for the C&I program
<b>2019</b>	
<b>Study</b>	<b>Impact Descriptions</b>
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, Wi-Fi 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 Wi-Fi thermostats. Rhode Island adopted these results to update savings assumptions for Wi-Fi thermostats in HVAC and residential retrofit programs.
DNV GL, Impact Evaluation of PY2016 Custom Electric Installations. January 2020.	The study updated realization rates for custom electric projects, as part of a study leveraging the MA study of the same program element.
<b>2018</b>	
<b>Study</b>	<b>Impact Descriptions</b>

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 2022.
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.
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 Residential Wi-Fi Thermostat Demand Response. April 2018.	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>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>Navigant, MA Residential Electric Loadshape and Baseline Study (Heating and Cooling Season report). July 2018. (Leveraged study from MA)</p>	<p>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.</p>
<p>NMR, RLPNC 17-4/17-5 Products Impact Evaluation of In-service and Short-term Retention Rates Study. March 2018. (Leveraged study from MA)</p>	<p>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.</p>
<p>NMR/Tetra Tech, TXC34 Massachusetts Residential HVAC Net-to-Gross and Market Effects Study. July 2018. (Leveraged study from MA)</p>	<p>This study yielded recommended net-to-gross ratios for selected heating, cooling, and water heating measures that will receive Mass Save® Standard rebates in 2019-2022. Rhode Island adopted the result from this study to inform savings for measures offered through Residential HVAC/HEHE programs.</p>
<p>Tetra Tech, Market-Rate Multifamily NEI – Phase I Final Memo. March 2018.</p>	<p>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.</p>
<p>Tetra Tech, Non-Energy Impact Framework Study Report. January 2018.</p>	<p>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>

<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>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>
<p>NMR, 2017 Rhode Island Code Compliance Enhancement Initiative Attribution and Savings Study</p>	<p>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.</p>
<p>New Buildings Institute, Energy Impacts of Commercial Building Code Compliance in Rhode Island, July 2017</p>	<p>This study quantified the energy impacts of energy code compliance patterns from field data collection and analysis of building characteristics.</p>
<p>The Cadmus Group, Inc., Ductless Mini-Split Heat Pump Impact Evaluation, 2016</p>	<p>This study estimated savings from various types of heat pumps.</p>
<p>DNV-GL, Impact Evaluation of 2014 Custom HVAC Installations, September 2017</p>	<p>The study updated realization rates for custom electric HVAC projects, as part of a study leveraging the MA study of the same program element.</p>

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 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.
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.	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>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>
<p><b>2015</b></p>	
<p><b>Study</b></p>	<p><b>Impact Descriptions</b></p>
<p>Cadmus, Inc., High Efficiency Heating Equipment Impact Evaluation: Final Report, March 2015</p>	<p>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.</p>
<p>DNV-GL, Retrofit Lighting Controls Measure Summary of Findings: Final Report (MA), October 2014</p>	<p>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.</p>
<p>Tabors Caramanis Rudkevich, Avoided Energy Supply Costs in New England: 2015 Report, April 2015</p>	<p>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.</p>

<p>DNV-GL, Massachusetts 2013 Prescriptive Gas Impact Evaluation; Steam Trap Evaluation Phase 1, March 2015</p>	<p>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.</p>
<p>Cadmus, Inc., Cool Smart Incremental Cost Study: Final Report, July 2015</p>	<p>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>
<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>
<p><b>2014</b></p>	
<p><b>Study</b></p>	<p><b>Impact Descriptions</b></p>
<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>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. Superseded by 2020 Brattle Group study that revised methods.</p>

2013	
Study	Impact Descriptions
<p>KEMA, Inc., Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations</p> <p>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 <math>\pm 15\%</math>.</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 <math>\pm 23\%</math>, and identification of factors that influenced the realization rate.</p>
<p>KEMA, Inc., Impact Evaluation of 2010 Prescriptive Lighting Installations</p>	<p>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.</p>
2012	
Study	Impact Descriptions
<p>TetraTech, Final Report – Commercial and Industrial Non-Energy Impacts Study, (prepared for Massachusetts Program Administrators), June 29, 2012</p>	<p>This report provides a comprehensive set of statistically reliable Non-energy impact (NEI) estimates across the range of C&amp;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.</p>

2011	
Study	Impact Descriptions
KEMA, Inc., C&I Lighting Loadshape Project, Prepared for the Regional Evaluation, Measurement, and Verification Forum, June 2011.	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
KEMA, Inc., C&I Unitary HVAC Loadshape Project Final Report, Prepared for the Regional Evaluation, Measurement, and Verification Forum, June 2011.	From end use metering, the study produced updated diversity and equivalent full load hours for unitary HVAC measures
2010	
Study	Impact Descriptions
ADM Associates, Inc., Residential Central AC Regional Evaluation, Final Report, October 2009	kWh and kW savings figures for the installation of efficient residential CAC systems

## 6. EM&V Legislated Study

In 2018, the OER hired a third-party vendor to conduct the Energy Efficiency Program Evaluation Study, as a result of an amendment made to the Least Cost Procurement Law. The objective of the study was to verify energy savings from National Grid Energy Efficiency Programs. The study included the following tasks, research objectives, and high-level findings:

**Task 1: Review of EM&V Process.** This task addressed the research question *“Does the current Evaluation, Measurement, and Verification (EM&V) process in Rhode Island comply with national industry best practices for programs of its size and scope?”*

### Highlights of Key Findings

RI EM&V exhibits many best practices:

- Evaluators are independent but collaborative
- Strategically planned across years for most programs
- Annual planning allows for flexibility to adjust to program and market needs
- Comprehensive for most programs integrating process, impact, and market evaluations
- Uses defensible approaches and rigor

Additional opportunities were identified:

- Develop multi-year strategic plan (with flexibility)
- Narrow timeframe between participation and verification for C&I evaluations

Further details and complete findings can be found in the report: *Task 1: Review of EM&V Processes*.<sup>14</sup>

**Task 2: TRM Benchmarking & Best Practices Review of Evaluation Studies.** This task addressed the research question *“Quantitatively, to what extent are National Grid’s claimed energy savings accurate?”*

### Highlights of Key Findings

Evaluation Reports Review:

- Evaluations are generally high-quality work products that provide actionable recommendations to inform future program planning and implementation

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<sup>14</sup> <http://www.energy.ri.gov/documents/archived-reports/Task%201%20Report.pdf>



TRM Review:

- National Grid regularly uses evaluation results for the enhancement of the Rhode Island TRM.
- Almost all measures received at least one update over the five years of evaluated TRMs.
- Recommendation: Organize the TRM by equipment and measure to make the TRM easier to navigate

Further details and complete findings can be found in the report: *Task 2 Report: TRM Benchmarking & Best Practices Review of Evaluation Studies*.<sup>15</sup>

**Task 3: Analysis of Bills and Customer Experience Evaluation.** This task addressed the research question “*Are there savings estimation and program implementation improvements that can be identified to help customers that have or are likely to experience a substantial difference in estimated gross energy savings versus installed gross energy savings and visible bill savings?*”

Highlights of Key Findings

National Grid reported savings for C&I customers are reasonable.

- Electric billing analysis estimates were generally lower but were positively correlated with National Grid reported savings.
- Gas billing analysis estimates were largely uncorrelated with National Grid reported savings.
- Variance could be explained by several factors: meter issues, business expansion, operational changes, yearly variations in energy use, data entry errors, TRM assumptions, etc.

Further details and complete findings can be found in the report: *Task 3 Report: Analysis of Utility Bills and Customer Experience Evaluation*.<sup>16</sup>

**Company Response**

The Company carefully reviewed the EM&V legislated study findings and opportunities identified to improve the EM&V process. Tables 4 and 5 provide the Company’s responses regarding incorporation of these opportunities into the current EM&V process for National Grid’s energy efficiency programs.

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<sup>15</sup> <http://www.energy.ri.gov/documents/archived-reports/Task%202%20Report.pdf>

<sup>16</sup> <http://www.energy.ri.gov/documents/archived-reports/Task%203%20Report.pdf>

**Table 4. The Company’s Response to Task 1 Study Recommendations.**

	Opportunities	National Grid Response
<b>Planning</b>	Draft a strategic, preliminary three-year EM&V plan of studies within the three-year Energy Efficiency Plan. Document EM&V expectations for studies (e.g., rigor, confidence and precision, prioritization, funding levels, evaluation level and type within a 3-year cycle). Build from the systems in place (primarily the EM&V study tracker developed by National Grid) to document, at minimum, when the study will be completed and level of effort or rigor (such as through a dollar allocation range). Because this is a strategic plan it should be flexible based on changing needs and priorities.	This will be addressed in the next Three Year Plan. Toward that end, a small project will be undertaken in 2021 to document study expectations such as rigor, precision, etc.
	Make sure to build in budget for ad-hoc market or other studies.	We will continue to build in budget for ad-hoc studies. Placeholders for C&I and Residential ad hoc studies are included in the 2022 Plan. If these funds are unspent in 2022, they will be reallocated to other parts of the program or other programs, or they will result in a rate reduction through the reconciliation adjustment mechanism.
	In annual planning, continue to strategically consider high-priority high-impact high-budget needs and, conversely, where less costly approaches can be taken. Not all measures require high-impact approaches (on-site visits).	For C&I custom studies going forward, National Grid plans to evaluate custom lighting projects at a longer interval, due to the stable realization rate over the last several years. This will reduce high-cost on-site work in an area where it has an undersized impact.  National Grid will also consider new approaches and sources of information for studying code compliance, such as the use of e-permitting data.
	When setting EM&V funding, consider reasonableness given Rhode Island’s EM&V rigor standards and the fact that there is active EM&V oversight through the EERMC. Increasing Rhode Island samples and state-specific research may warrant additional EM&V funding as a percentage of implementation and/or additional trade-off analysis between number of studies, rigor, and cost.	Target budget for 2022 in 3YP is ~40% higher than 2018 budget. Much of this is driven by the increase in state-specific research. National Grid will continue to review planned budgets in the context of research needs.

	Opportunities	National Grid Response
<b>Implementation</b>	Allow sufficient time (from kick off to completion) to complete EM&V studies that require process and impact evaluations and need to be integrated into program planning, recognizing studies take varying amounts of time.	As of 2020, both residential and C&I sectors have multi-year contracts in place with evaluation vendors, allowing for studies to be planned across multiple years to better accommodate planning deadlines.
	Identify strategies to narrow the timeframe between program participation and verification of results for C&I impact evaluations. This may mean any combination of the following: a) more real-time sampling and evaluation, after verification but prior to year-end reporting; b) multi-method EM&V approach, including engineering reviews, focusing on-sites on the highest priority measures where on-sites are warranted. National Grid is currently implementing studies with rolling samples to address this.	In the time since the M&V Legislated Study began, C&I has implemented a rolling sampling process for custom project studies, which has improved the recency of study result application while also allowing for a shift to a RI-only sample for C&I impact evaluations.
	Incorporate process-related evaluation activities for all programs at least once a cycle, focusing on areas that could provide the greatest benefit and insight related to program delivery and effectiveness. Continue to build in opportunities for evaluations to provide early insights into new program initiatives, pilots, assessments, demonstrations, and even new elements to existing programs, following strategies outlined in the 2021 Energy Efficiency Plan.	In the time since the M&V Legislated Study began, a new process for the development and execution of pilots, demonstrations, and assessments has been implemented. This includes designated steps for EM&V involvement, beginning early in the process. C&I has planned a process evaluation to be carried out in 2022.
	Continue to integrate the EERMC Consultants in critical points of the review process to identify unforeseen issues, receive and discuss their methodological guidance, and gain buy-in on the approach. Critical points include planning, sample planning, and data collection instrumentation.	National Grid will continue to integrate the EERMC consultants in this process.

	Opportunities	National Grid Response
	Consider closer coordination between the EM&V team and implementation team, whether it be with National Grid implementation staff and/or vendors. Doing so could continue to impress the need for EM&V to effectively inform and integrate into implementation processes and fosters a collaborative relationship to help both parties identify how they can work together to improve energy efficiency program design and implementation.	National Grid will continue to coordinate with implementation while carrying out studies and with vendors to the extent possible while maintaining the objectivity of the evaluation. Toward this goal, National Grid will implement "triangle" meetings between strategy, implementation, and EM&V at a regular cadence for programs where this is not already in place. In early 2022, National Grid EM&V will solicit feedback on 1) the effectiveness of these meetings for each program and needed changes, and 2) other feedback from implementation on strategies for improving coordination. Agenda items for triangle meetings may include: updates on in-progress and future EM&V studies, data tracking issues, programmatic changes, and marketing needs.
<b>Reporting</b>	Ensure all reports provide sufficient data to understand confidence, precision, and any caveats related to the representativeness of the population (this is done most of the time, with some minor areas for improvement in residential reporting).	National Grid will work with vendors to ensure reporting of these statistics. Documentation of EM&V expectations referenced in Planning Opportunity 1 above will guide this work.
	Based on Rhode Island’s current structure, recognize and build in sufficient time for at minimum three points of review and feedback including from National Grid staff, the EERMC Consultants, and OER. As a standard practice, integrate results presentations to help make the reporting process more efficient.	Results presentations may not be necessary for all studies but can be beneficial for particularly impactful or unique studies. National Grid has been working to increase study timelines in recent years in order to accommodate the review process.
	Related to stakeholder review process, primarily EERMC Consultant efforts, continue to streamline, coordinate, and synthesize feedback for the evaluation team. Further, attempt to prioritize feedback to methodological and finding-related concerns, recognizing that while feedback is valuable, overly extensive can create delays as the evaluation teams strive to address each comment, big and small.	Not applicable to National Grid

**Table 5. The Company’s Response to Task 2 Study Recommendations.**

Recommendations	National Grid Response
Add applicable C&I prescriptive lighting into future TRMs	This will be completed in the 2022 TRM.
More carefully consider hours of use assumptions for Upstream Lighting	HOU assumptions by building type were updated in a 2020 study that was applied beginning in 2021.
Review assumptions used to calculate savings values for LED Screw-In Lamps, to ensure they accurately align with market conditions.	Assumptions used to calculate savings were updated in a 2020 study that was applied beginning in 2021.
Explore potential adjustments to the steam trap deemed savings value.	The value used in RI is based on a series of studies in MA, including one that found a previous higher deemed value to be overestimated and another that refined the deemed value into separate high-pressure and low-pressure deemed values. With only one data point outside the MA/RI value, National Grid doesn't believe an update is warranted.
Organize the TRM by equipment and measure rather than by program or in another mode that makes the TRM easier for the reader to navigate.	This will not be feasible for the 2022 TRM due to the extensive effort required but will be revisited during the 2023 planning cycle.

No formal recommendations were identified from Task 3.