2022 Evaluation, Measurement, and Verification Plan

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1. Introduction

Evaluation, Measurement and Verification (EM&V) is an integral and required part of National Grid's energy efficiency program planning process. EM&V provides independent verification of impacts to ensure that savings and benefits claimed by the Company through its energy efficiency programs are accurate and credible. EM&V 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 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 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

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.[1] 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[2], the Rhode Island Public Utilities Commission (PUC)[3], 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. In order to optimize the use of evaluation resources, where programs are considered to be similar in program delivery and population served with those offered in Massachusetts, the studies will be done in conjunction with the Company's Massachusetts retail affiliate. The Company will also stay abreast of the voluminous Massachusetts evaluation activities that may be beneficial and applicable in Rhode Island and will use the guidelines provided by the Rhode Island Piggybacking Diagnostic Study to inform this strategy.

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 July 2022. Study

[1] http://webserver.rilin.state.ri.us/PublicLaws/law18/law18079.htm
[2] https://rieermc.ri.gov/plans-reports/evaluation-studies/
[3] http://www.ripuc.org/

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	RI
C&I	RI-21-CE-CustElecPY20	Impact	C&I Elec	Impact Evaluation of PY2020 Custom Electric Installations	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 and Code Compliance 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-Potential	Policy	Multiple	Technical Potential Study Update	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 and jurisdictions in order to achieve the lowest cost procurement of required external services while enabling the Company to minimize administrative costs, deliver on program commitments and meet time-sensitive regulatory deadlines. The 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 $3.0 million ($2.3 million for electric and $0.7 million for gas), excluding internal staffing costs. The proposed budget for EM&V comprises approximately 1.9% 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. [4]

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 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

[4] https://rieermc.ri.gov/plans-reports/evaluation-studies/

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 inform industry standard practice development and/or adoption 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 convene a consensus group to determine market share estimates in Rhode Island. 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.

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[5] 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 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 (continued from 2021)

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 efficient these units work at different temperatures, do they perform close to their rated efficient 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.

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[5] http://ma-eeac.org/wordpress/wp-content/uploads/MA19R04-A-NP-Nonpart-MarketBarriersStudy_Final.pdf

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.

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-Potential – Technical Potential Study Update

At the discretion of OER, this study will update the Rhode Island Market Potential Study (2021-2026) in preparation for the 2024-2026 Three-Year Plan.

4. Evaluation Study Findings

This section will be updated in the second draft.

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									
	Connected Solutions	Impact									
Cross-cutting/ Special	Potential study	Market									
	Job Impact	Jobs									
	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									
	Connected Solutions	Impact									
	All	NTG									
C&I Gas	Custom	Impact									
	Prescriptive	Impact		steam trap		steam trap	steam trap				
	All	NTG									
Small Business	Lighting	Impact		presc.							
	Non-Lighting Electric	Impact									
	All	Process									
	All	NTG									

These studies are available through the EERMC[6], the PUC[7], and National Grid.

[6] https://rieermc.ri.gov/plans-reports/evaluation-studies/

[7] http://www.ripuc.org/

The table will be updated in the second draft.

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, (Date)	Study is in progress
DNV, Impact Evaluation of PY2018 Custom Electric Installations, (Date)	Study is in progress
DNV, Impact Evaluation of PY2019 Custom Electric Installations, (Date)	Study is in progress
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.
Guidehouse, RCD Virtual Assessment Study, March 2021 (Leveraged study from MA)	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.
Guidehouse, Comprehensive TRM Review, April 2021 (Leveraged study from MA)	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.
NMR, Low Income Multifamily Health NEI (TXC 50), (July) (Leveraged study from MA)	This study produced NEI values associated with weatherization programs in Income Eligible, Multifamily buildings. A total of health and safety NEIs were monetized as part of this study.

NMR, Residential Downstream/Upstream Products Net-to-Gross Study, June 2021 (Leveraged study from MA)	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.
Guidehouse, Impact Analysis of Residential Wi-Fi Thermostats, Jun 2021 Results Presentation (Leveraged study from MA)	This study will update 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.
2020	
Study	**Impact Descriptions**
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, Februray 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, Februrary 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
2019	
Study	**Impact Descriptions**
NMR, Delta Watts Update. April 2019. (Leveraged study from MA)	This MA study updated delta watts for general service lamps, specialty and reflectors. Rhode Island adopted the results to update gross savings calculation for its Residential Upstream Lighting program.

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

Study	Impact Descriptions
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 ≤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.
Illume Advising LLC, Rhode Island Statewide Behavioral Evaluation: Savings Persistence Literature Review. January 2018.	This study reviewed the existing research on the persistence of savings generated by HERs with particular attention to the applicability of each study to Rhode Island. The study explored potential impacts on the HER program when reducing the cadence of reports.
Synapse Energy Economics, Avoided Energy Supply Components in New England 2018 Report. March 2018.	This study developed new estimates of avoided costs associated with energy efficiency measures for program administrators throughout New England States. Rhode Island used the avoided costs of energy, capacity, natural gas, fuel oil, environmental costs and demand reduction induced price effects resulting from this study for 2019 program planning.
Navigant, 2017 Seasonal Savings Evaluation. March 2018.	This study evaluated the Nest thermostat optimization program offered in Massachusetts and Rhode Island. The study found that the program achieved energy and demand savings of 57 MWh and 134 kW, respectively, in Rhode Island

Navigant, 2017 Residential Wifi 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.
NMR, Rhode Island Lighting Market Assessment. July 2017	This Residential study estimated lighting saturation and other critical market indicators in Rhode Island and included a detailed comparison to Massachusetts. The study concluded that the two markets are substantially similar, therefore Rhode Island can use the results from the recently completed net-to-gross consensus study in MA to inform program planning for the Residential Upstream Lighting program.
Research Into Action, Rhode Island HEAT Loan Assessment. December 2018	This study assessed the extent to which HEAT Loan encourages uptake of weatherization and HVAC projects through the EnergyWise program. Findings from this study will be used to inform program planning and support future potential studies in Rhode Island.

NMR, Rhode Island Residential Appliance Saturation Survey. October 2018	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.
Cadeo, Rhode Island Impact Evaluation of Income Eligible Services Single Family Program, August 2018	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.
NMR, RLPNC 17-11 LED Net-to-Gross Consensus Panel Report. June 2018. (Leveraged study from MA)	This study yielded recommended prospective net-to-gross ratios for 2019 to 2022 for the Residential Upstream Lighting program in MA. Rhode Island adopted the NTG established for 2019 and 2020 due to similarity in lighting market condition.
NMR, RLPNC 18-5 Home Energy Assessment LED Net-to-Gross and EUL Consensus. July 2018 (leveraged study from MA)	The study yielded recommended net-to-gross and estimated useful life for direct installed LED bulbs offered through the Home Energy Services Initiative in Massachusetts. Rhode Island adopted the results from this study to inform 2019 and 2020 planning for the Residential EnergyWise program.

NMR, RLPNC 18-4 Products Net-to-Gross Consensus Study, August 2018. (Leveraged study from MA)	This study yielded prospective net-to-gross for Residential Retail products for 2019 to 2022 in Massachusetts. Rhode Island adopted the results from this study to inform 2019 and 2020 planning for the Residential Products program.
Navigant, MA Residential Electric Loadshape and Baseline Study (Heating and Cooling Season report). July 2018. (Leveraged study from MA)	This study collected saturation, penetration and usage behavior data for all major electric and gas appliances in Massachusetts. Rhode Island adopted the end use load shapes determined by this study.
NMR, RLPNC 17-4/17-5 Products Impact Evaluation of In-service and Short-term Retention Rates Study. March 2018. (Leveraged study from MA)	This study yielded estimates of in-service rates (ISRs) and short-term retention rates for products currently offered through the Residential Consumer Products Core Initiative or the Mass Save® Home Energy Assessment (HEA) Programs. Rhode Island adopted the result from this study to inform savings for measures offered through Residential Products program.
NMR/Tetra Tech, TXC34 Massachusetts Residential HVAC Net-to-Gross and Market Effects Study. July 2018. (Leveraged study from MA)	This study yielded recommended net-to-gross ratios for selected heating, cooling, and water heating measures that will receive Mass Save® Standard rebates in 2019-2022. Rhode Island adopted the result from this study to inform savings for measures offered through Residential HVAC/HEHE programs.

Tetra Tech, Market-Rate Multifamily NEI – Phase I Final Memo. March 2018.	This MA study reviewed non-energy impacts associated with market-rate multifamily properties, including whether or not any additional NEIs should be applied, whether NEI values differ based on type and ownership of building, and whether there is double counting of NEIs.
Tetra Tech, Non-Energy Impact Framework Study Report. January 2018.	This MA study reviewed the current status of NEIs and had the following recommendations: do not count existing property value NEIs, review the BCR-model-related differences highlighted in the study and determine whether there is a reason for each, and, in cases where an NEI for one initiative or measure is applied to a different initiative or measure, provide clear public documentation of how the decision was made.

DNV GL, NMR Group, Tetra Tech, Massachusetts Commercial and Industrial Upstream HVAC/Heat Pump and Hot Water NTG and Market Effects Indicator Study. September 2018.	This MA study updated NTG for the following upstream equipment: • Ductless mini-split heat pumps • Electric water-source heat pumps • Air-cooled unitary/split central air conditioning (>5 tons) • Gas-fired storage water heaters between 76,000 and 300,000 BTU/hour • Gas-fired tankless water heaters between 180,000 and 199,900 BTU/hour
DNV GL, Evaluation of 2017 Demand Response Demonstration: C&I ConnectedSolutions. February 2018.	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.
2017	
Study	**Impact Descriptions**

Navigant, Rhode Island Energy Efficiency Program Customer Participation Study – Phase 1, October 2017	The study characterized participants and non-participants in several energy efficiency programs and identified customers that can be potentially targeted to increase participation.
NMR, 2017 Rhode Island Single-Family Code Compliance/Baseline Study, July 2017	This study yielded the final agreed upon baseline values to update the User Defined Reference Home (UDRH) in Rhode Island
ICF, 2017 Rhode Island Residential Code Savings Analysis	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.
NBI, 2017 Rhode Island Commercial Code Savings Analysis	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.
NMR, 2017 Rhode Island Code Compliance Enhancement Initiative Attribution and Savings Study	The study found residential and commercial attribution factors of 23% and 46, respectively, which were used along with study results on average savings as well as construction activity projections to calculate the CCEI's projected savings from 2018-2020.

Peregrine Energy Group, Analysis of Job Creation from 2016 Expenditures for Energy Efficiency in Rhode Island by National Grid, April 2017	A study of the job impacts of National Grid's energy efficiency programs delivered to Rhode Island electricity and natural gas customers in 2016. The study estimated that 702 FTE workers, across 923 companies and agencies were employed in 2016 as a result of investments energy efficiency programs in Rhode Island.
New Buildings Institute, Energy Impacts of Commercial Building Code Compliance in Rhode Island, July 2017	This study quantified the energy impacts of energy code compliance patterns from field data collection and analysis of building characteristics.
The Cadmus Group, Inc., Ductless Mini-Split Heat Pump Impact Evaluation, 2016	This study estimated savings from various types of heat pumps.
DNV-GL, Impact Evaluation of 2014 Custom HVAC Installations, September 2017	The study updated realization rates for custom electric HVAC projects, as part of a study leveraging the MA study of the same program element.
DNV-GL, 2014 RI Custom Process Impact Evaluation, December 2017	The study updated realization rates for custom process projects, as part of a study leveraging the MA study of the same program element.
TetraTech, C&I Programs Freeridership & Spillover Study, September 2017	This study updated free-ridership and spillover values for the C&I electric and gas programs.
DNV-GL, MA C&I Steam Trap Evaluation Phase 2, Feb, 2017	This study updated steam trap savings estimates.
DNV-GL, Gas Boiler Market Characterization Study Phase II: Final Report, March 2017	This study updated C&I condensing boiler savings estimates.
DNV-GL, MA45 Prescriptive Programmable Thermostats, March 2017	This study updated programmable thermostat deemed gas savings for C&I programs.

2016	
Study	**Impact Descriptions**
DNV-GL, Impact Evaluation of 2014 Custom Gas Installations in Rhode Island Final Report, July 2016	This study yielded an energy realization rate for Custom Gas projects.
DNV-GL, Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations Final Report, July 2016	This study yielded an energy realization rate for prescriptive compressed air compressors, dryers, and EE accessories.
DNV-GL, Impact Evaluation of 2012 National Grid-Rhode Island Prescriptive Chiller Program Final Report, July 2016	This study yielded an energy realization rate for prescriptive chillers.
DNV-GL, Multifamily Impact Evaluation, National Grid Rhode Island, January 2016	This study estimated realization rates for electric and gas savings for 2013 participants using a billing analysis. The results include a low level of precision and thus the realization rates are not applicable. The Company has been improving tracking, savings estimations and verification processes in line with the study's recommendations.
Research Into Action, National Grid Rhode Island EnergyWise Single Family Process Evaluation, August 2016	This study surveyed customers, vendors, contractors, and lending agencies to order to assess customer experience, HEAT Loan lender perspectives on the program, performance of the lead vendor and sub-contractors and lessons learned from programs elsewhere in the country.

DNV-GL, Impact Evaluation of 2014 EnergyWise Single Family Program, National Grid Rhode Island, August 2016	This study estimated deemed savings values and realization rates for electric and gas 2014 participants using billing and engineering analysis. The Company adopted the deemed savings values in the 2017 program plan.
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.
Cadmus Group; Large Commercial and Industrial On-Bill Repayment Program Evaluation, September, 2016	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.
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	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.

DNV GL, Stage 2 Results—Commercial and Industrial New Construction Non-Energy Impacts Study—Final Report, prepared for the Massachusetts Program Administrators, March 2016	The purpose of this study was to quantify the dollar value of participant NEIs for C&I NC projects completed in 2013, and to estimate gross NEIs per unit of energy savings resulting from NC electric and gas measures separately.
2015	
Study	**Impact Descriptions**
Cadmus, Inc., High Efficiency Heating Equipment Impact Evaluation: Final Report, March 2015	The study determined revised deemed savings values for each furnace and boiler measure, including condensing boilers and early replacement of heating equipment. The study also reflected the increasing baseline for standard efficiency heating equipment.
DNV-GL, Retrofit Lighting Controls Measure Summary of Findings: Final Report (MA), October 2014	The study examined trends in lighting control savings and noted a decrease in savings over previous program years. It recommended updated coincidence factors as well as potential program and technology areas that may yield higher savings. Finally, the study recommended a change in the savings calculation algorithm for lighting controls.

Tabors Caramanis Rudkevich, Avoided Energy Supply Costs in New England: 2015 Report, April 2015	This study developed new estimates of avoided costs for application in 2016 through 2018 energy efficiency programs throughout the six New England states. Avoided costs were developed for natural gas, electric energy, electric capacity, demand reduction induced price effects (DRIPE), other fuels (oil, propane and wood), and carbon.
DNV-GL, Massachusetts 2013 Prescriptive Gas Impact Evaluation; Steam Trap Evaluation Phase 1, March 2015	The study concluded that there should continue to be both prescriptive and custom pathways for steam trap retrofit incentives, and further recommended that a group convene to review and revise the deemed savings estimate for steam traps. The study also recommended the use of a six year lifetime for steam traps.
Cadmus, Inc., LED Incremental Cost Study – Modeling LightTracker LED and Halogen Pricing Data, June 2015	This memo summarizes selected findings from the LightTracker LED, CFL, and halogen pricing data modeling effort and the resulting state-level price forecast through 2020 for LED, CFL, and halogen bulbs. These results are based on light bulb price data from 25 states that lacked LED programs from 2009 to 2014.

Cadmus, Inc., Cool Smart Incremental Cost Study: Final Report, July 2015	This incremental cost study estimates how manufacturing production costs (MPCs) and purchase prices of residential air conditioning (AC) and heat pump (HP) equipment change as equipment efficiency increases. The results support Cool Smart program enhancements and cost-effectiveness analysis, as well as potential upstream residential upstream heating, ventilation and air conditioning (HVAC) incentive programs.
Cadmus, Inc., Lighting Interactive Effects Study Preliminary Results – Draft, April 2015	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.
2014	
Study	**Impact Descriptions**
DNV GL, 2014 , Impact Evaluation of National Grid Rhode Island C&I Prescriptive Gas Pre-Rinse Spray Valve Measure	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.

NMR Group, Inc., Northeast Residential Lighting Hours-of-Use Study	This multi-State study provided updated hours-of-use assumptions for residential lighting programs in various room types.
The Cadmus Group, Impact Evaluation: Rhode Island Income Eligible Services, Volume II The Cadmus Group, National Grid Income Eligible Services Process Evaluation	This RI-specific impact evaluation focused on the electric and gas savings resulting from the participation of these dwellings in in-home retrofit of electrical components and weatherization of electric, gas, and fossil fuel heated homes. It used billing analysis, engineering reviews, and interviews for the process components.
National Grid, Macroeconomic Impacts of Rhode Island Energy Efficiency Investments REMI Analysis of National Grid's Energy Efficiency Programs	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.
2013	
Study	**Impact Descriptions**

KEMA, Inc., Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations KEMA, Inc., Impact Evaluation of 2011 Rhode Island Custom Lighting Installations	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.
KEMA, Inc., Impact Evaluation of 2011 Prescriptive Gas Measures	On-site monitoring and verification of installation provided updated impacts for four major prescriptive gas measures. Programs and measures are similar between National Grid affiliates in MA and RI, and results are applied to RI. The overall realization rate for the four measures was approximately 102% and the relative precision was about ±15%.
KEMA, Inc., and DMI, Inc., Impact Evaluation of 2011-2012 Prescriptive VSDs	This evaluation provided a new estimate of the impacts of prescriptive variable speed drives, based on pre-post metering of measures installed in 2011 and 2012. Programs and measures are similar between National Grid affiliates in MA and RI, and results are applied to RI. Key findings include an annual kWh realization rate was 94% with a relative precision of +/- 23%, and identification of factors that influenced the realization rate.

The Cadmus Group, Inc., 2012 Residential Heating, Water Heating, and Cooling Equipment Evaluation: Net-to-Gross, Market Effects, and Equipment Replacement Timing	The results of this study yielded updated net-to-gross factors and estimates of the timing of equipment replacement for residential heating and cooling measures. Programs and measures are similar between National Grid affiliates in MA and RI, and results are applied to RI.
KEMA, Inc., Impact Evaluation of 2010 Prescriptive Lighting Installations	The RI Prescriptive lighting study listed above did not examine case lighting separately from other lighting systems. To complement the RI-specific results, this MA study provided impact updates on case lighting.
2012	
Study	**Impact Descriptions**
TetraTech, Final Report – Commercial and Industrial Non-Energy Impacts Study, (prepared for Massachusetts Program Administrators), June 29, 2012	This report provides a comprehensive set of statistically reliable Non-energy impact (NEI) estimates across the range of C&I prescriptive and custom retrofit programs offered by the MA electric and gas Program Administrators (Pas). The analytical methods used allow this report's findings to be applicable to RI.
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
2007	
Study	**Impact Descriptions**
RLW Analytics, Small Business Services Custom Measure Impact Evaluation, March 23, 2007	Verification of energy savings from custom lighting projects in the Small Business Services program.
RLW Analytics, Impact Evaluation Analysis of the 2005 Custom SBS Program, May 29, 2007	Realization rates for the Small Business Services program

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*?"

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 can be found in the report: *Task 1: Review of EM&V Processes*.[8]

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?"*

Key Findings

Evaluation Reports Review:

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

[8] 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 can be found in the report: *Task 2 Report: TRM Benchmarking & Best Practices Review of Evaluation Studies*.[9]

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?"*

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 can be found in the report: *Task 3 Report: Analysis of Utility Bills and Customer Experience Evaluation*.[10]

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.

[9] http://www.energy.ri.gov/documents/archived-reports/Task%202%20Report.pdf
[10] 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
Planning	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. Added placeholders for C&I and Residential ad hoc studies in the 2022 Plan.
	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).	(Discussion underway)
	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
Implementation	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 will plan 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. In the coming year, we will look for ways to increase coordination with internal implementation and vendors.
Reporting	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.
	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 but will be revisited during the 2023 planning cycle.

No formal recommendations were identified from Task 3.