The Narragansett Electric Company
d/b/a/ Rhode Island Energy
Docket No. 23-35-EE
2025 Annual Plan Attachment 3

2025 Evaluation, Measurement, and Verification Plan

1 Contents

Business Use

1 Introduction

Evaluation, Measurement, and Verification (EM&V) is an integral and required part of Rhode Island Energy'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 jurisdictions 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 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 follow each study closely and are 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 Applicable to 2025

2.1 Overview

The Company, with input from EERMC and OER, expects to complete thirteen Rhode Island-specific evaluation studies in 2024 that will be applied beginning in 2025 (see Section 2.2 below). The research studies include impact evaluations, process evaluations, and market studies in the residential and commercial and industrial (C&I) sectors, as well as studies that are considered cross-cutting.

Commented [RIE1]: To be updated in subsequent drafts

A complete list of historical research studies is provided in Section 4 along with a brief summary of the impact of those results in planning the Company's programs. Most of these studies are posted on the EERMC website.[1] Prior year studies that have been superseded by studies completed since the filing of the 2024 Energy Efficiency Plan have been removed from this list.

Section 5 provides detailed descriptions, findings, and recommendations of each of the Rhode Island-specific studies listed in the next section. In addition, selected research studies completed in other regions and/or other jurisdictions, most commonly Massachusetts,[2] are periodically reviewed for applicability to Rhode Island due to similarity with RI Energy's programs, either in the measures offered, or program structure or delivery. In some instances, the results of these other evaluations have been judged by the Company, in consultation with EERMC and OER, to be applicable to Rhode Island's energy efficiency programs. No such evaluation study results are being adopted in 2025 program planning.

Commented [RIE2]: Currently under review

2.2 Recent Rhode Island-Specific studies

Commented [RIE3]: To be updated in subsequent drafts

Commercial

- Small Business Process Evaluation (RI-22-CX-Proc)
- C&I New Construction Baseline Study (RI-22-CX-Codes)
- Automated RTU Optimization Demonstration Evaluation (RI-22-CX-RTUOpt)
- Impact Evaluation of PY2021 Custom Gas Installations (RI-22-CG-CustGasPY21)
- Impact Evaluation of PY2021 Custom Electric Installations (RI-22-CE-CustElecPY21)
- C&I Free-Ridership and Spillover Study (RI-23-CX-FRSO)
- Commercial Cooking Gas and Electric Impact Evaluation (RI-23-CX-CommCook)

Residential and Income-Eligible

- RI-24-RX-IncEligible - Income Eligible Single Family Impact Evaluation
- Nonparticipant Characterization and Segmentation Research (RI-23-RX-NPSegmentation)
- Participation Study Dashboard Update (RI-23-RX-Dashboard)

[1] https://rieermc.ri.gov/resources/ then scroll to "EM&V Studies."
[2] Prior to May 2022, Narragansett Electric Company was part of National Grid, which has affiliates in Massachusetts, and which facilitated the leveraging of evaluation studies.

- EnergyWise PY 2021 Impact Evaluation Study (RI-23-RX-EWisePY21)

Cross-cutting

- Comprehensive Measure Life Review (RI-23-XX-Lifetime)

2.3 Recent Studies Adopted from Other Jurisdictions

The company will not be adopting any studies from other jurisdictions at this time.

Commented [RIE4]: Under review

3 2025 Planned Evaluation Studies

3.1 Overview

This section describes planned studies that focus on areas of interest to the Rhode Island Energy 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 Company will consider avenues to participate in Massachusetts studies.[3]

3.2 Summary

Table 2 lists evaluation studies that the Company plans to conduct in 2025 to inform the 2026 Annual Plan and future planning cycles. Barring changes to the 2025 Annual Plan schedule, studies that will be incorporated into the Annual Plan must be completed by August 2024. The proposed budget for evaluation study expenditures in 2025 is approximately $2.7 million ($2.2 million for electric and $0.5 million for gas), including staffing costs. The proposed budget for EM&V comprises approximately 1.5% of the total portfolio budget in 2025.

Commented [RIE5]: To be updated. For now, RIE assumes that the evaluation budget will be level with the 2024 budget

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		21 22 23		R = residential C = commercial X = cross sector	E = electric G = gas X = electric & gas		

[3] Despite no longer being part of National Grid, the Company plans to stay abreast of Massachusetts evaluation activities that may be beneficial and applicable in Rhode Island and follow through as appropriate.

Table 2. Planned Evaluation Studies in 2025

Sector	Study Code	Type	Affected Programs	Study Name
C&I	RI-24-CE-Lighting	Impact	C&I Elec	Impact Evaluation of Upstream or Downstream Prescriptive C&I Lighting
C&I	RI-24-CX-CustProcessEval	Process	C&I	Process Evaluation of Custom Approach
C&I	RI-23-CG-CustGasPY22	Impact	C&I Gas	Impact Evaluation of Custom Gas Installations
C&I	RI-23-CE-CustElecPY22	Impact	C&I Elec	Impact Evaluation of Custom Electric Installations
Cross-cutting	RI-23-XX-AESC24	Value	All Elec; All Gas	2024 Avoided Energy Supply Component Study 2024
Residential	RI-24-RX-IncEligible	Impact	Residential	Impact Evaluation of Income Eligible Single Family Program
Cross-cutting	RI-24-XX-StandardsSavings	Impact	All Elec; All Gas	Appliance Standards Gross Savings Review
C&I	RI-24-CX-CINCProcess	Process	C&I	Process Evaluation of C&I New Construction Program
C&I	RI-24-CX-ISPResearch	Impact	C&I	Commercial and Industrial Industry Standard Practice Research
Cross-cutting	RI-24-XX-MultiFamCustom	Impact	All Elec; All Gas	Impact Evaluation of Multifamily Custom Approach
Residential	RI-24-RX-MarketResearch	Market	Residential	Residential Market Research
C&I	RI-24-CX-MarketResearch	Market	C&I	Commercial and Industrial Market Research
C&I	RI-24-CX-SBDashboard	Market	Residential	Small Business Data Dashboard
Cross-cutting	RI-24-XX-MeasureLife2	Impact	All Elec; All Gas	Comprehensive Measure Life Review, Phase II

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 a 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.

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]

3.3 Commercial and Industrial Planned Studies

RI-23-CG-CustGasPY22 - Impact Evaluation of PY2022 Custom Gas Installations (Continuing)

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 2022. 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 began in summer 2023 and will continue into 2024 at which time a new cohort from 2023 will be studied.

RI-23-CE-CustElecPY22 – Impact Evaluation of PY2023 Custom Electric Installations (Continuing)

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 2022. This will continue 'rolling' evaluation efforts,

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

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 began in summer 2023 and will continue into 2024 at which time a new cohort from 2023 will be studied.

RI-24-CE-Lighting - Impact Evaluation of C&I Lighting Controls (Continuing)

Lighting efficiency continues to be a significant contributor to savings in the C&I Electric portfolio, and it has been five years or more since C&I lighting was studied in an impact evaluation. This study focuses on lighting controls, which will continue to be an important part of the C&I portfolio even as incentives for luminaires is phased out.

RI-24-CX-CustProcessEval - Process Evaluation of Custom Approach

Commercial and Industrial custom projects continue to be a major contributor to overall savings. The Company has many strategies for reaching customers through the custom pathway and, in addition, there are several additional administrative process steps needed in the custom pathway. This study will review both the outreach and administrative processes and develop recommendations for process improvements that may ultimately lead to greater amounts of participation and savings. A similar study is being launched in Massachusetts and it is believed that it may be possible to leverage survey instruments from that study.

RI-24-CX-CINCProcess - Process Evaluation of C&I New Construction Program

The Commercial and Industrial New Construction market continues to offer opportunities for savings. The Company's process to effectively intervene in this market will be reviewed in this study with the objective of more effectively influencing New Construction efficiency projects.

RI-24-CX-ISPResearch - Commercial and Industrial Industry Standard Practice Research

The objective of this study is to better understand what the baseline or industry standard practice (ISP) is for certain technologies. There are two potential areas of investigation: One area is air compressors, where many projects use load/no load as the baseline but VFD (variable frequency drive) compressors are ever more common and could be standard practice. There may be an opportunity to study compressor ISP jointly with Massachusetts. The second potential area is a cannabis grow facility ISP study, particularly with regards to horticulture lighting. This is an emerging area in the state with great potential for efficiency. However, since it is emerging, there are varying views about what baseline practices are. These questions could be resolved with an ISP study. The Company will determine the specific area for investigation in late 2023 or early 2025.

RI-24-CX-MarketResearch - Commercial and Industrial Market Research (Continuing)

This research will focus on one or more of the following areas: it may focus on the lighting market to understand more concretely how much fluorescent lighting is still installed, and how much lighting is still without controls. Updated data collection should help plan future lighting programs in the state. The research may also focus on certain C&I submarkets that have experienced lower than average participation and savings rates to understand the market drivers and develop strategies for increasing participation and savings.

3.4 Residential and Income-Eligible Planned Studies

RI-24-RX-MarketResearch – Residential Market Research

There are several areas of potential interest for additional market research to support delivery of Residential energy efficiency programs. Among these are research into: HVAC market intervention strategies, customer attitudes about electrification of residential cooking, challenges and opportunities of electrification in LMI households, language and access barriers for Residential customers, and follow-ups to the Nonparticipant Characterization and Segmentation Research (RI-23-RX-NPSegmentation) which is focusing on electric heat customers. Research related to electrification will be carefully considered to make sure it is consistent with the Company's energy efficiency implementation efforts. The Company will determine the specific area for investigation in late 2023 or early 2025.

3.5 Cross-sector or Other Planned Studies

RI-24-XX-MultiFamCustom - Multifamily Custom Measure Impact Evaluation

In 2021, the Residential evaluation team completed a comprehensive process and impact evaluation of Rhode Island Energy's market rate and income eligible multifamily programs. However, that study focused exclusively on the programs' prescriptive measures and did not include custom measures, which given the programs' position at the nexus of the residential and commercial sectors, reflect a meaningful portion of total multifamily savings. An impact study focused on custom measures would close this existing evaluation gap.

RI-24-XX-MeasureLife2 - Comprehensive Measure Life Review, Phase II

The Comprehensive Measure Life Review (RI-23-XX-Lifetime) being conducted in 2023 reviewed the measure lives of approximately 60% of the measures in the Company's benefit-cost model, assessed the quality of those measure lives and, where appropriate, recommended updated sources and values. This is an important exercise because the calculation of lifetime benefits created by the programs depends on an accurate assessment of measure lives. Because Rhode Island Energy expanded the number of measures in its model, the 2023 study was not able to review the measure lifetimes for all the measures. This proposed study will complete the research.

4 Historic Evaluation Studies

Commented [RIE6]: Table to be updated in next draft

This section contains a list of all historic studies still being used by the Company as the basis of claimed savings in the 2024 Program Plan and in the Technical Reference Manual. An at-a-glance summary in

Table 3 shows the studies by program, followed by the more detailed Table 4 summarizing the relevant studies.

Table 3. Historic Evaluation Studies

Sector	Study type	Program	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024 Plan
Residential	Impact	EnergyWise SF										
		Income Eligible SF										
		EnergyWise MF										
		Income Eligible MF										
		Home Energy Reports										
		EnergyStar Products										
		HVAC							Demo	HP		
	Impact/Market	EnergyStar Lighting										
	Impact/Process	Connected Solutions										
	Market	EnergyWise SF										
		EnergyWise MF										
	Process	EnergyWise SF				HEAT Loan						
		Income Eligible SF										
		EnergyWise MF										
		Income Eligible MF										
		Home Energy Reports										
	Process/Market	HVAC										
Cross-cutting/Special	Benefits	Avoided Cost										
		Economic Impacts										
	Impact	Lifetime										
		C&I NEIs										
		Gas Peak Demand										
		C&I Cooking										
	Impact/Market	Workforce										
		ES Homes/Codes&Standards										
	Market	Potential Study										
		Participation										
		Non-Paticipant										
		RASS										
		Heat Pumps Study										
		Legislated M&V Study										
		Free Ridership/Spillover										
	Process	Piggybacking Study										
	Value	All										
C&I Electric	Impact	Custom										
		HVAC										
		Industrial Process										
		CAIR										
		Refridgeration, Motors, Other										
		Custom Lighting										
		Street Lighting										
		CDA										
		CHP										
		Prescriptive Lighting										
		Upstream Lighting										
		Prescriptive HVAC		chillers								
		Prescriptive VSD										
		Prescriptive CAIR										
		Connected Solutions										
		All										
	Market	All										
	NTG	All										
	Process	Upstream Lighting										
		All										
C&I Gas	Impact	Custom										
		Prescriptive	steam trap		steam trap	steam trap						
		All										
	Market	All										
	NTG	All										
	Process	All										
Small Business	Impact	Lighting	presc.									
		Non-Lighting Electric										
	Market	All										
	NTG	All										
	Process	All										

These studies are available through the EERMC, the PUC, and Rhode Island Energy.

Table 4. Completed Evaluation Studies Applicable in 2023

Commented [RIE7]: To be updated

2023

Study	Impact Descriptions	Sector
Cadeo & NMR, Residential New Construction and Code Compliance Study, May 2023	The study updated the User Design Reference Home baseline measure level efficiencies, observed how building practices have changed over time, and identified the level of code compliance.	Res
Cadeo, Comprehensive Measure Life Review, August 2023	The study reviewed prescriptive measure life assumptions and ensured they aligned with recent research, Rhode Island evaluation studies, and industry best practices. The study also recommended measure life updates when appropriate.	Cross-Cutting
Cadeo, EnergyWise Single Family Weatherization Impact Evaluation, August 2023 (Draft)	The study updated the gross energy savings for EWSF's weatherization measures, for both primary and secondary heating and cooling. The evaluation accounted for energy savings associated with natural gas, electricity and/or delivered fuels (oil, propane, and wood).	Res
DNV, Impact Evaluation of PY2021 Custom Gas Installations, August 2023	The study updated realization rates for custom gas projects, as part of a rolling effort that incorporated results from PY2019, PY2020, and PY2021.	C&I
DNV, Impact Evaluation of PY2021 Custom Electric Installations, August 2023	The study updated realization rates for custom electric projects, as part of a rolling effort that incorporated results from PY2019, PY2020, and PY2021.	C&I
DNV, Rhode Island Commercial Food Service Equipment ISP, August 2023	The study characterized industry standard practice in RI for commercial kitchen equipment by incorporating the 2023 appliance standards and prevalence of used equipment in the marketplace.	C&I
Cadeo, Small Business Program Process Evaluation, August 2023	The study assessed program activities and identified opportunities for program enhancement for the small business program.	C&I
BW Research Partnership, Rhode Island Energy Workforce Development, August 2023	The study quantified the current energy efficiency workforce in RI, identified needs and opportunities for the future, highlighted workforce development gaps and potential solutions, and identified potential roles for RI Energy in supporting energy efficiency workforce development in RI.	Cross-Cutting

2022		
Study	**Impact Descriptions**	**Sector**
DNV, C&I Lighting Market Characterization and Adjusted Measure Life Study, August 2022	The study calculated adjusted measure lives for non-residential custom and prescriptive lighting measures for RI.	C&I
DNV, Impact Evaluation of PY2020 Custom Gas Installations, August 2022	The study updated realization rates for custom gas projects, as part of a rolling effort that incorporated results from PY2018, PY2019, and PY2020.	C&I
DNV, Impact Evaluation of PY2020 Custom Electric Installations, August 2022	The study updated realization rates for custom electric projects, as part of a rolling effort that incorporated results from PY2018, PY2019, and PY2020.	C&I
DNV, Rhode Island Cannabis Industry Standard Practice, August 2022	The study identified industry standard practices for the medical market cannabis industry with a focus on horticultural lighting, lighting controls, cultivation area HVAC, HVAC controls, and dehumidification.	Cross- Cutting
Cadeo, Nonparticipant Market Barriers Study, June 2022	The study characterized the customer groups not participating in Rhode Island Energy's energy efficiency programs, determined barriers to participation, and identified opportunities to engage nonparticipants.	Cross- Cutting
Cadeo, Participation and Multifamily Census Study, June 2022	The study identified trends and drivers in participation and the likelihood of nonparticipants opting into a residential program in the future. The study also developed an algorithm to identify multifamily buildings suitable for RIE's multifamily programs.	Cross- Cutting
Guidehouse, Rhode Island 2021 Energy Efficiency Workforce Analysis – Final Report, May 2022	This study quantified the workforce that was involved in delivering The Narragansett Electric Company's Rhode Island programs in 2021. The workforce analysis reported the number of jobs associated with the programs, compared them to past years, and provided narrative context for those findings and observations.	Cross-Cutting
DNV, O&M and Non-O&M NEI Study (MA20X10-B-CIOMNEI), October 2021	This study developed O&M and non-O&M non-energy impacts (NEIs) across all C&I measures and programs.	C&I
2021		
Study	**Impact Descriptions**	**Sector**
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.	C&I

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.	C&I
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.	C&I
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.	C&I
NMR, 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.	Res
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.	C&I
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.	C&I
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.	C&I
DNV, NRNC Market Characterization Study, June 2021 (Leveraged study from MA)	This study produced factors to be applied to IECC 2015-based code LPD to determine baseline LPD requirements.	C&I
DNV, Energy Management System ISP Study, 2021 (Leveraged study from MA)	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.	C&I
DNV, C&I HVAC NTG & Market Effects Measurement, 2021 (Leveraged study from MA)	This study established Net to Gross Ratios for six technologies supported by the Upstream HVAC Initiative.	C&I
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.	Res

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.	Res
NMR, Low Income Multifamily Health NEI (TXC 50), July 2021 (Leveraged study from MA)	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.	Res
NMR, Residential New Construction Quick Hit NEI Study (MA20X14-RNCNEI), September 2021 (Leveraged study from MA)	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.	Res
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.	Res
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.	Res
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.	Res
Guidehouse, Impact Analysis of Residential Wi-Fi Thermostats, September 2021 (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.	Res
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.	Res
Synapse Energy Economics, Avoided Energy Supply	This study developed new estimates of avoided costs associated with energy efficiency measures for program administrators throughout New England States. Rhode Island	All

Components in New England 2021 Report. May 2021.	used the avoided costs of energy, capacity, natural gas, fuel oil, environmental costs and demand reduction induced price effects resulting from this study for 2022 program planning.	
2020		
Study	**Impact Descriptions**	**Sector**
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.	Res
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.	Res
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.	Res
Cadeo, Impact Evaluation of Home Energy Reports Program 2017-2019, September 2020.	This study updated realization rates for the Home Energy Reports program.	Res
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.	Res
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.	C&I
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.	C&I
Tetra Tech, C&I Free-Ridership and Spillover Study, September 2020.	This study updated free-ridership and spillover rates for the C&I program	C&I
The Brattle Group, The Road to 100% Renewable Energy by 2030 in Rhode Island, December 2020.	This study provided a high-level economic analysis of the key factors that will guide RI to meet 100% of the state's electricity demand by 2030 through renewable generation and efficiency. The study updated economic impact multipliers to quantify the benefits of future EE programs in the Rhode Island economy.	All

2019		
Study	**Impact Descriptions**	**Sector**
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.	Res
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.	Res
2018		
Study	**Impact Descriptions**	**Sector**
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.	C&I
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.	C&I
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.	C&I
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.	C&I
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.	C&I
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.	Res

Cadeo, Rhode Island Impact Evaluation of Income Eligible Services Single Family Program, August 2018	This study produced 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.	Res
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.	Res
NMR/DNV GL, TXC29 Market-Rate Rental Property NEI Study (Phase 1), March 2018	This study identified and analyzed NEIs associated with market-rate multifamily properties.	Res
2017		
Study	**Impact Descriptions**	**Sector**
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.	Res
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.	C&I
DNV-GL, MA C&I Steam Trap Evaluation Phase 2, Feb, 2017	This study updated steam trap savings estimates.	C&I
DNV-GL, Gas Boiler Market Characterization Study Phase II: Final Report, March 2017	This study updated C&I condensing boiler savings estimates.	C&I
DNV-GL, MA45 Prescriptive Programmable Thermostats, March 2017	This study updated programmable thermostat deemed gas savings for C&I programs.	C&I
2016		
Study	**Impact Descriptions**	**Sector**
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.	C&I
DNV-GL, Impact Evaluation of 2012 National Grid-Rhode	This study yielded an energy realization rate for prescriptive chillers.	C&I

Island Prescriptive Chiller Program Final Report, July 2016		
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.	C&I
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.	C&I
2015		
Study	**Impact Descriptions**	**Sector**
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.	C&I
2014		
Study	**Impact Descriptions**	**Sector**
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.	C&I
2012		
Study	**Impact Descriptions**	**Sector**
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.	C&I

2011		
Study	**Impact Descriptions**	**Sector**
KEMA, Inc., C&I Unitary HVAC Loadshape Project Final Report, Prepared for the Regional Evaluation, Measurement, and Verification Forum, June 2011.	This study produced updated diversity and equivalent full load hours for unitary HVAC measures using end use metering.	C&I
NMR/TetraTech, MA Special and Cross Sectors Studies Area, Residential and Low-Income NEI Evaluation, August 2011	This study quantified NEIs that apply to residential and low-income programs.	Res
2010		
Study	**Impact Descriptions**	**Sector**
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.	Res

5 2024 Evaluation Study Findings

5.1 Rhode Island-Specific studies

Commented [RIE8]: Example from 2024 Plan, will be updated for recently completed studies and studies adopted from MA.

RI-21-RX-CSNC - Residential New Construction and Code Compliance Study

Type of Study: Impact/Market
Evaluation Conducted by: Cadeo/NMR
Date Evaluation Conducted: May 2023

Evaluation Objective and High-Level Findings:
The primary objectives of this study included:

- Updating the baseline efficiencies for measures included in the UDRH.
- Estimating average code compliance for homes built under the Rhode Island State Building Code – 8 Energy Conservation Code.
- Comparing non-program on-site data to program home data, as well as comparing those to results from previous baseline studies.
- Understanding the extent to which building departments keep thorough and accurate records that could inform baseline efficiencies.

The key findings from the study include:

- Non-program HERS scores have only improved slightly since the previous 2017 baseline study (2017 Baseline HERS score = 73 vs 2022 Baseline HERS score = 71).
- Most measure level efficiencies have improved since the previous 2017 baseline including all building shell R-values; however, some measures have decreased in efficiency (measure level percent improvements shown in *Table 5* below).
- Program homes continue to outperform non-program homes, but the margin is decreasing. (Program homes HERS score = 61 vs non-program homes HERS score = 71).
- Overall code compliance has increased since the previous study among non-program homes, and it is higher among custom built homes than spec homes (code compliance for custom homes = 90%, spec homes = 85%, and statewide homes = 87%).
- Windows and air leakage had the highest rate of code compliance, and duct leakage the lowest (measure level code compliance is illustrated in *Table 6*).
- The recommended UDRH update inputs are highlighted below in *Table 7.*

Table 5. Measure Level Efficiencies Percent Improvement

Measure	% Improvement
Conditioned foundation wall	57%
Frame floor	29%

Measure	% Improvement
Vaulted ceiling	20%
Air leakage	13%
Flat ceiling	7%
Cooling efficiency	7%
Above grade wall	7%
Duct leakage to outside	3%
Heating efficiency	-1%
Total duct leakage	-19%
DHW efficiency	-35%

Table 6. Measure Level Code Compliance

Measure	% Compliant
Windows	97%
Air leakage	95%
Foundation walls	94%
Above grade walls	91%
Slabs	89%
Total	87%
Frame Floors	82%
Ceiling	81%
Duct leakage	68%

Table 7. Recommended UDRH Inputs

	Units	2017 Baseline	Recommended URDH Input
Above grade wall	R-value	19.8	21.3
Flat ceiling	R-value	36.1	39.0
Vaulted ceiling	R-value	29.4	36.9
Frame floor	R-value	20	28.1
Conditioned foundation wall	R-value	7.9	18.2

	Units	2017 Baseline	Recommended URDH Input
Duct leakage to outside	CFM25/ 100 sq. ft.	8.6	8.3*
Total duct leakage	CFM25/ 100 sq. ft.	20.6	24.6*
Air leakage	ACH50	5.3	4.6
Heating efficiency	AFUE	92.1	91.4
Heating efficiency (fossil fuel)	AFUE	NA	91.4
Heating efficiency (electric)	HSPF	NA	10.3
Cooling efficiency	SEER	13.7	14.8
DHW efficiency	EF	1.38	1.02
DHW efficiency (fossil fuel)	EF	NA	0.89
DHW efficiency (electric)	EF	NA	1.35

*Two outliers identified and removed. No other outliers identified for other measures.

Programs to which the Results of the Study Apply:
The results of this study are applicable to Residential New Construction (RNC) measure savings and results may inform RNC program strategy.

Evaluation Recommendations included in the Study:
Cadeo/NMR recommends the following:

- Focus code compliance training activities on measures with the lowest levels of compliance, specifically duct leakage. Compliance has dropped for duct leakage since the previous baseline from 72% to 68% and a majority (93%) of homes sampled in this study had ducts, presenting a large opportunity to increase compliance. Ceilings and frame floors continue to have lower compliance so should continue to be a focus in these trainings as well.
- The program should consider increasing the stringency of program requirements to increase the overall performance of program homes over the general market, otherwise program savings may decrease. This may involve increasing the minimum % savings thresholds for program Tiers or adopting a pay for performance type model similar to the Massachusetts program.
- Increase incentives outside of the RNC program (downstream or midstream) for heat pump water heaters above the level of gas tankless models, or drop gas tankless incentives entirely, to drive adoption in new homes. While a builder or homeowner may not decide to participate in the RNC program for the whole home, they may decide to purchase an incentivized piece of equipment. Decreasing the upfront cost of HPWHs through incentives will make them a competitive choice for water heating.
- Focus code official trainings on consistently collecting third party verification of energy code compliance such as prescriptive checklists, blower door and duct blaster results, IECC certificates, or HERS ratings. Collecting building department data to inform UDRH values in future RNC baseline studies is still a worthwhile endeavor, but data from third party verified sources should be prioritized.

Explain Whether or Not Rhode Island Energy (RIE) Decided to Adopt Recommendations from the Study:
RIE is considering the recommendations for implementation into the RNC program and have adopted the savings impacts from the updated UDRH.

Savings Impact:
The RNC measures savings decreased by 2.37% for heating measures, 2.76% for cooling measures, 2.72% for hot water savings, and 2.50% for appliance measures based on the updated UDRH.