Regional End Use Load Profile Data Inventory and Needs Assessment

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About NEEP

Founded in 1996, NEEP is a non-profit whose goal is to assist the Northeast and Mid-Atlantic region to reduce building sector energy consumption at least three percent per year and carbon emissions at least 40 percent by 2030 (relative to 2001). Our mission is to accelerate regional collaboration to promote advanced energy efficiency and related solutions in homes, buildings, industry, and communities. We do this by fostering collaboration and innovation, developing tools, and disseminating knowledge to drive market transformation. We envision the region's homes, buildings, and communities transformed into efficient, affordable, low-carbon, resilient places to live, work, and play. To learn more about NEEP, visit our website at http://www.neep.org.

Executive Summary

Purpose: This report provides a summary assessment of end use load profile (EULP) data currently available in Massachusetts, New York, and the Northeast region and identifies regional needs for EULP data in order to guide recommendations for future priority EULP research. As background, EULPs quantify how and when energy is used on a granular (end use/subsector) level. This information is important to many energy and environmental stakeholders in the Northeast and nationally. The report highlights how quality EULPs can contribute to the energy industry in many ways, including providing a better understanding of the value of energy efficiency, demand response, and other distributed resources, and helping with planning and forecasting efforts.

Scope: NEEP engaged in three main research efforts to produce this report: 1) development of a regional data inventory, 2) a stakeholder survey to identify and explore key needs for EULPs (use cases), what EULPs may be available from diverse sources, and whether the national EULP study (currently being conducted by the U.S. DOE, National Renewable Energy Laboratory (NREL), and Lawrence Berkeley National Laboratory (LBNL)) will meet regional needs, and 3) interviews with stakeholders throughout the region to further explore EULP data needs and priorities. The findings from these three research efforts provide the basis for the report's conclusions and recommendations.

Key Findings:

- NEEP's research to populate the regional EULP data inventory identified some energy efficiency program evaluations that included metering data, but publicly available EULP data is in relatively short supply across the region. Most evaluation studies that involved metering were conducted by states with relatively large energy efficiency program and evaluation budgets (for example Massachusetts and New York).
- Data sharing arrangements across states could be beneficial, particularly in states with limited budgets, given the high cost of conducting metering studies. The further development of data sharing guidance, along the lines of NEEP's May 2020 report: Sharing Load Profile Data: Best Practices and Examples, could facilitate more widespread development and use of EULP data.
- The stakeholder survey and key stakeholder interviews demonstrated that there are both unmet needs for EULP data and gaps in available data. Needs for EULP data will continue to increase in the near future. The national EULP study will meet some of these regional needs, but there are opportunities for research specific to the Northeast region. NEEP identified the following potential areas for future regional projects/research: 1) more detailed, equipment-specific EULPs, 2) EULPs for measures not included in the national study, 3) understanding individual customer variability in loads, 4) collection of advanced metering infrastructure (AMI) and metadata, 5) data sharing to drive usage and innovation, 6) applications of load profiles to assess flexible demand, and 7) data privacy policies.

Introduction

End use load profiles (EULPs) quantify how and when energy is used. This information is important to many energy and environmental stakeholders in the Northeast region and nationally. There are many ways that high quality EULPs contribute to the energy industry. They are important to better understand the value of energy efficiency, demand response, and other distributed resources, and can help with planning and forecasting needed to design strategies.[1] For example, availability of load profiles on a granular (end use/subsector) level will help a great deal in standardization while still keeping information relevant to the region.

Massachusetts and New York are two states with many existing and emerging state and local energy and carbon reduction policies and programs focusing on the buildings sector. These states can benefit from load profiles that display energy consumption patterns in buildings because buildings have significant potential to reduce carbon emissions and efficient buildings with flexible load can serve as grid assets. Many of these interests and needs are shared by other states in the Northeast. As noted by one stakeholder, "we need to better understand impacts and value of load management, including emissions impacts and resilience aspects, in order to better design policies and regulations." Currently, from the national perspective, publicly available EULPs have limited applications because of age and incomplete geographic representation across the country.

The purpose of this report is to provide a summary assessment of EULP data available to Massachusetts, New York, and the Northeast region and to identify and explore key needs for EULPs (use cases). These findings provide the basis for the report's recommendations about gaps in EULP data and needs. A follow-up report planned for later in 2021 will provide more detailed recommendations for supplemental EULP research and recommendations for the facilitation of data sharing.

This report is the product of research related to an ongoing national study, the U.S. Department of Energy-funded ***End-Use Load Profiles for the U.S. Building Stock***. The national study will produce EULPs at an aggregate level in one or more customer segments in a region or service territory, as well as EULPs at the individual building level. These will be developed using building stock models augmented by stochastic occupant behavior models. Data for model inputs and calibration are being collected from around the country. NEEP is among the organizations participating in and informing the national study.[2] AmplifyMass and NYSERDA are funding NEEP's participation in the national project and NEEP's efforts for the regional assessment.

Approach

To inform our assessment of data availability and needs in the Northeast region, NEEP first identified some key needs for EULPs (use cases). These were then tested for their relative priority level via a stakeholder survey targeted to members of the Northeast Regional Advisory Committee (NE-RAC) and other regional stakeholders with potential interest in load profile data. We compiled the results of this survey and reviewed findings with the NE-RAC. NEEP also conducted interviews with NE-RAC members and others across the region to better understand regional needs for EULP data and gaps in existing data sources that are a priority to fill with future research.

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[1] See Caputo, Sam, Building Decarbonization Public Policy Framework, NEEP, 2019 for additional discussion.
[2] For more information about the national project, see the End Use Load Profiles for U.S. Building Stock project website.

NEEP also developed an inventory of evaluation studies from Massachusetts, New York, and the greater Northeast region through website research and guidance from NE-RAC members and energy program evaluation contacts associated with utilities throughout the Northeast region. The results of this inventory are located in Appendices A, B and C: Massachusetts, New York, and Multi-State Study Tables. NEEP took a broad geographic approach and researched studies in states across the region in recognition that EULPs are often transferable, and that some key users of EULPs are active in a regional context and can sometimes leverage data from nearby sources. For example, ISO-New England operates in multiple states and can extrapolate data from one state for analysis in another. Furthermore, various utilities in the region operate in multiple states.

The national study is developing many EULPs that will be available for the Northeast region by the end of 2021 and has identified various kinds of data from the Northeast, which helps inform our inventory and assessment.

Integration of National and Regional Studies

NEEP's assessment of EULP data availability and needs in the region is taking place in the context of the national study. NEEP assists the national study by bringing regional data sources and information needs to the national study and by providing relevant information from the national study to Massachusetts and New York. NEEP has been able to leverage and build on work that has been done by the national study.

NEEP serves on the national study's technical advisory group. At the outset, NEEP participated in a survey identifying use cases for EULPs. NEEP has also been facilitating the national study's data collection efforts in various ways. For example, we have inquired about sources of relevant data, shared information about publicly available data sources, and introduced members of the national study team to regional stakeholders with relevant data.

NEEP has followed a similar approach to the national study, including selecting a diverse advisory group to help guide the project, establishing the use cases for EULPs that are important to stakeholders, examining data requirements needed for the use cases, and searching for or identifying sources of EULP data.

Northeast Regional Advisory Committee (NE-RAC)

NEEP is drawing upon the experience of the diverse NE-RAC to guide many aspects of the project, including serving as information sources and in prioritization. NEEP formed this group using a combination of broad and targeted outreach to ensure a committee that represents stakeholders specific to Massachusetts and New York, as well as stakeholders with expertise spanning other Northeast states. In addition, we sought diversity in types of affiliations and perspectives on uses of load profile and meter data. Three members of the NE-RAC also belong to the national study's advisory group.

End Use Load Profile (EULP) Development

End use load profiles can be developed in various ways, such as: 1) sub-metering a sample of buildings, 2) top-down modeling based on whole-building metering (e.g., conditional demand analysis), and 3) bottom-up engineering modeling (with or without using sub-metering or whole-building metering data for validation). The data needs for bottom-up engineering modeling, which is the national study's primary approach, fall into four basic types: weather and location data, building characteristics data, end-use energy consumption data, and population-level whole-building data. It requires detailed knowledge about the characteristics of buildings that can be constructed from many sources. The bottom-up engineering model approach used by the national study

greatly reduces the amount of measured data necessary to complete the study when compared to a purely data-driven approach. The national study uses weather data based on the National Oceanic and Atmospheric Administration's (NOAA) Integrated Surface Database and the National Weather Service stations. For building characteristics data, it relies primarily on public or commercially available sources, specifically saturation and survey data from a variety of sources, including the U.S. Energy Information Administration (EIA), U.S. Census, and real estate organizations.

When using the pure sub-metering approach to characterize a profile within a sector or region, a statistically selected subset of buildings is sub-metered and results are extrapolated. This can yield a high degree of accuracy, but the high costs required for sufficient sample sizes are a constraint. This approach is commonly applied in energy efficiency program evaluations as well as in baseline studies conducted for utilities. For program evaluation, the focus has been on savings loadshapes, which are end use profiles developed by comparing a pre-installation estimated baseline pattern of consumption with the observed post-installation profile. For some measures, savings loadshapes are transferable and can be assumed to have the same shape as end use profiles, but for measures such as electrification with heat pumps, thermostat controls, lighting controls, and so on, the baseline end use profiles and savings loadshapes differ. The bottom-up engineering approach can also produce loadshapes for energy efficiency savings, building electrification, and demand flexibility measures, although doing so is not in the scope of the current national study.

Inventory of EULP Data Sources

The inventory of evaluation studies from Massachusetts, New York, and the greater Northeast region that NEEP developed includes studies with end-use energy consumption data, population-level whole-building data, and related end-use metering, e.g. energy efficiency program evaluations. To develop the inventory, NEEP conducted website research and reached out to NE-RAC members and related informants as well as energy program evaluation contacts associated with utilities throughout the Northeast region. NEEP supplemented this with results of the national study's extensive data collection effort and the preexisting NEEP Repository of Evaluation Studies and NEEP Loadshape Report and Data Catalog.[3]

In our search for EULP data sources, we looked for whole-building metering studies, such as from AMI, as well as sub-metering studies. This is because end use load profiles can be developed from both types of metering. While our focus is on Massachusetts and New York, our search included other states in the Northeast region, recognizing that in many cases load profiles are transferable from one location to another with little or no adjustment. Another important consideration was data accessibility. Sometimes the most granular data is inaccessible, but aggregations or parameters based on metering results are publicly available. Our primary focus was on publicly available data, recognizing that further study would be required to assess whether barriers to access could be overcome.

The national study also developed an End Use Load Profile Inventory that includes data sources for end use load profiles in locations beyond the northeast region.

[3] All of NEEP's loadshape-related projects are available here: https://neep.org/advanced-emv-forecasting-and-planning-solutions/emv-products

Stakeholder Survey

In addition to the data inventory, NEEP developed a stakeholder survey to efficiently gather feedback on many aspects of the regional study, in particular to help identify end use load profile data needs and priorities. The survey also collected information useful to the national study's ongoing data collection effort. Topics in the survey included: use case identification, use case data requirements, preliminary assessment of Northeast priority needs, national study data needs, and experience with data sharing.[4] NEEP sent the survey to all NE-RAC members. To cast as broad a net as possible, NE-RAC members were invited to distribute the survey to others within or outside of their organization whom they thought could provide helpful information. As a follow-up to the survey, NEEP conducted phone interviews with stakeholders throughout the region for more detailed discussion about the survey questions and current and potential EULP needs.

Data Inventory Findings

In order to better understand the extent of publicly available EULP data and reveal gaps in available data that could help prioritize future research, NEEP developed a comprehensive inventory of energy efficiency evaluation studies in New York, Massachusetts, and the broader Northeast region, focusing on studies most relevant to our regional assessment of EULP data needs and gaps.

NEEP used its Repository of EM&V Studies, Reports and Evaluations and Loadshape Report and Data Catalog as a starting point for the data inventory effort. The NEEP repository was developed in 2009 and consists of an Excel workbook with a worksheet for each state that includes direct links to state Technical Reference Manuals, if available, and links to known energy efficiency evaluation studies and reports dating back to 2004. The repository also contains a topical *Load Shape* studies worksheet and a *Multi-State* studies worksheet. NEEP focused on adding studies to the repository that were completed in late 2017 through 2021 since the most recent Repository update had been in November 2017.

The Loadshape Report and Data Catalog focuses specifically on metering-based studies performed in the region. Criteria for inclusion in the catalog included: parameters to be based on primary data collected for the study or vetted for relevance and included in the study, at least 10 sample points for simple end uses (e.g. indoor lighting) and at least 15 sample points for more complex end uses (VFDs or refrigeration). The catalog includes parameters from 31 studies performed between 2009 and 2016 that cover diverse measures in the residential and commercial and industrial (C&I) sectors. All of the studies in the Loadshape Data Catalog can also be found in the repository.

In order to find recently completed studies across the region, NEEP engaged in internet research and queried evaluation contacts from energy efficiency program administrators in each state. NEEP added the recent studies to the NEEP repository and also created state-specific tables listing recent studies relevant to this regional EULP data assessment. The tables include links to and information about the studies including: study title, state/program administrator, date, sector, study type (i.e. impact or process evaluation, market characterization), program & end use, study summary, meter data, and author. NEEP created individual tables for New York and Massachusetts, and a multi-state table for studies from other states in the region. These tables

[4] Data sharing guidance is another task in the regional project and is also a topic of interest in the national project. See the 2020 NEEP report: Sharing Load Profile Data: Best Practices and Examples

are provided in the Appendices to this report: Appendix A: Massachusetts Studies, Appendix B: New York Studies, and Appendix C: Multi-State Studies. Summaries of the data inventory findings in each state are outlined in the following sections.

Table 1 identifies the sectors and end uses studied in recent Massachusetts and New York evaluation reports that have been added to the repository and are relevant to EULP needs, organized by state and year.

Table 1: Repository Additions: Studies Relevant to EULP Needs in MA and NY

Program Administrator Evaluation Reports		Massachusetts			New York		
Year Published	End Uses	C&I	Small C&I	Residential	C&I	Small C&I	Residential
2020	Lighting			X			
	Appliances and Equipment	X	X	X	X		X
	Whole Building	X		X			X
	Demand Reduction			X			
	Solar PV			X	X	X	X
2019	Lighting	X			X		
	Appliances and Equipment	X		X	X		X
	Whole Building			X	X		
	Demand Reduction	X		X			X
	Solar PV						
2018	Lighting		X		X	X	X
	Appliances and Equipment	X		X	X		
	Whole Building			X	X	X	X
	Demand Reduction	X					X
	Solar PV				X	X	X
2017	Lighting						X
	Appliances and Equipment						X
	Whole Building	X					X
	Demand Reduction	X					

	Solar PV						

Table 2 identifies the sectors and end uses studied in recent evaluation reports in Maine, New Hampshire, and Vermont that have been added to the repository and are relevant to EULP needs, organized by state and year.

Table 2: Repository Additions: Studies Relevant to EULP Needs in Maine, New Hampshire and Vermont

Program Administrator Evaluation Reports		Maine			New Hampshire			Vermont		
Year Published	End Uses	C&I	Small C&I	Res	C&I	Small C&I	Res	C&I	Small C&I	Res
2020	Lighting									
	Appliances and Equipment						X			
	Whole Building									
	Demand Reduction					X				
2019	Lighting									
	Appliances and Equipment			X	X			X		
	Whole Building									X
	Demand Reduction									
2018	Lighting					X				
	Appliances and Equipment						X			X
	Whole Building									
	Demand Reduction									X
2017	Lighting									

	Appliances and Equipment	X					X			
	Whole Building									
	Demand Reduction									

Table 3 identifies the sectors and end uses studied in recent evaluation reports in Connecticut and Rhode Island that have been added to the repository and are relevant to EULP needs, organized by state and year.

Table 3: Repository Additions: Studies Relevant to EULP Needs in Connecticut and Rhode Island

Program Administrator Evaluation Reports	End Uses	Connecticut			Rhode Island		
Year Published		C&I	Small C&I	Res	C&I	Small C&I	Res
2020	Lighting				X		
	Appliances and Equipment	X			X		
	Whole Building				X		
	Demand Reduction						
2019	Lighting						
	Appliances and Equipment			X	X	X	
	Building						
	Demand Reduction			X			X
2018	Lighting				X		
	Appliances and Equipment	X		X			X
	Building						
	Demand Reduction						X
2017	Lighting						
	Appliances and Equipment				X		
	Building						
	Demand Reduction						

The following sections provide more information about how each state in the region provides publicly available evaluation study information, including studies relevant to EULP data needs.

Data Availability and Priorities

Massachusetts

The Massachusetts Energy Efficiency Advisory Council (MA EEAC) posts all completed evaluation studies on its studies website, which makes it very easy to find and utilize publicly available EULP information. Massachusetts' collaborative approach to administering and evaluating energy efficiency programs under the MassSave umbrella also provides for greater transparency and accessibility to program materials. Evaluation studies on the MA EEAC website are organized by sector, with a *special* and *cross-sector* category to capture broader studies that cut across sectors. Massachusetts has a robust approach to energy efficiency evaluation, with an annual evaluation budget that exceeds neighboring states. This places Massachusetts as a regional leader in the scope of evaluation studies it completes each year. Highlights of recent Massachusetts studies that are included in the Massachusetts study table (Appendix A) and relevant to our assessment of regional EULP data availability include:

- Three-Year Massachusetts Residential Baseline study: This three-year study started in 2018 and has collected saturation, penetration, and usage behavior data for all major electric and gas appliances, mechanical equipment, and electronics in Massachusetts homes. The data supports energy and peak demand savings calculations for program evaluation and design, and provides additional insight on the savings potential in the existing residential buildings market. Study methods included an online survey and metering of sampled homes. In the first year of the study, study author Navigant surveyed thousands of Massachusetts residents about their household appliances and energy use and metered 25 end uses at over 350 homes. In the second year and third year of the study, Guidehouse (formerly Navigant) repeated and continued the same data collection activities to calculate updates and changes in saturation and load shapes. The yearly reports allow for a side-by-side breakdown of residential energy usage by appliance in Massachusetts.
- Massachusetts Non-Residential New Construction EUI Baseline Study - Revised Results: This study's primary objective was to assess whether the Massachusetts data warehouse maintained by DNV GL can be used to estimate energy use intensity (EUI) baselines for various building types, identify supplemental information that may be needed to support the creation of the EUIs, and conclude whether the above methods will work. DNV GL was able to generate less variable EUI estimates for most building-use size categories but only had access to little or no data for large new construction such as hospitals, colleges, and other campuses.
- Lighting Hours of Use (HOU) Study: The primary objective of this project was to develop building level annual hours of use estimates for estimating savings for the upstream lighting program offering. Massachusetts was considering moving away from product-specific annual HOU estimates to building level HOU estimates to improve customer targeting and align with commercial lighting best practices. This was also in response to recent evaluation findings and feedback to leverage upstream leads to get deeper energy efficiency savings. The study used site level lighting fixture savings results from all of the

C&I lighting impact evaluations conducted in Massachusetts since 2010. DNV GL performed a thorough review of completed impact evaluation projects to identify known sources of lighting fixture savings profiles. In total, 458 unique sites were metered and evaluated by the DNV GL team during this period.

- Residential Lighting Hours of Use (HOU) Quick Hit Study: This was an update to the 2014 HOU study to accommodate the residential lighting market's period of rapid change, with LEDs now the dominant technology. Building on the 2014 Lighting Hours of Use study, this study explored the relationship between saturation and HOU to aid in updating HOU estimates for program-supported LEDs for the 2019, 2020, and 2021 program periods.
- 2019/20 Residential Energy Storage Demand Response Demonstration Evaluation: This study evaluates National Grid's and Unitil's battery response demonstrations during the winter of 2019-2020 to determine the validity of battery response programs for reducing system peak demand and flattening the solar PV output curve for residential customers. The study found the program saved 559 kW per demand response event on average, and batteries that participated in events saved an average of 6.9 kW per device.

Outside of formal evaluation studies, advanced metering infrastructure (AMI) is starting to be used by some municipal utilities across the region and can be helpful when developing load profiles, even though it is whole building data, not end use data. In recognition of this, NEEP contacted municipal utilities across Massachusetts to ask whether they are currently using AMI or have future plans to do so. We found that four municipal utilities currently store and use AMI data because it can aid in the event of outages and provides services for residents.[5] These municipalities are Braintree Electric Light Department, Danvers Electric Division, Groton Electric Light, and Groveland Municipal Light Department. Three municipal utilities in Massachusetts plan to use AMI in the coming years. Of these, two have pilots in place to test the technology. The third municipal utility's meters were at the end of their useful life, and they were able to upgrade the whole system with AMI meters. Many municipal utilities that did not have AMI capabilities were open to installing meters. One municipal utility indicated that while there are no plans to incorporate the technology, customers have been asking for the type of information that can be provided by AMI (more information on billing, storage, etc.). Another stated that a major barrier to deployment is the cost. While AMI data is not widespread at this time in Massachusetts, it may become a rich data source in the future.

Massachusetts' Recent Data Priorities

NEEP's review of Massachusetts studies shows a robust approach to program evaluation with a broad array of study types and examined end-uses. Table 1 shows that Massachusetts has completed studies in each of the end-use categories we identified in our review: lighting, appliances and equipment, whole building, demand reduction, and solar PV.

Notably, Massachusetts is the only state to study and publish a year-by-year residential baseline comparison in the Three-Year Massachusetts Residential Baseline study. This allows for a side-by-side breakdown of residential

[5] Groveland Municipal Light Department uses its AMI system to do an on-demand meter read in the event on is needed (i.e. a customer is moving.)

energy usage by appliance in Massachusetts. With this data, utilities, program administrators, and state policy makers can make more informed decisions about how to change energy usage in the state.

Massachusetts has also prioritized evaluating future technologies that look to reduce or manage peak consumption and incorporate more grid interactive technology. Example studies include the 2019 Residential Wi-Fi Thermostat Direct Load Control Offering Evaluation and the 2019/20 Massachusetts Winter Thermostat Optimization Evaluation which examine customer adaptation and the impact of thermostats on savings. Also, the 2019/2020 Residential Energy Storage Demand Response Demonstration Evaluation – Winter Season report evaluated solar and battery technology to determine the validity of battery response programs for reducing system peak demand and flattening the solar PV output curve for residential customers.

In addition to contributing to its own state programs, Massachusetts has invested in long-term studies that provide valuable data that other states can utilize. For example, other states looking to incorporate heat pump technology into building electrification strategies have utilized Massachusetts studies in recent years. For example:

- Rhode Island's Impact & Process Evaluation EnergyWise & Income Eligible Multifamily Programs National Grid Rhode Island and Impact & Process Evaluation EnergyWise Single Family Program National Grid Rhode Island used pre- and post-retrofit wattages gathered by multifamily assessors and location-based hours-of-use values from a recent multifamily metering study in Massachusetts.
- Connecticut's R1617 Connecticut Residential Ductless Heat Pumps utilized metered data from a 2016 study of ductless heat pumps in Massachusetts and Rhode Island.

Massachusetts also developed its own C&I loadshape tool for prescriptive C&I measures. The tool was developed primarily to divide energy savings into four annual periods, but it can be used to develop demand loadshapes as well. It was developed by DNV GL using loadshape data collected as part of Massachusetts evaluation studies.

New York

In New York, program administrators file evaluation, measurement, and verification (EM&V) plans and final reports in the New York Department of Public Service's (NY DPS) Document and Matter Management (DMM) System under designated matter number 16-02180. This centralized website supports transparency of New York's EM&V activities by providing public access to the reports. It also allows program administrators and other New York stakeholders to track EM&V plans and results. While it's helpful to have the plans and reports in one location, the website can be challenging to navigate. Documents are listed by date published and study title. There is no ability to filter studies by end use or sector. The majority of the studies in the New York data inventory table were pulled from the NY DPS DMM matter number 16-02180.

The New York State Energy Research and Development Administration (NYSERDA) posts its evaluation studies on its Program Planning, Status, and Evaluation Reports website. Most of these studies, however, are not relevant to this EULP data assessment as they evaluate aspects of program implementation and do not involve metered data.

Highlights of recent New York studies that are relevant to our assessment of regional EULP data availability include:

- SmartCharge Electric Vehicle Program Impact Evaluation: This report describes the results and findings from an impact evaluation of Con Edison's 2018 SmartCharge NY program. The program was designed to reduce electric vehicle (EV) charging during Con Edison's peak period. This evaluation focuses on the private vehicle portion of the program, which uses a FleetCarma C2 device to record program participant EV charging events. The impact evaluation calculated the peak demand reductions attributable to the program for two peak periods: the NYISO peak period and the Con Edison summer weekday peak period.
- Energy Efficiency Portfolio Standard (EEPS) Commercial and Multifamily Close-out Impact Evaluation: This study is the close-out impact evaluation of three NYSERDA EEPS-funded legacy programs: 1) the Existing Facilities Program (EFP), including National Fuel Gas Distribution Corporation's (NFGDC) Non-Residential Rebate Program, which was administered by NYSERDA, 2) the Multifamily Performance Program (MPP), and 3) the Commercial New Construction Program (CNCP). The evaluation of EFP and the NFGDC's Non-Residential Rebate Program was a joint NYSERDA-utility effort, with NFGDC as the lead participant on its rebate program with respect to post EEPS program years. The study evaluates gross energy impacts, develops realization rates, and applies lessons learned to other programs. Findings are based on desk review, billing analysis, energy modeling and metering.
- NY-Sun Solar Photovoltaic Program Impact Evaluation for 2011-2016 and NY-Sun Solar Photovoltaic Program Impact Evaluation for 2016–2018. These reports present the impact evaluation of solar photovoltaic (PV) projects installed under NYSERDA's NY-Sun program. New York and Massachusetts are the only states to collect solar PV that we came across in our review. As renewable energy becomes more of a priority, these studies can be referenced or modeled in other states that are looking to use the technology.
- Con Edison Pilot Residential Weatherization Program – 2018 Preliminary Impact Evaluation: This preliminary evaluation covered the initial group of homes treated by the Con Edison Pilot Residential Weatherization Program in the fourth quarter of 2018. The goal for this program is to encourage homeowners to complete thermal envelope improvements using financing and utility incentives. The primary objective was to ascertain the natural gas and electric energy savings as well as peak period natural gas and electric demand reductions from the pilot program

In addition to evaluation studies, there are several current examples of EULP-related data coming online in New York from various sources. For example, AMI is starting to be used by some utilities, which can be helpful when developing load profiles. Con Edison is using AMI in conjunction with its new pilot pay-for-performance energy efficiency program, Business Energy Pro. Another example is Pecan Street, a nonprofit that makes residential energy consumption and supply data available for research and commercial uses. Pecan Street provides both whole house and some sub-metering data. Furthermore, while universities are not a focus of this EULP data inventory, NEEP is aware that Cornell University meters some buildings as part of its energy research. Cornell stores energy data from over 1,000 meters installed across the campus. These sources may merit further investigation or a more comprehensive inventory in the future.

New York's Recent Data Priorities

In New York, the Public Service Commission has recognized the value of data to be included in evaluation studies as part of the state's Advanced Evaluation, Measurement, and Verification plan. In November 2016, the NY DPS issued updated Evaluation, Measurement and Verification Guidelines that recommend using advanced

measurement and verification (AM&V) techniques for program impact evaluation when appropriate and cost-effective. The New York Department of Public Service (NY DPS) defines AM&V as "automated M&V software, data analytics, advanced metering or sub-metering, building or home energy management systems, load monitoring systems, utilization of data science practices, and other emerging technologies."[6] The guidelines call for traditional end use metering impact evaluation studies when appropriate, but acknowledge their high expense and long timelines compared to other evaluation methods. The guidelines are cognizant of privacy concerns, encouraging evaluators to leverage data from other sources on the condition that customer privacy is ensured. This recommendation is similar to those outlined in NEEP's recent report, Sharing Load Profile Data: Best Practices and Examples. Furthermore, in August 2019, the NY DPS issued supplementary EM&V guidance determining that the wide variability in energy efficiency program realization rates warranted a greater focus on actual realized savings.[7] As part of this guidance, the NY DPS directed NYSERDA and other interested shareholders to issue guidance regarding gross savings verification.

New York priorities include using metering data to examine grid reduction and grid flexible technology, such as the SmartCharge Electric Vehicle Program Impact Evaluation, which evaluated the success of Con Edison's 2018 SmartCharge New York Program. New York has also used metering data to evaluate retrofit impacts, such as the NYSERDA Residential Retrofit Impact Evaluation Report (PY2012—2016) and Con Edison Pilot Residential Weatherization Program – 2018 Preliminary Impact Evaluation. Both used metering data to verify savings compared to estimated savings. The Con Edison report also concluded that "Metering is the most reliable method of measuring residential air conditioning use. An alternative is a large-scale billing or AMI data analysis including many homes and the entire baseline and efficient case cooling seasons."[8]

Northeast Region

Along with the New York and Massachusetts data inventory tables, NEEP created a multi-state table (Appendix C) with recent energy efficiency program evaluations from the following states in the Northeast region: Rhode Island, Maine, Connecticut, Vermont, and New Hampshire. Each of these states maintains a dedicated website where energy efficiency evaluation studies are posted and publicly available.

Rhode Island

Rhode Island's Energy Efficiency and Resource Management Council (RI EERMC) keeps all of its plans and reports centrally located on a webpage: Rhode Island Energy Efficiency & Resource Management Council: Plans and Reports. Similar to Massachusetts, Rhode Island's evaluation studies are broken into categories by program and then organized by date published.

While a majority of Rhode Island's studies that utilize metering data focus on evaluation of C&I programs, Rhode Island has also used meter data to examine grid reduction. In 2018 and 2019, Rhode Island produced studies looking at thermostat optimization as a means to reduce load. In 2018, the state released the 2017 Seasonal Savings Evaluation. The report concluded that National Grid's thermostat optimization program reduced household energy consumption and resulted in peak demand savings. In 2019, the state released the 2017 Residential Wi-Fi Thermostat DR Evaluation. This evaluation found that National Grid's ConnectedSolutions demonstration project, which tests controllable thermostats as a demand reduction technology (testing various

[6] https://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/255ea3546df802b585257e38005460f9/$FILE/CE-05-EMV%20Guidance%20Final%20%2011-1-2016.pdf
[7] http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7BB53F3D02-2292-4F10-AC79-EDBE5C0860C7%7D
[8] http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7b04E12355-B2B9-41E1-AB58-41E9137EDC2C%7d

thermostat models from multiple thermostat vendors), was successful in demand reduction and customer acceptance.

Maine

Maine also has an easily accessible website where it keeps its reports: Efficiency Maine: Reports. The website is organized by report type (annual reports, program evaluations, and legislative reports) with the reports listed by date.

Maine has taken steps recently to focus efforts on climate change, releasing Maine Won't Wait: A Four Year Plan for Climate Action, and has recently focused its data efforts on technology that will help accomplish these goals. In 2019, the state released two reports that utilized metering data to evaluate heat pump water heaters and ductless heat pumps in various climate conditions. The Efficiency Maine Trust Home Energy Savings Program Impact Evaluation used metering data to evaluate the performance of ductless heat pumps in various climates and estimate program savings. The Efficiency Maine Trust Heat Pump Water Heater Initiatives Impact Evaluation covers the impact evaluation and cost-benefit analysis of heat pump water heaters incentivized through Efficiency Maine Trust's Consumer Products Program and the Low-Income Direct Install Initiative. For this study, metering throughout the year provided the opportunity to investigate seasonal effects on heat pump water heater performance.

While it has not been collecting metering data for long, Maine's prioritization of examining heat pumps and hot water heaters demonstrates its commitment to using the data to help accelerate electrification and other state decarbonization.

Connecticut

Connecticut also has its studies centrally located on a webpage: Energize CT: Evaluation Reports and Studies. The studies are listed by date, with all appendixes listed and available. Connecticut also assigns evaluation studies identifier numbers, which can aid in reviewing and referring to the various studies. (i.e. [R1963] short-term lighting study).

Connecticut has limited studies with metering data and largely uses the data to verify energy savings of C&I projects. Similar to Maine, it has published studies examining the potential for heat pumps in the state and leveraged some metering data to look at potential next steps for its programs. In 2019, Connecticut conducted the Connecticut Residential Ductless Heat Pumps market evaluation study. While the study did not collect meter data, it relied on meter data from a previous Massachusetts study to conclude that ductless heat pumps present an opportunity in Connecticut.

New Hampshire

New Hampshire's evaluation reports are located on one central webpage: New Hampshire PUC: Completed Monitoring and Evaluation Studies. The studies are in a numbered list ranging from oldest to newest.

Similar to other states in the northeast region, New Hampshire has a limited number of metering studies. In 2020, the state released a demand reduction study utilizing battery meter data, Cross-State C&I Active Demand Reduction Initiative Summer 2019 Evaluation Report, which examined the impacts of battery storage to reduce demand on the ISO-NE Forward Capacity Market. New Hampshire is recognizing the importance of collecting metering data to help evaluate tools to create a more flexible grid.

Vermont

Vermont has two separate websites where it stores evaluation reports and plans for state efficiency programs. The Department of Public Service's Energy Efficiency Utility Performance evaluation website, Energy Efficiency Utility (EEU) Performance Evaluation, has performance evaluations for all utility energy efficiency programs in Vermont. Efficiency Vermont also has a report library: Efficiency Vermont: Library of Reports.

While Vermont has limited studies utilizing metering data, the state has started to prioritize this data more. In 2019, Vermont released the Vermont Energy Efficiency Market Potential Study. The study assessed the energy efficiency potential associated with the state's three designated energy efficiency utilities for a period of 20 years (2021–2040). The study utilized data compiled from metering studies, EM&V, and engineering algorithms to further disaggregate energy intensities into more granular end uses and technologies. Utilizing pre-existing data sets, the study disaggregated industrial and commercial uses and residential uses across the state.

Other Data Sources

In addition to researching publicly available data throughout the region for the data inventory, NEEP also included a question in the stakeholder survey to help identify potential data sources needed by the national study since extensive data is needed to inform, calibrate, and validate its models. As shown in the Type of Data column in Table 4 below, a range of whole building, sector-level, and measure-specific data would be of value to the national study. Population whole building data has value for model calibration and validation. Geographically complete AMI data sets for an entire city, county, utility territory, or other region provide an inherently unbiased perspective on that location and give insight into energy use diversity among buildings in a region. Load research data—typically developed by metering a sample of customers in each customer class—is a valuable check but is not typically categorized by commercial building type. Time series end use energy consumption data, often limited in quantity as well as quality and is generally never available for entire geographic populations of buildings, is useful to inform models about occupancy, set points, schedules, and other behavior-driven inputs. If it is available for whole populations of buildings, it could also meet calibration and validation needs.

The survey responses were not restricted to Northeast region data sources. Results are included here to illustrate the fact that a variety of relevant data sources exist. However, to a large extent, these are not publicly available.

Table 4: Survey Respondents that Have or Have Access to Data

Type of Data	Number of Respondents	Percent of Respondents
AMI data	5	24%
Load research sample data less than five years old	8	36%
Commercial building end use data (baselines, evaluation or M&V studies, occupancy patterns)	13	54%
Ducted or all heat pump market saturation, heat pump sales, or counts of rebated products more up-to-date than 2009 in the region or nationally	8	32%

Heat Pump Water Heater market saturation, sales, or counts of rebated products more up-to-date than 2009 in the region or nationally	5	22%
Smart appliance or smart thermostat metering records	8	33%
Disaggregation of whole facility metering data into end uses (e.g. Sense meter results)	4	20%
Meta data (descriptive information to support metering data (e.g. characteristics of sites)	8	38%
End use data (e.g. lighting time of use, HVAC time of use)	12	52%

The national study's November 2019 report, End Use Load Profiles for the U.S. Building Stock, also includes information in its appendices that are relevant to EULP data in the Northeast region. Appendix E identifies load research data recently completed in the Northeast and Mid-Atlantic region, including data points for the program administrator, sector, location, sample size, frequency, length of data, and year(s) collected. This overlaps with the state-specific inventory tables completed for this report. Appendix E of the national report also provides information about the sources of sub-metering data from the Northeast region that the national study used for model calibration. This includes residential sub-metering data from Clarkson University in New York, the Residential Energy Disaggregation Data (REDD) set from Massachusetts, and other end use time-series data from ecobee. Finally, the national study also identified AMI and other whole building time series data that were used in the national report, including Massachusetts loadshape data collected from 2014-2016 and Sagewell data from across New England. The national study team has also negotiated with NYSERDA to obtain commercial data from its Real Time Energy Management (RTEM) program.

The national study created an End Use Load Profile Inventory that focuses on datasets that contain hourly load profiles and are publicly available. The national study team created this inventory by updating existing lists of EULP studies with new studies that have available data. Experts at E3 and LBNL helped identify these new data sources for the inventory. This inventory is an excellent companion piece with a broader reach to NEEP's Northeast regional data inventory.

Overcoming Barriers to Data Availability

NEEP's research to populate the EULP data inventory reinforced the findings outlined in our Sharing Load Profile Data: Best Practices and Examples brief regarding barriers to data availability across the region. The brief found three principle barriers to data sharing: 1) limited data applicability, 2) challenges gaining access to data, and 3) lack of transparency. The principal barrier to end use load profile data sharing is limited applicability of existing data to diverse applications and end-user populations. The central barrier to whole building load profile data sharing is gaining access to the required source data. The final barrier, lack of transparency of the process employed to generate the source data, is common to all types of data sharing.

The brief outlined best practice guidelines for end use load profile data sharing projects in energy efficiency and related applications in the form of seven elements, 1) select the measure or end use categories, 2) define the required load profile parameters and compliance standards, 3) define the measurement boundary, 4) specify the normalization variables, 5) specify the level of site aggregation and segmentation, 6) create a flexible user

interface for the end use load profile data, and 7) explore opportunities to leverage secondary data. It is important to note that these elements are situational; all of the steps may not apply for every project.

A 2020 paper developed by national and regional EULP study team members, Putting Our Industry's Data to Work: A Case Study of Large Scale Data Aggregation, also provides insight into the value and challenges associated with collecting and sharing EULP data. The paper includes lessons learned from the national study's extensive EULP data collection efforts.

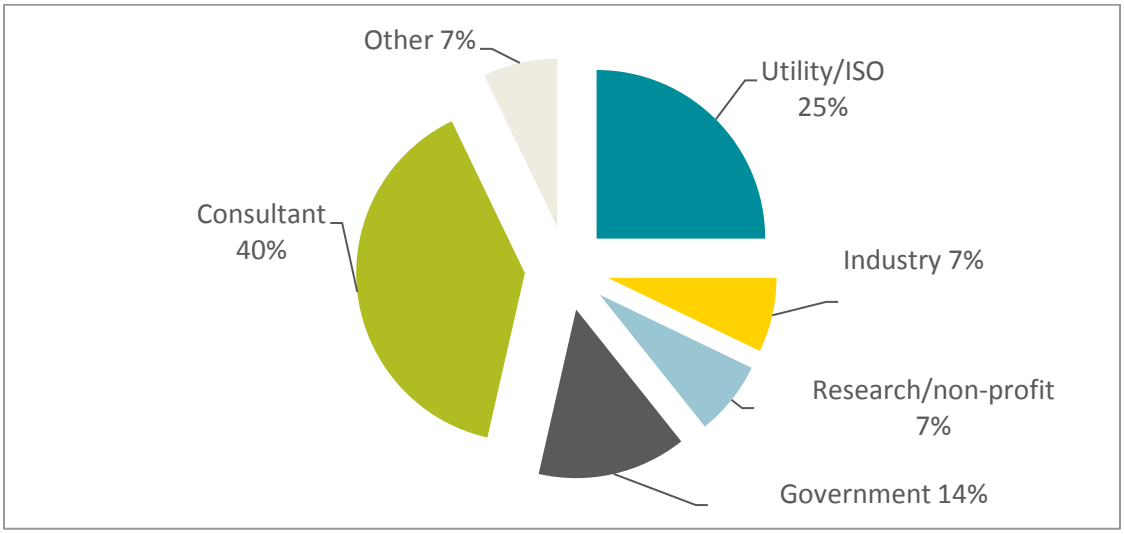
Some states in the region are actively working to increase data availability. As discussed in the New York section above, the state has recognized the cost effectiveness of utilizing data and is encouraging program administrators to utilize it under its Advanced Evaluation, Measurement, and Verification policy. New York defines Advanced M&V as "technologies and practices that include, but are not limited to, automated M&V software, data analytics, advanced metering or sub-metering, building or home energy management systems, load monitoring systems, utilization of data science practices, and other emerging technologies."[9]

Stakeholder Survey Findings

This section provides a detailed overview of findings from the stakeholder survey NEEP issued in 2020 to help identify important EULP use cases in the region and supporting data needs. The survey was intended as companion research to NEEP's data inventory research. NEEP distributed the survey link to the NE-RAC members as well as to other energy efficiency evaluation and policy contacts across the region.

As shown below in Figure 1, the 28 respondents to the survey represent diverse organizational interests, with utilities and ISOs comprising 25 percent of the mix, since many of the consultants and other category support utility or ISO clients. The mix of survey respondents is similar to that of the NE-RAC. Eighty-one percent of the NE-RAC participated, accounting for 61 percent of the survey participants.

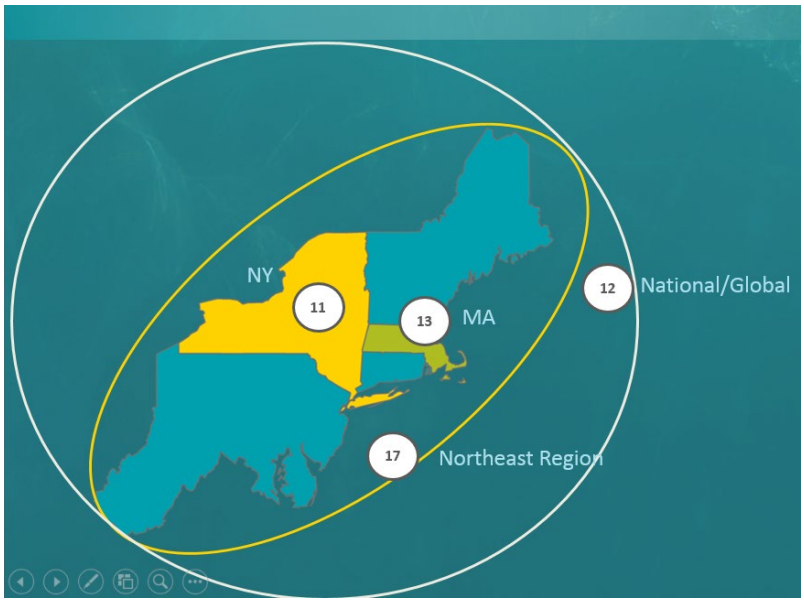
Figure 1: Survey Respondents by Organizational Type



[9] https://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/255ea3546df802b585257e38005460f9/$FILE/CE-05-EMV Guidance Final 11-1-2016.pdf, PSC Order, Page 8.

Figure 2 shows the broad geographical diversity of survey respondents across Massachusetts, New York, the Northeast region, and beyond. The total number of respondents in Figure 2 exceeds 28 since some respondents work in multiple areas.

Figure 2: Geographic Distribution of Survey Respondents



Use Cases: Why are EULPs Needed?

To assess the need for EULPs in the region, the survey first asked why they are needed, i.e. what are stakeholders' key use cases for them. Consistent with the national study, we defined a use case as any type of process or analysis that utilizes EULPs. In the national study, 10 use cases surfaced as priority needs for EULPs. We tested the importance of these in the Northeast region plus an 11th, the case of equipment fault detection. While the use cases are somewhat broad and overlapping, as presented in Table 5 below, they reflect the energy efficiency and distributed energy policy and program functions that are ongoing and under development in Massachusetts, New York and the Northeast.

Table 5: EULP Use Case Descriptions

Use Case	Description
Policy and Rate Design	For utility rate design, EULPs can be used to modify rate design such as time-of-use rates which provide appropriate price signals to incentivize energy efficiency measures or practices. EULPs can also aid in awareness campaigns in conjunction with rates to help customers manage their energy costs.
Energy Efficiency Program Impacts	Impact evaluations can document metrics (e.g., energy and demand savings or avoided air emissions) and inform cost-effectiveness. Energy efficiency impact evaluation, measurement, and verification utilizes energy savings information from facilities where efficiency measures are installed, as well as information about the performance of the efficiency measures themselves, to assess specific metrics of interest such as coincident peak demand savings. Thus, robust EULPs that provide hourly profiles of kW and kWh savings are important

	elements on their own, and they can be helpful in constructing savings loadshapes that show net effects of efficient controlled appliance usage profiles as compared to baseline.
Electrification Programs	Electric vehicle adoption and the transition of end uses such as water and space heating to electricity are trends that significantly affect electricity resource planning. To understand the impact of increased demand for electricity, utility or grid systems, planners can use EULPs to more accurately understand how electrification could affect annual consumption and how the increase in consumption is spread across the hours of the year. EULPs can provide insights into how electrification impacts hourly load shapes. For example, if electrification increases load predominantly during peak hours, the requirements on the grid and resources necessary to meet the grid needs will be different than if electrification largely drives increased demand in off-peak hours.
Electricity Resource Planning	Long-term resource planning processes (10–40 years) include load forecasting and integrated resource planning. Load forecasts are used to predict total electricity consumption (measured in kWh), peak load (measured in kW), and the timing of peak load. Energy efficiency forecasts predict savings from a bundle of efficiency measures. Conservation supply curves are developed based on the costs of measures, and their EULPs are an element in some integrated resource planning approaches. Planners rely on such forecasts to ensure there will be adequate resources to meet demands cost effectively.
Distribution System Planning	Electric distribution system planning focuses on assessing needed physical and operational changes to the local grid to provide safe, reliable, and affordable electricity. EULPs can help analysts understand the end uses that drive the need for the potential infrastructure investment. Related to this is electric transmission planning which identifies areas of the transmission system in need of upgrade or expansion to maintain or improve reliability and accommodate new generation or load. System planning may include consideration of non-wires alternatives to transmission and distribution infrastructure expansion. EULPs provide analysts with data on the end uses that are consuming energy at hourly or other time intervals and can be used to develop the optimal portfolio of resources for the distribution grid. They can help planners understand the impact of photovoltaics and other distributed energy resources on the grid and how the adoption of distributed energy resources affects end-use consumption across the hours of the day and year.
Building Energy Modeling and Benchmarking	EULPs can be used to improve building energy use assumptions relating to equipment usage at the building level for use in simulation models and building design. Currently, building energy models are not necessarily reflective of either real-world practice or regional differences. Calibrating building energy models by end use will help to improve these assumptions and enable more realistic modeling of energy consumption and improved building design. In addition, EULPs can also help inform the development of building benchmarking programs.
Energy Efficiency Planning	EULPs can inform many aspects of utility and state run energy efficiency planning: benefit-cost analysis, potential studies, and program evaluation. EULPs provide more granular level detail on the relative benefits and costs of measures, programs, or portfolios from different perspectives. In addition, EULPs and related savings load profiles inform estimates of the overall costs and the implications of potential efficiency to influence peak consumption as well as seasonal or annual impacts. Energy efficiency program designs can vary widely, ranging from audits and incentives to financing, and from direct installs to retro-commissioning and custom designs. Programs also vary in objectives, such as resource acquisition, market transformation, and education. By using EULP data, many elements of program design can benefit from more granular data.

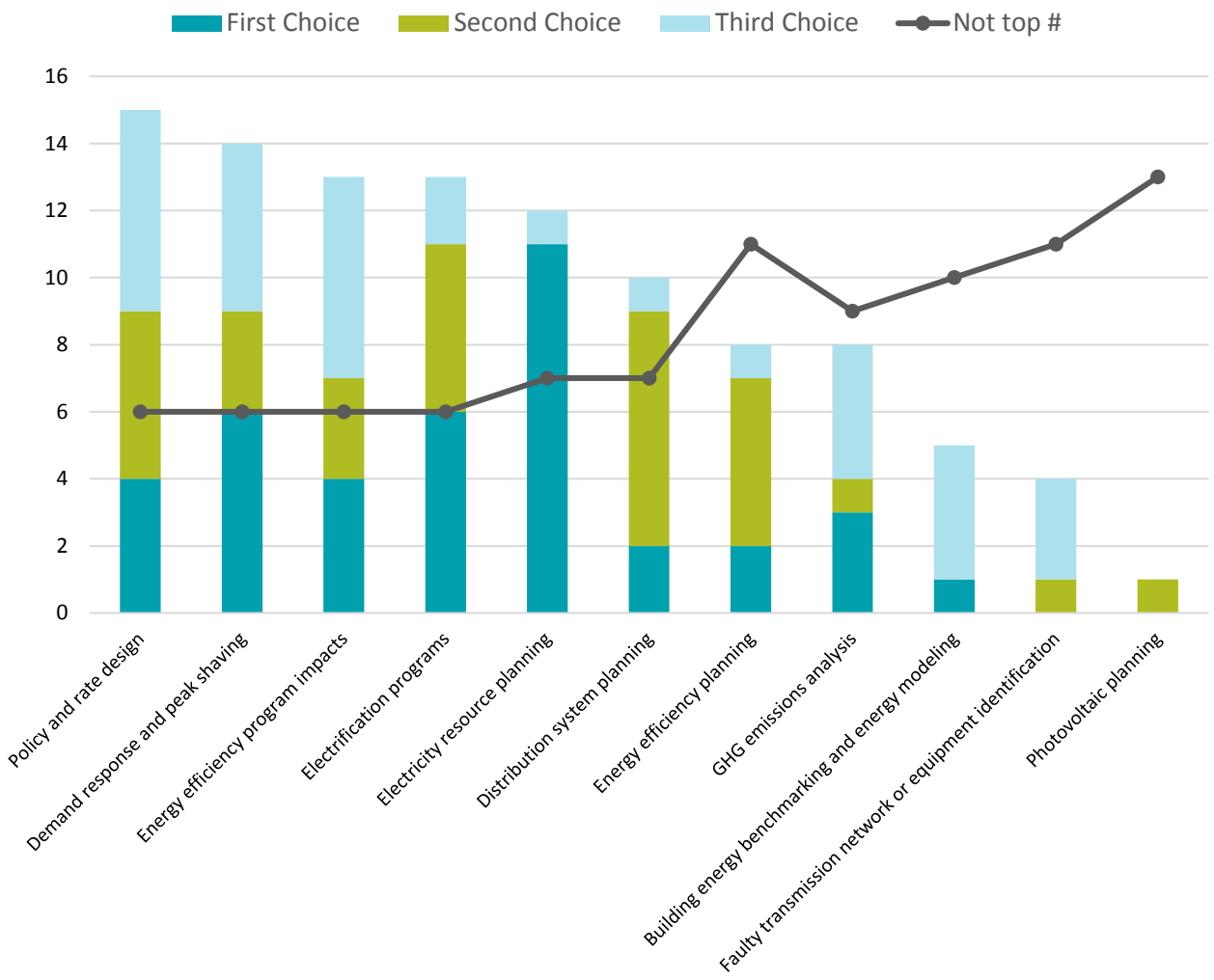
GHG Emissions Analysis	Most Northeast states have emissions reduction goals or targets for air pollutant emissions (carbon, other pollutants). EULPs can help with development of abatement strategies, and could support a more detailed analysis of the emissions impacts of building energy consumption. Moreover, when determining avoided emissions, a key consideration is the timing of energy savings because it determines which electric generation units' output is displaced. EULPs help identify the timing of energy savings by providing usage data on a more granular level.
Faulty Equipment Identification	EULPs can be used to compare expected equipment performance with abnormal or disrupted performance to help detect faults.
Photovoltaic (PV) Planning	A better understanding by utilities and the solar industry of energy demand, through EULPs, can lead to more appropriate sizing of distributed and utility-scale photovoltaics and battery storage systems. It can also help with distribution planning as noted in other use cases.

We asked survey respondents to identify their top three out of the 11 use cases. We then ranked the cases in importance based on the number of times the use case appeared among the top three in the survey. Figure 3 below compares the rank order results. The top five use cases identified in the survey were:

1. Policy and rate design
2. Demand response and peak shaving
3. Energy efficiency program impacts
4. Electrification programs
5. Electricity resource planning

We observed many ties in the ranking; this may in part be due to the broad and overlapping nature of the categories. The survey confirms that all the use cases are of at least some importance across stakeholder groups since every use case placed among the top three for some respondents, except among the Massachusetts-only respondents, where building benchmarking, fault detection, and photovoltaic planning were never among top three. When comparing responses, there was agreement across the board that photovoltaic planning was low in ranking; GHG emissions analysis and fault detection are use cases that also received relatively low ranking.

Figure 3: Use Cases Ranked by Importance



Several anecdotal survey responses helped confirm the survey results and point to regional priorities:

- "I would say almost all of the listed use cases are important."
- "There is a lot of overlap; it may be easier to say what is not of interest."
- "Load shapes are crucial in understanding what large measures and end-uses should be the focus of EE and electrification programs. They will also drive energy pricing and policy designs."
- "Our main interest is policy and regulation to deliver benefits of improved energy management, including economic, environmental, reliability and resilience; we are interested in load flexibility and grid-interactive functionality for the details on time and spatial resolution needed and units of analyses may vary, for which I don't have expertise."
- "There is strong disagreement about the potential electric demand impacts of massive building heating electrification - we need more data about the real differences in winter peak load shapes between electrically heated large buildings (residential and non-residential), and buildings using significant fossil fuel for their heating, for buildings of all vintages in the key cities/jurisdictions moving toward rapid electrification."

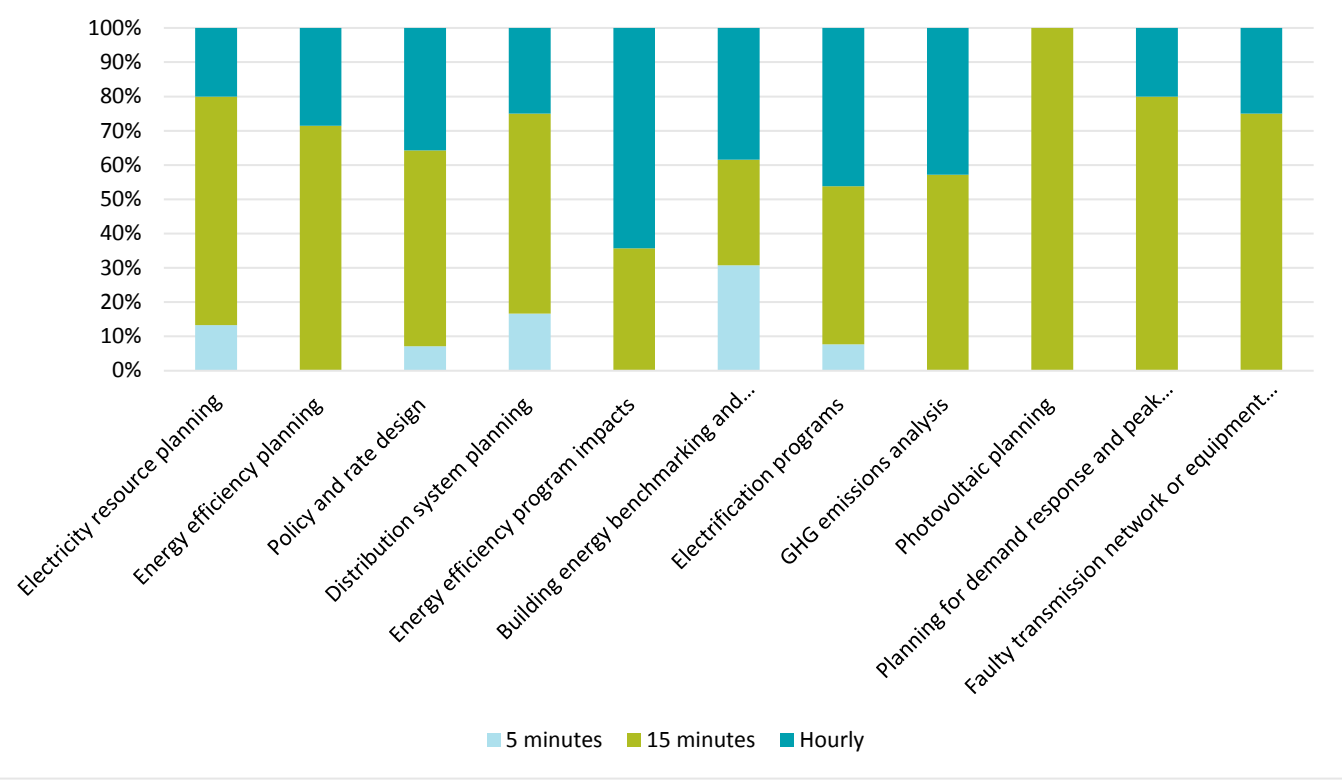
Data Requirements for EULPs by Use Case

To better understand regional stakeholder needs and uses for EULPs, we explored what time intervals, measurement boundaries (e.g. measure-level, end-use level, building-level) and levels of aggregation (e.g. facility, building type, sector) are appropriate for the use cases that respondents indicated were among their top three. The national study will produce EULPs with 15-minute time interval data for major climate zones and by various building type categories. Our questions helped serve as a check to see how well the national study results can satisfy the region's needs.

Time Intervals

As shown in Figure 4 below, a time interval of 15 minutes prevailed as the level of granularity appropriate to satisfy the use cases. There are a few cases with different findings. For example, hourly intervals were frequently cited for energy efficiency planning and electrification planning, and policy and rate design. All three options – from five minutes to hourly – were chosen for resource and distribution planning and for building energy benchmarking. This suggests that the appropriate time intervals for these kinds of projects may depend on the nature of a specific project. One respondent noted "wholesale markets in New England have five minute nodal pricing for generators but not yet for loads."

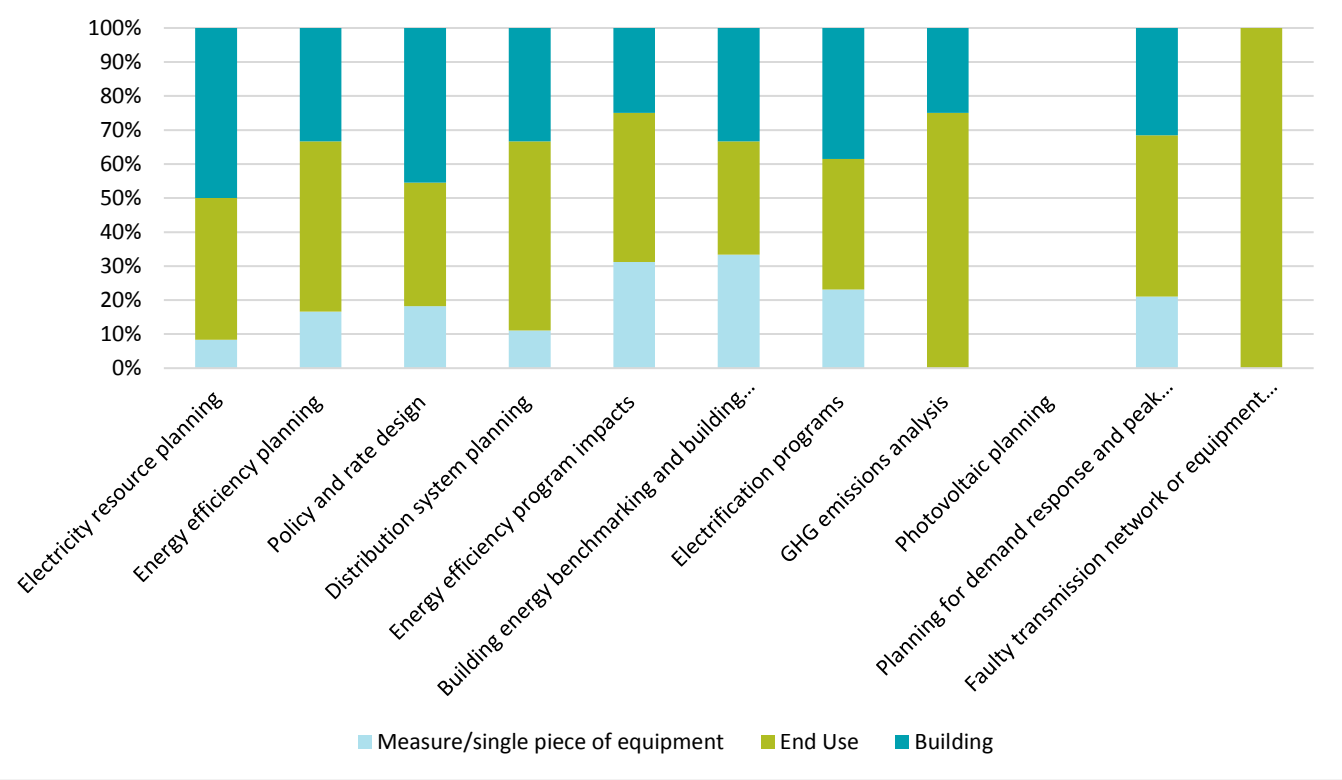
Figure 4: Preferred Time Interval by Use Case



Measurement Boundaries

The variation in desired measurement boundaries shown in Figure 5 below suggests that the nature of the research dictates whether measure, end-use or building level information is most appropriate within a use case. The end-use level prevails as an appropriate measurement boundary across most but not all use cases. Building level information is important for electricity resource planning and for policy and rate design, and the need for measure-level profiles was frequently cited for energy efficiency program impacts.

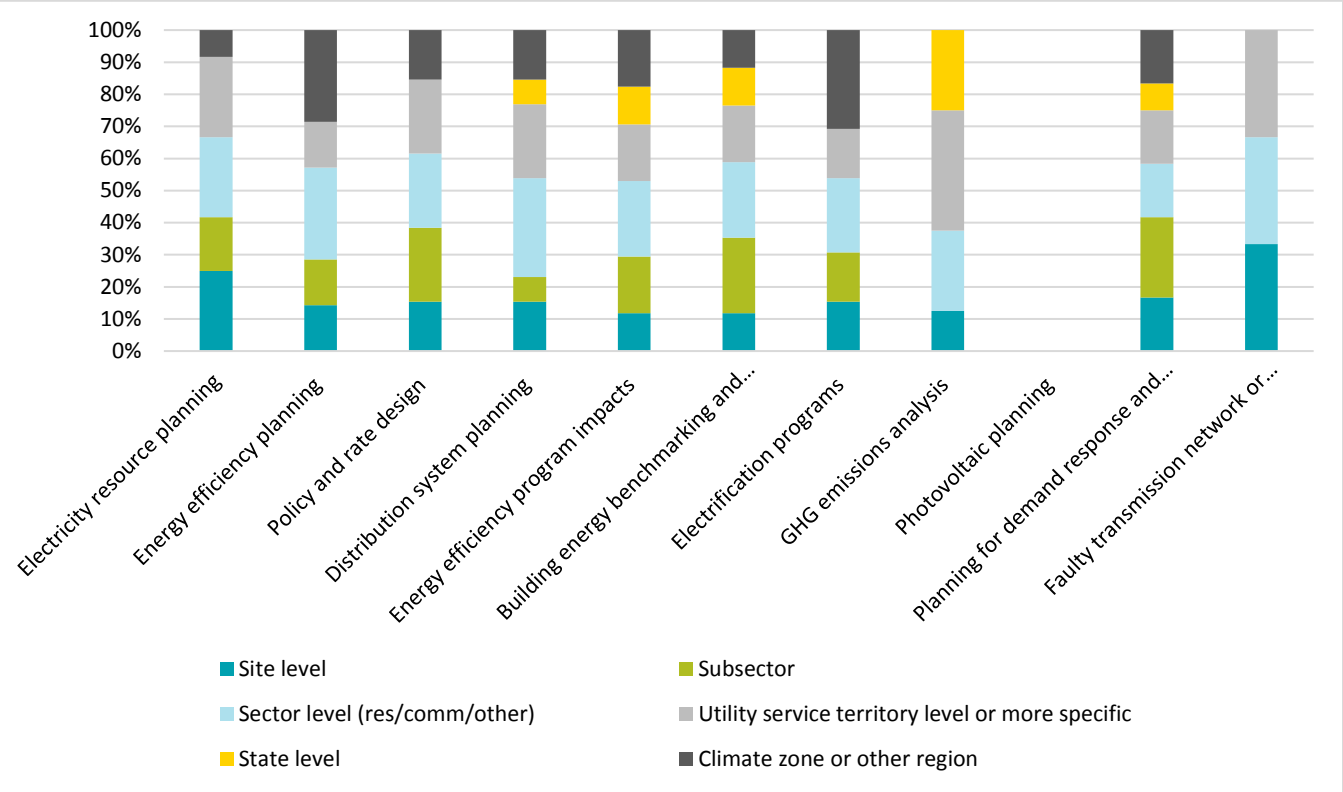
Figure 5: Preferred Measurement Boundary by Use Case



Aggregation Level

Without more specific information, the level of aggregation appropriate for use cases is difficult to generalize. One respondent noted, "the more granular the better, but more information would be better in general" and another observed "subsector and sector can be derived from billing address." Results of the survey, as shown in Figure 6 below, back up these comments and suggest that any level, from site or sector and utility to state, can meet needs of multiple use cases. Sector and utility levels of aggregation prevail across many use cases. The responses slightly suggest that site level data is important for electricity resource planning, and that subsector and utility level is important in building energy benchmarking.

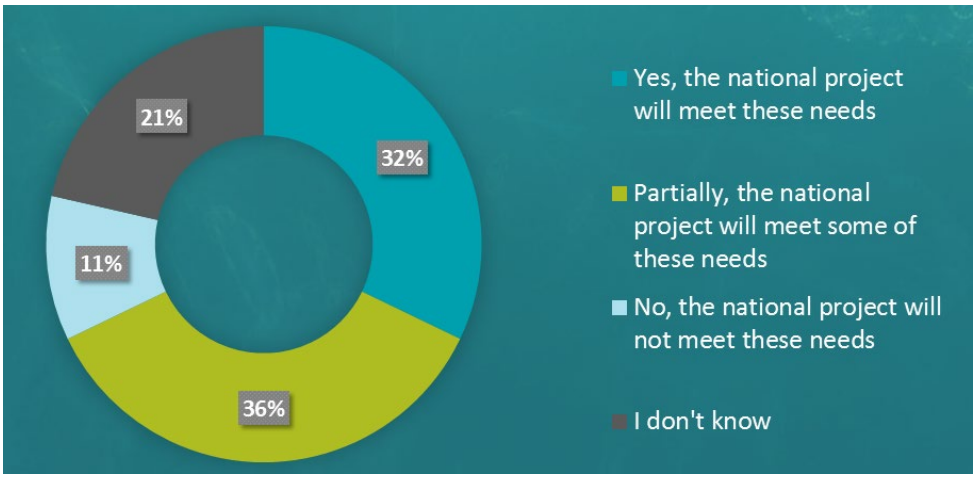
Figure 6: Preferred Aggregation Level by Use Case



National Study Outcomes

The survey also asked to what extent the national study will meet regional EULP data needs. Figure 7 shows that approximately two-thirds of survey respondents indicated that the national study will either partially or fully meet their needs. The national study will not meet data needs for a small percentage of respondents, while the remaining 21 percent of respondents were not sure.

Figure 7: Regional Use of National EULP Project Results



Several survey respondents provided detail as to why or why not the national EULP study would meet their needs. Respondents who stated the national study will not meet their needs commented that "profiling does not enable dynamic load control, which will be needed as we electrify heating and transportation" and "industrial load information is needed." The comments from respondents who stated that the national study will partially meet their needs highlighted that insights such as "information by subsector would be helpful". Additionally, a single data source can be helpful for states that have just began to use this data to inform their programs, which we have seen in the Northeast region with use of the Massachusetts data. Yet, there are some limitations to the national study. There may be unique regional features such as weather, building codes, or other policy drivers that a national model may not be able to account for.

Generally, respondents largely agreed that some useful information can be gleaned from the national study to help inform decisions now, and future studies can drill deeper. Additionally, the granular data the study will provide, while not region specific, will still allow for a more detailed evaluation of usage than the status quo. Further access to individual customer energy usage can have "significant impacts in market with high capacity costs or volatile energy costs, and drives utility (and their customer) economics more than is understood in the industry."

Regional Load Profile Data Needs

The table below summarizes the regional load profile data needs extracted from the stakeholder survey comments and from informational interviews with several Massachusetts and New York evaluators and system planners. These needs could form the basis for future regional EULP research.

Table 6: Load Profile Data Needs Identified

Need	Description
Applications of Load Profiles to Assess Flexible Demand	Some integrated programs are being implemented to manage flexible loads. In the future, buildings will use multiple distributed energy resources (DERs) and demand flexibility modes to respond to grid needs quickly, even within seconds or sub-seconds, potentially providing continuous demand flexibility. These changes will require advances in how utility needs for planning and program evaluation in the new DER environment. Loadshapes could help in the future with non-wires alternatives, emerging technologies, penetration of DERs, and system forecasting. They could open the door to more creative program design and more targeting of measures in flexible load programs.
Ability to Assess Impacts of Whole Buildings on the Grid and in Grid Planning	Conceptually, all performance metrics may be assessed at the whole building or individual system or equipment level, or for all buildings participating in a demand flexibility program or time-varying retail rate. While performance cannot be assessed by EULPs alone, EULPs can contribute to development of baselines against which impacts associated with energy efficiency or the four modes of demand flexibility (load shed, load shift, modulate, and generate) could be modeled for individual buildings or an aggregation of buildings. Each building will have very different needs in order to optimize it and different cost sensitivities for implementing optimization strategies.
More Detailed (equipment-specific) EULPs	The publicly available EULPs from the national study will be based on the technology saturation in the current building stock. The dataset can be filtered by technology type, but only includes technologies that current exist in the

	building stock (in large enough numbers to show up in building characteristic survey data).
EULPs for Measures Not Included in the National Study	EULPs or savings shapes for specific measures or technologies are not part of the current national study. Program administrators, RTOs, energy planners and other stakeholders with an interest in electrification or other emerging new efficiency technologies benefit from load profiles for these measures. Details of specific technologies can have a significant impact on peak demand and overall load shape. For example, with heat pumps alone, numerous factors can determine their load shape: rated performance (HSPF), sizing approach, backup heat source (electric resistance or fuel), cold climate performance, air-source vs. ground-source, controls, occupant behavior).
Understanding of Individual Customer Variability in Loads	Better understanding variability could help utilities more effectively implement time-of-use rates by identifying times when peak load is high that coincides with use of certain appliances and/or identifying what appliances use the most load. This data could be used to incentivize customers to use the appliances at a different time and lower the constraint on the grid. Studying a sample of diverse customers could also help provide a better understanding of potential winter peak issues.
Collection of AMI and Metadata	This could help with load management as new technologies that have not in the past been part of the grid, such as electric vehicles and energy storage, become increasingly pervasive.
Data Sharing to Drive Usage and Innovation.	More publicly available EULPs or savings load profiles could help drive more innovative program design, particularly for program administrators with limited resources to conduct metering studies on their own. Creating shared databases on the regional and national levels could provide access to this data, which would help states create data-driven policies and electrification or whole building goals.
Data Privacy Policies	Data privacy should be discussed and standardized as usage becomes more common.

Recommendations and Conclusion

NEEP's research efforts associated with this project – the data inventory update, stakeholder survey, and interviews with key regional stakeholders – confirmed that EULP data sources are fairly limited and that EULP data is a topic of increasing importance throughout the region. End use load profiles are important because they enable more granular assessment of cost effectiveness of state and utility investments. Additionally, access to this information allows regulators to understand grid needs, and the data can provide insight into the real energy needs of the state.

Through its research for the data inventory, NEEP found that most of the evaluation studies that involved metering were conducted by states with relatively large energy efficiency program and evaluation budgets (for example Massachusetts and New York). Data sharing arrangements across states could be beneficial given the high cost of conducting metering studies, particularly for states with more limited budgets. Sharing of this data can aid in market transformation and help states plan decarbonization goals. The data could also enable states

to design decarbonization and electrification goals more tailored to a particular region and climate. For example, cold climate EULP data for heat pumps and other electrification strategies in one state could help other states that are considering such programs but are hesitant to enact them due to cold climate performance concerns. The further development of data sharing guidance, along the lines of NEEP's May 2020 report Sharing Load Profile Data: Best Practices and Examples, could facilitate more widespread development and use of EULP data while ensuring that customer privacy is protected.

The stakeholder survey and NEEP's outreach to key stakeholders via interviews demonstrated that there are unmet needs for EULP data and gaps in available data. It also revealed that EULP data needs will continue to increase in the near future. The national EULP study will meet some of these regional needs, but there are opportunities for research specific to the Northeast region. NEEP identified the following potential areas for future regional projects/research: 1) more detailed, equipment-specific EULPs, 2) EULPs for measures not included in the national study, 3) understanding individual customer variability in loads, 4) collection of AMI and metadata, 5) data sharing to drive usage and innovation, 6) applications of load profiles to assess flexible demand, and 7) data privacy policies.

As a next step in this regional EULP project, NEEP will be producing a report ***Recommendations for Facilitation of Data Sharing and Supplemental Research,*** in which we will further examine these potential topics for future regional research

Appendix A: Massachusetts Study Table

State / PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
MA – MA PAs and EEAC	C&I	Jan-21	Gross Impact Framework - Decision Guide	Memorandum	N/A	This memo summarizes decisions related to key processes and issues that the PAs, the EEAC Consultants, and the DNV GL team have addressed since the publication of the previous Gross Impact Framework – Decision Guide Memo in March 2020, following the implementation of the Gross Impact Evaluation Framework adopted in February 2017.	N/A	DNV GL

MA – MA PAs and EEAC	Res	Dec-20	Massachusetts Residential Lighting On-Site Study	Market Analysis	N/A	The goal of this study was to update estimates of lighting saturation and other market indicators. The data came from on-site lighting inventories conducted in Massachusetts homes that are part of the Residential Baseline Study.	This survey's data comes from on-site lighting inventories of 301 homes in Massachusetts between October 2019 and March 2020. Data was weighted to reflect the population proportions for home ownership and education in Massachusetts based on census data.	NMR Group, Inc.
MA – MA PAs and EEAC	Res	Dec-20	2019 Regional Lighting Sales Data Analysis	Market Analysis	N/A	This study examines light bulb market share, shipment, and prices in the New England region. The study examines market share and bulb prices (provided by CREED) in four study states: Connecticut, Massachusetts, New Hampshire and Rhode Island. It also looks at program and non-program states. The primary purpose of this study is to characterize the current lighting market and track market share over time.	N/A	NMR Group, Inc.

MA- MA PAs	Res	Oct-20	2019/20 Massachusetts Winter Thermostat Optimization Evaluation	Impact Evaluation	Winter Seasonal Savings Program (Thermostat optimization program)	This is an energy impact evaluation with an exploratory analysis using thermostat telemetry data from Google's SS program in Massachusetts during the 2019-20 winter. In the 2019-20 winter, the program was deployed to Massachusetts PA customers who had a Nest thermostat installed, specifically natural gas customers for Eversource and National Grid (including non-natural gas devices in natural gas homes) and non-natural gas customers for Cape Light Compact.	Guidehouse conducted exploratory analysis on enrollment rates and set points and thermostat heating runtime to assess customer acceptance of the program and the impact of thermostat optimization. They compared data on device treatment between over time and between weekends and weekdays. In addition, they conducted an impact analysis of 145,659 thermostats using telemetry data to estimate energy impacts and total energy savings.	Guidehouse Inc.
MA – MA PAs and EEAC	C&I	Oct-20	Steam Trap and Boiler Efficiency Research Report	Evaluation	N/A	This study consists of a number of unique, partially overlapping research objectives related to estimating savings for steam traps and the annual heating plant efficiency factor, which is a primary steam trap savings input (as well as for other measures like pipe insulation).	N/A	ERS and DNV GL

MA - National Grid and Unitil	Res	Sept-20	2019-2020 Residential Energy Storage Demand Response Demonstration Evaluation – Winter Season	Demand Response Evaluation	Battery Response Program	This study evaluates National Grid's and Unitil's battery response demonstrations during the winter of 2019-2020. National Grid's program was a "bring your own battery" program that had 148 enrolled devices. Unitil's demonstration paid for and installed battery storage for four participants. The program demonstration's goals were to determine the validity of battery response programs for reducing system peak demand and flattening the solar PV output curve for residential customers.	Guidehouse received 15-minute telemetry data for 119 battery devices. Overall, the final dataset used included 8,892 device days and 853,632 intervals from December 1, 2019 to February 29, 2020. Analysis found that 102 devices successfully participated in at least one event during the winter season. The program saved 559 kW per event on average.	Guidehouse Inc.

MA – MA PAs	Res	July-20	2019 Electric Vehicle Supply Equipment Direct Load Control Demonstration – Process Evaluation Findings	Process Evaluation	Electric Vehicles	This memo summarizes the methods and results of the participant survey and literature review conducted for the evaluation of Eversource's 2019 Electric Vehicle Supply Equipment (EVSE) Direct Load Control (DLC) demonstration. The EVSE DLC demonstration aims to reduce peak demand of home electric vehicle charging load by way of Wi-Fi-enabled Level 2 EVSE. Participating customers were provided incentives for allowing Eversource to restrict their EV charging during demand response events, as well as for access to their charging data.	N/A	Guidehouse Inc.
MA – MA PAs	Res	June-20	Passive House Offering Program Theory and Logic Model Final Report	N/A	Residential New Construction Programs	The Passive House offering seeks to have transformational impacts on the RNC market-helping to make passive design more commonplace and, eventually, an industry standard practice.	N/A	NMR Group

MA – MA PAs	Res	June-20	Residential New Construction Non-Program Model Review	N/A	Residential New Construction Programs	This study assessed the relative merits of using Home Energy Rating System (HERS) data, obtained from Ekotrope Inc, as an additional data source to inform research on the performance of new homes built outside of the RNC program.	N/A	NMR Group
MA – MA PAs	C&I	June-20	Massachusetts Cannabis Cultivation ISP	Evaluation Plan/ Market Evaluation	C&I Cannabis Programs	The DNV GL CI Evaluation Team, with ERS as lead and DMI as team member, carried out the cannabis cultivation industry standard practice (ISP) study for the Massachusetts Program Administrators (PAs) and Energy Efficiency Advisory Council (EEAC) Consultants from August 2019 to March 2020. The study's overall purpose was to define ISP in indoor cannabis cultivation in Massachusetts using high rigor methods, including interviews of cultivators, facility design engineers, and vendors/contractors	N/A	DNV GL

MA – MA PAs and EEAC	C&I	June-20	Impact Evaluation of PY 2017-18 Custom Electric Installations	Impact Evaluation	Custom Electric	This study evaluated the gross savings impacts of PY2017-18 custom electric projects pooled with the results of the PY2016 study, including: achieved electric energy savings for custom lighting and non-lighting segments at the state-wide and PA level in addition to summer and winter on-peak demand realization rates.	Data collection methods included interviews of facility personnel and equipment vendors, on-site monitoring of operating equipment, receipt of BMS trend data collected by the customer, and receipt of PA meter consumption data. It included program-level statistical sampling and selection of 92 lighting and non-lighting sample points for intensive study.	DNV GL

MA – MA PAs	C&I	April-20	C&I New Construction Program Planning & Market Effects/Spillover Study	Evaluation	PAs Non-Residential New Construction (NRNC) Program	This study is intended to help the Massachusetts Program Administrators (PAs) redesign their NRNC Program and position themselves to claim market effects. The purpose of the redesign is due to diminishing savings due to (1) rising energy codes, municipal mandates, and industry standard practices; (2) low program realization rates; and (3) a strategic three-year goal to explore further-reaching design innovations.	N/A	NMR Group and EMI Consulting
MA – MA PAs and EEAC	C&I	April-20	C&I Small Business Non-Participant Customer Profile Study	Impact Evaluation/ Market Assessment	PAs' 2019-2021 Energy Efficiency Plan Term Sheet Commitments	The purpose of this study is to better understand patterns of participation in the small business population. The study examines various small business sub-segments and program activity categories in the 2012-2017 program years.	N/A	DNV GL

MA – MA PAs	Res	April-20	Evidence for Market Effects from Support for Ductless Mini-Split Heat Pump Integrated Controls	Market Analysis	N/A	The objective of this study is to assess the evidence for or against the PAs' support of DMSHP integrated controls having made a substantial, lasting impact on the Massachusetts market for these controls and for cold-climate DMSHPs, and to provide a qualitative assessment of the degree of market effects, if any.	N/A	NMR Group, Inc. and DNV GL, Inc.
MA – MA PAs	Res	April-20	2019 Residential New Construction Baseline/Compliance Study	Baseline Study	Residential New Construction Programs	This study is part of an evaluation of the Residential New Construction (RNC) program in Massachusetts. The RNC program provides incentives to builders for constructing homes that are more efficient than a baseline home. The program determines a home's efficiency over a baseline by comparing an energy model of the home to an energy model of a baseline home, called a User Defined Reference Home (UDRH).	Collected Meter Data. The study consisted of 100 on-site energy inspections of single-family, non-program homes built between 2017 and 2019 in MA. They included inspections with full HERS ratings for 51 homes built under the new base code and 49 homes built under the new stretch code.	NMR Group, Inc.

MA - Eversource (MA and CT), National Grid MA, Unitil MA	Res	April-20	2019 Residential Wi-Fi Thermostat Direct Load Control Offering Evaluation	Evaluation	Program Administrator Active Demand Response Initiatives	This evaluation assessed the demand and energy impacts achieved in 2019 and calculated savings adjustment factors for use by the PAs for claiming savings in future years. The evaluation also assessed customer experience and acceptance of the solution.	Navigant developed, fielded, and analyzed the results of an online survey of 316 participants at the end of the 2019 DR season. Prior to conducting its analysis, Navigant performed a QA/QC of the 15-minute thermostat telemetry for 20,737 participants. The review included screening for gaps in the data, logic errors, and confirming the experimental design group assignment.	Navigant
MA - National Grid	Res	April-20	2019 National Grid Behavioral Demand Response Evaluation Findings	Demand Response Evaluation	National Grid's BDR Program	The objective of this study was to estimate demand reductions from National Grid's 2019 behavioral demand response program via a literature review and an analysis of a subset of National Grid MA customers with interval utility metering.	Cadmus conducted a process evaluation including several surveys throughout the two-year pilot with a responding sample size of 585.	Guidehouse

MA – MA PAs	Res	Mar-20	2019 Massachusetts Summer Thermostat Optimization Evaluation	Impact Evaluation	Summer Seasonal Savings Program (Thermostat optimization program)	The goal of this year's thermostat optimization evaluation was to explore persistence from thermostat set-point schedule adjustments from year to year and to estimate savings in electric consumption and peak demand. The evaluation included both an exploratory persistence analysis of thermostat set-points and runtime, and an impact analysis of energy and demand savings. The evaluation also yielded realization rates, comparing evaluated and vendor-generated savings; a demand-to-energy factor; and an on-peak savings percentage.	In 2017, 2018 and 2019, through a randomized encouragement design, all customers in a PA's service territory with a Nest thermostat were randomly assigned to one of two groups-- the ITT group and the control group. Data on thermostat-level participation and thermostat telemetry was collected after the program was launched to assess opt-in percentages over time. Navigant then conducted an impact analysis to estimate the energy savings and peak demand savings from temperature optimization for treated groups.	Navigant Consulting Inc.

MA – MA PAs and EEAC	Res	Mar-20	Energy Optimization Measures and Assumptions Update Memo	Memorandum	Energy Optimization Model (EOM)	This memo summarizes the evaluation team's work to update the Energy Optimization Model (EOM) per the requests of the Massachusetts Program Administrators (the PAs) and the Energy Efficiency Advisory Council (EEAC) consultants. The evaluation team initially developed the EOM in October 2018 to estimate the costs and benefits associated with a variety of energy efficiency measures that use electric heat pumps and natural gas heating equipment to displace the consumption of delivered fuels. This memo describes updates implemented in the model, including revised input values, new installation parameters, and new measures covering ground-source heat pumps (GSHPs).	N/A	Navigant Consulting Inc.

MA – MA PAs	Res	Mar-20	Renovations and Additions Market Characterization and Potential Savings Study	Market Characterization	Residential New Homes and Renovations Initiative	This study conducted a detailed assessment of the size and scope of the single-family (one-unit attached and detached) renovations and additions market in Massachusetts. It investigated the state and size of this market and helped inform the design of the PAs' current additions and renovations offering for their initiative.	N/A	NMR Group, Inc.
MA – MA PAs	Res	Mar-20	Residential New Construction Incremental Cost Update	Cost Estimation	Massachusetts Low-Rise Residential New Construction Program	The goal of this study is to provide an updated estimate of the incremental costs associated with participating in the Massachusetts RNC program.	N/A	NMR Group, Inc.
MA – MA PAs and EEAC	Res	Mar-20	Residential Lighting Hours-of-Use Quick Hit Study	N/A	N/A	The overall objectives of this study were to explore the relationship between saturation and hours of use (HOU) and provide inputs into the PA and EEAC Consultant consensus process to update HOU estimates for program supported LEDs, taking into account the increasing saturation of LEDs.	N/A	DNV GL and NMR Group Inc.

MA – MA PAs	Res	Mar-20	MA Residential Baseline Study	Baseline Study	N/A	The primary goal of this study is to collect saturation, characterization, and usage behavior data for all major electric and gas appliances, heating and cooling equipment, and electronics in Massachusetts homes.	Third year of the study, Guidehouse repeated and continued the same data collection activities to calculate updates and changes in saturation, meter whole home and end use gas consumption, log space temperature, and maintain the research panel for future research objectives.	Guidehouse
MA - MA PAs and EEAC	C&I	Mar-20	Impact Evaluation of PY 2017 Small Business Initiative Non-lighting Measures	Impact Evaluation	Small Business Initiative	This study evaluates HVAC and refrigeration measures installed in 2017. The study provides energy savings (kWh) and realization rates, summer on-peak and winter on-peak kW realization rates and lifetime savings realization rates. Research methods included sampling, on-site measurement and verification, and measure analysis.	Study included on-site metering of 14 refrigeration sites and 16 HVAC sites. Metering was installed to capture seasonal use as appropriate.	DNV GL

MA - MA PAs	Res	Mar-20	Home Energy Services Realization Rate Assessment (RES 39)	Realization Rate Assessment	Home Energy Services	This study sought answers to the following two key research questions: 1. Why are the evaluation realization rates for weatherization measure not closer to 1.0? And 2. What changes would improve vendor savings estimates? Study methods included Engineering Review of LV Modeling Software, Interviews with Assessors, Survey Participants, and Comparing Modeled Consumption and Billing Data.	N/A	Navigant Consulting, Inc. and Cadeo

MA - MA PAs and EEAC	C&I	Mar-20	Impact Evaluation of PY2017 Custom Gas Installations	Impact Evaluation	Custom Gas Installations	The primary objective of this impact evaluation was to verify and re-estimate the energy savings for a sample of statistically selected PY2017 custom gas projects through site-specific inspection, monitoring, and analysis. The Team combined the PY2017 results with the PY2016 results to determine the gross RRs for custom gas energy efficiency projects implemented in 2019 and beyond.	Study included a site-based M&V impact evaluation to quantify the achieved natural gas energy savings for 31 custom gas projects for program year 2017. The authors also conducted a desk review of PY2017 projects installed at sites where the evaluators had conducted M&V.	ERS, DMI, DNV GL

MA – MA PAs and EEAC	Res	Feb-20	Residential Nonparticipant Market Characterization and Barriers Study	Market Characterization	Mass Save	The purpose of this study was to meet the requirements of the term sheet established as part of negotiations related to the approval for the 2019-2021 Energy Efficiency Plan, which required the PAs to conduct tailored evaluators that address participation levels and potential unaddressed barriers. In short, it aimed to characterize nonparticipants in Mass Save programs, investigate the barriers to participation, and identify engagement opportunities.	N/A	Navigant, Illume, Cadeo

MA – MA PAs	Res	Feb-20	Winter Thermostat Optimization Evaluation	Evaluation	Winter Seasonal Savings (SS) Program	The goal of the thermostat optimization evaluation was to confirm the technical feasibility of using thermostat set-point adjustments to reduce household energy consumption and peak demand. The evaluation included both an exploratory analysis of set-points and an impact analysis of energy and demand savings.	Google deployed the SS program using a RED, in which all customers in a PA's service area with a Nest thermostat were randomly assigned to one of two groups. These two groups are the ITT group (participants are randomly assigned to receive the program offering) and the control group (where participants are randomly assigned to not receive the program offering). In total, 52,238 were treated, and 41,880 acted as the control group.	Navigant

MA - National Grid and Unitil	Res	Feb-20	2019 Residential Energy Storage Demand Response Demonstration Evaluation - Summer Season	Impact and Process Evaluation	Res-Appliances (scalability of storage) Res- Demand Reduction (storage) Energy Storage Pilot	This evaluation assesses the technical feasibility, customer acceptance, and scalability of battery storage as a resource for lowering the system peak demand (National Grid) and flattening the solar PV output curve (Unitil) for residential customers. The evaluation consisted of process and impact components. The process component assessed participant motivation and acceptance of the piloted battery storage technology (a key to scalability) through surveys and phone interviews. The impact component assessed whether the battery storage system lowered demand during the Summer Peak Periods and measured demand and energy impacts.	Navigant and the PAs performed a data transfer test of the whole home, solar PV, and battery storage telemetry data. Navigant conducted a QA/QC review to ensure data w as being collected from the limited number of participants and could be readily analyzed. After the summer demonstration season, the data was transferred to Navigant for impact analysis and QA/QC. The evaluation measured demand and energy impacts of the energy storage, assuming the whole-home and solar PV data as the baseline. 50 devices participated in at least one event.	Navigant Consulting, Inc.

MA - MA PAs and EEAC	C&I	Jan-20	Massachusetts Non-Residential New Construction EUI baseline Study - Revised Results	Baseline Study	C&I - Buildings New Construction	This study's primary objective was to assess whether the MA Data Warehouse maintained by DNV GL can be used to: estimate energy use intensity (EUI) baselines for various building types, identify supplemental information that may be needed to support the creation of the EUIs, and conclude whether the above methods will work.	DNV GL used the PAs billing and tracking data, Massachusetts Level 3 tax data, and Boston tax data housed in the MA Data Warehouse to estimate EUIs for non-residential new construction projects.	DNV GL

MA - MA PAs and EEAC	C&I	Jul-19	Methods and Evaluation of Control Measures Phase 2 Consumption Data Analysis	Impact Evaluation	N/A	Building automation systems (BAS) have become a popular measure in the food service segment in Massachusetts. One large coffee chain franchisor has accelerated installations in the quick-serve food service segment by marketing an energy management program to their franchisees. This program features BAS and a suite of additional energy efficiency measures including lighting, heating, ventilation, and air conditioning (HVAC), and process end uses. The Massachusetts PAs are interested in quantifying savings from this important measure. In this Phase 2 evaluation, site- and measure-level savings estimates were developed using consumption data for all available BAS-enabled sites. Phase 2 attempted to produce BAS-specific savings estimates at the measure level despite the presence of additional EE measures.	N/A	DNV GL

MA - MA PAs and EEAC	C&I	Jun-19	Massachusetts Commercial and Industrial Impact Evaluation of 2016 Custom Electric Installations	Impact Evaluation	C&I – Custom Custom Electric	The objective of this impact evaluation is to provide verification or re-estimation of electric energy and demand savings estimates for a sample of custom lighting and non-lighting electric projects through site specific inspection, monitoring, and analysis.	Data collection methods included interviews of facility personnel, interviews of equipment vendors, on-site monitoring of operating equipment, receipt of data collected by the customer, and receipt of utility meter consumption data. This program included lighting, HVAC, process, refrigeration, motors, compressed air, and other measures. This impact group includes new construction, major renovation, and retrofit projects.	DNV GL, DMI, and ERS

MA - MA PAs	Res	Apr-19	Massachusetts Residential Baseline Study	Baseline Study	Res - Appliances	This study collected saturation, penetration, and usage behavior data for all major electric and gas appliances, mechanical equipment, and electronics in Massachusetts homes. This data supports energy and peak demand savings calculations for program evaluation and design, and provides additional insight on the savings potential in the existing residential buildings market. Study methods included an online survey and metering of sampled homes.	This study included conducting an online survey, drawing an onsite sample and installing meters at sampled homes. In the first year of the study, Navigant surveyed thousands of Massachusetts residents about their household appliances and energy use and metered 25 end uses at over 350 homes. In this second year of the study, Navigant repeated and continued the same data collection activities to calculate updates and changes in saturation and load shapes.	Navigant Consulting, Inc.

MA - MA PAs and EEAC	C&I	Apr-19	Evaluation of 2018 Demand Response Demonstration : C&I Connected Solutions	Impact and Process Evaluation	C&I Demand Response Demand Response Demonstration	The overarching goal of this study was to assess the readiness of the Connected Solutions Demand Response Demonstration for full scale operation. This study has both impact and process research activities. Impact: validate proper baseline application and impacts calculated by National Grid, examine the intersection between ISO NE market offerings and this Demonstration, and assess ex-post impacts. Process: understand customer acceptance and experience with the intervention, the effectiveness of Demonstration changes made after the 2017 summer season, readiness of systems for larger deployment, and PA and vendor success in delivery.	Methods include the validation of demonstration curtailment estimates using the hybrid baseline and an ex-post regression analysis. The validation provides confirmation of the settled curtailment estimates while the ex-post analysis offers a retrospective assessment of the summer's curtailments. 17 Participant Surveys (eleven 2017 enrollees, six 2018 enrollees).	DNV GL

MA - MA PAs and EEAC	C&I	Apr-19	MA C&I Project 86: Lighting Hours of Use Study	Hours of Use	C&I Lighting Upstream Lighting	The primary objective of this project was to develop building level annual hours of use estimates for estimating savings for the upstream lighting program offering. This study made use of site level lighting fixture savings results from all of the C&I lighting impact evaluations conducted in MA since 2010. DNV GL performed a thorough review of completed impact evaluation projects to identify known sources of lighting fixture savings profiles. In total, 458 unique sites have been metered and evaluated by the DNV GL team during this period.	This study made use of site level lighting fixture savings results from all of the C&I lighting impact evaluations conducted in MA since 2010. DNV GL performed a thorough review of completed impact evaluation projects to identify known sources of lighting fixture savings profiles. In total, 458 unique sites have been metered and evaluated by the DNV GL team during this period.	DNV GL

MA - MA PAs and EEAC	C&I	Apr-19	Impact Evaluation of Commercial Water Heaters: Findings from Project 77 Pilot Study	Impact Evaluation	C&I Appliances C&I Upstream Gas Water Heater	This pilot evaluation tests and compares the results of a variety of field measurements for a small sample of 10 sites, comparing a variety of lower-cost measurements and water/gas bills to the higher cost measurements to determine the most accurate way to estimate savings without unreasonable expense. The goal of the field data collection will be to gather information in support of two parameters: the amount of natural gas used by the water heater and the deviation of water heater operating efficiency from nameplate efficiency.	This subsample pilot study was designed to test various field measurement methods and technologies for measuring the operating characteristics of commercial water heaters (WH). The evaluation team ultimately was able to recruit six sites for monitoring that collectively contained a total of twelve WH.	DNV GL

MA - MA PAs and EEAC	Res	Mar-19	RLPNC 17-3: Advanced Power Strip Metering Study	Impact Evaluation	Res-Appliances – Power Strip	NMR conducted a 9-month metering study of 133 computer (PC) and home entertainment center (HEC) connected strips across MA to measure baseline usages and the energy reduction potential (ERP) of Tier 1 and Tier 2 advanced power strips (APS). The study found statistically significant ERP values for all strip types and end-uses when compared to the base case, but did not find statistical differences between each APS technology. The measured baseline energy usage values were lower than those published in the previous Technical Resource Manual (TRM), possibly due to decreased usage times.	NMR conducted a 9-month metering study of 133 computer (PC) and home entertainment center (HEC) connected strips across MA to measure baseline usages and the energy reduction potential (ERP) of Tier 1 and Tier 2 advanced power strips (APS).	NMR Group, Inc.

MA - MA PAs and EEAC	C&I	Mar-19	Impact Evaluation of 2016 Custom Gas Installations	Impact Evaluation	C&I Custom Custom Gas	This study has two main objectives: 1) A site-based metering and verification (M&V) impact evaluation at 53 sites for determining program level and PA-specific gross savings realization rates. 2) A baseline focused desk-review of a sample of PY2016 projects to examine the frequency and impact of baseline changes, dual baseline calculations, and lost opportunity vs. retrofit measure reclassifications. The scope of work for this impact evaluation was all custom natural gas measures incentivized in 2016 and included measures such as steam traps, pipe insulation, high efficiency heating equipment, heating systems, heating controls, energy management systems (EMSs), boiler combustion controls, building shell measures, high efficiency gas industrial process equipment, and other measures.	This is a site-based M&V impact evaluation at 53 sites for determining program level and PA-specific gross savings realization rates. The scope includes all custom natural gas measures incentivized in 2016 (program year 2016, or PY2016) and measures such as steam traps, pipe insulation, high efficiency heating equipment, heating systems, heating controls, energy management systems (EMSs), boiler combustion controls, building shell measures, high efficiency gas industrial process equipment, and other measures.	ERS, DMI and DNV GL

MA - MA PAs	Res	Mar-19	2018 Massachusetts Summer Thermostat Optimization Evaluation	Impact Evaluation	Res- DR Seasonal Savings	This evaluation confirms the technical feasibility of using thermostat set-point adjustments to reduce household energy consumption and peak demand. The evaluation included both an exploratory analysis of thermostat set-points and an impact analysis of energy and demand savings. The evaluation also yielded realization rates, providing the PAs with a point of comparison between the evaluated savings and the vendor-generated savings.	The study analyzed 1,481 thermostats in the CLC service territory and 15,186 thermostats in the National Grid service territory.	Navigant Consulting, Inc.

MA - National Grid	Res	Mar-19	2018 Residential Wi-Fi Thermostat Demand Response Evaluation	Impact and Process Evaluation	Res - DR Connected Solutions	This evaluation of the 2018 DR season found that the program was successful both in testing the effectiveness of thermostats as a residential DR technology and in customer acceptance of the program offering. This study confirmed the technical feasibility of using thermostats to reduce household peak demands; however, it has not examined whether that control will be cost-effective for the electric system, program administrators, and/or customers.	In 2018, the program reached 5,228 customers and 7,087 thermostats.	Navigant Consulting, Inc.

MA - Cape Light Compact	Res	Jan-19	Cape Light Compact 2018 Smart A/C Savings Program Evaluation	Impact and Process Evaluation	Res – Demand response Smart A/C Savings	This evaluation of the 2018 demand response (DR) season confirmed the program was successful both in testing the effectiveness of thermostats as a residential DR technology and in customer acceptance of the program offering. This study also identified challenges associated with integrating mini-split systems into DR programs to assist in reducing household peak demands. Study methods included a participating assessment, customer surveys, and interim impact estimates.	The program had a total enrollment of 91 devices in 2018.	Navigant Consulting, Inc.

MA - PAs and JPB Foundation	Res	Oct-18	TXC50 Low Income Multi-family Health and Safety NEI Preliminary Findings Report	Non-Energy Impact Evaluation	Low-Income Multifamily Housing	This report presents preliminary results from the first phase of a study estimating non-energy impacts (NEIs) attributable to improving the energy efficiency of low-income multifamily (LIMF) buildings in the Commonwealth of Massachusetts (MA). These preliminary results are based on a partial data set and are only meant to inform the PAs in planning for 2019-2021. Later in 2018, the study team will deliver a comprehensive report with final results based on complete data.	N/A	NMR Group Inc.

MA - MA PAs and EEAC	C&I	Sep-18	Massachusetts C&I Upstream Lighting In-Service Rate (ISR) Analysis Summary	ISR Analysis	C&I Upstream Lighting Initiative	The objective of the ISR analysis was to calculate installation rate alternatives from the prior impact evaluation for use by the PAs in the 2019-2021 Three Year Plan. The ISR analysis reviewed both QC contractor inspection data and evaluation on-site data as discussed below. In June and July 2018, DNV GL completed 233 site visits to 2018 Q1 Initiative participants as part of this effort.	N/A	DNV GL

MA - MA PAs	Res	Aug-18	Home Energy Services Impact Evaluation - Final	Impact Evaluation	Home Energy Services	This evaluation estimates the gross per-unit energy savings associated with the HES measures offered in 2015 and 2016. The team evaluated 29 measures across four fuel types (natural gas, electric, heating oil, and propane); 9 of which were not part of the previous evaluation (completed in 2012). The evaluation also yielded realization rates, for insulation and air sealing, that the PAs will use to adjust the ex ante gross savings produced by each HES Lead Vendor's (LV) proprietary energy modeling software. The scope of this evaluation did not include LED lighting or smart strips—both common HES measures— since both measures were being evaluated through a different, concurrent, evaluation effort.	N/A	Navigant Consulting, Inc. and Cadeo

MA - MA PAs and EEAC	Res	Jul-18	Res 1 Baseline Load Shape Study	Load Shape Study	Res – Baseline/ Loadshape	The primary goal of this study is to collect saturation, penetration, and usage behavior data for all major electric and gas appliances, mechanical equipment, and electronics in MA homes. These data will support energy and peak demand savings calculations for program evaluation and design, as well as provide additional insight on the savings potential in the existing residential buildings market. The research team surveyed 6,673 households, asking questions about household occupants and home equipment. Survey results were trued up and expanded upon with onsite metering of 25 end uses at 356 sites. Also, see loadshape data from the Appendices also posted to the MA EEAC website.	The research team surveyed 6,673 households, asking questions about household occupants and home equipment. Survey results were trued up and expanded upon with onsite metering of 25 end uses at 356 sites. The study focused on all major electric and gas appliances, mechanical equipment, and electronics in MA homes.	Navigant

MA - MA PAs and EEAC	C&I	Jun-18	Impact Evaluation of PY 2016 Massachusetts Commercial and Industrial Small Business Initiative: Phase I	Impact Evaluation	Small C&I - Lighting C&I Small Business Initiative	The primary objective of this impact evaluation is to quantify the electric energy savings and demand reduction of lighting measures incented by the program. Evaluated savings are quantified through on-site inspection, monitoring, and analysis of lighting measures within a sample of custom and prescriptive electric SB projects. This study is the first of two phases in the SB impact evaluation plan; Phase I addresses lighting measures, which represent 90% of the total program-reported kWh savings in 2016. Phase II will address other end-uses.	Evaluated savings are quantified through on-site inspection, monitoring, and analysis of lighting measures within a sample of custom and prescriptive electric SB projects. This study required onsite visits and metering of lighting hours-of-operation (HOU) for a randomly selected sample of 105 customer facilities that participated in the Initiative in PY2016.	DNV GL and ERS

MA - MA PAs and EEAC	C&I	Apr-18	Massachusetts Commercial and Industrial Impact Evaluation of 2014 Custom CDA Installations	Impact Evaluation	C&I - Custom C&I Gas Custom Comprehensive Design Approach (CDA) Installations	The objective of this impact evaluation is to provide verification or re-estimation of electric energy and demand and natural gas therm savings estimates for a sample of custom CDA projects through site-specific inspection, monitoring, and analysis. The results of this study will be used to determine the gross realization rates for custom CDA energy efficiency projects completed in 2017, as well as prospectively.	Data collection methods included interviews of facility personnel, interviews of equipment vendors, on-site monitoring of operating equipment, receipt of data collected by the customer, and receipt of utility meter consumption data. The final sample included 11 sites.	DNV GL, DMI, SBW Consulting, and ERS
MA - National Grid	Res	Mar-18	2017 Seasonal Savings Evaluation	Impact Evaluation	Res – Demand Response - Thermostats Seasonal Savings	This evaluation confirmed the technical feasibility of using thermostats to reduce household energy consumption and peak demand and identified the energy and demand savings achieved during 2017 in Massachusetts and Rhode Island.	The MA program included 8,336 devices, and the RI program included 1,966 devices.	Navigant Consulting, Inc.

MA - National Grid	Res	Mar-18	2017 Residential Wi-Fi Thermostat DR Evaluation	Impact and Process Evaluation	Res – Demand Response - Thermostats Connected Solutions	This study found the program was successful both in testing the effectiveness of thermostats as a residential DR technology and in customer acceptance of the program offering. This study confirmed the technical feasibility of using thermostats to reduce household peak demands; however, it has not looked at whether that control will be cost-effective for the electric system, program administrators, and/or customers. Navigant's evaluation approach relied on several methods: 1. Post-season survey to gain feedback from 2017 MA program participants, 2. Thermostat usage assessment that combines and analyzes thermostat telemetry data and event participation data, and 3. Regression analysis to estimate demand and energy impact.	Navigant's evaluation approach relied on several methods: 1. Post-season survey to gain feedback from 2017 MA program participants, 2. Thermostat usage assessment that combines and analyzes thermostat telemetry data and event participation data, and 3. Regression analysis to estimate demand and energy impact. The program includes over 4,300 customers and more than 5,900 thermostats enrolled and the addition of Nest thermostats in Rhode Island.	Navigant Consulting, Inc.

MA - National Grid and MA EEAC	C&I	Feb-18	Evaluation of 2017 Demand Response Demonstration : C&I Connected Solutions	Impact and Process Evaluation	C&I – Demand Response Demand Response Demonstration	This study had both impact and process research activities: Impact: To provide verification of the proper baseline application and impacts calculated by the AutoGrid system, examine the effectiveness of the Connected Solution baseline, and assess ex-post impacts. Process: To understand customer acceptance and experience with the intervention, readiness of systems for larger deployment, and PA and vendor success in delivery. The impact methods undertaken in this study included three primary activities. These are summarized below and include developing an AutoGrid connection and acquiring data, performing a baseline analysis, and carrying out an ex-post regression analysis.	Study methods include developing an AutoGrid connection and acquiring data, performing a baseline analysis, and carrying out an ex-post regression analysis on the 99 accounts enrolled in the program.	DNV GL

MA – MA PAs and EEAC	C&I	Nov-17	Impact Evaluation of PY 2015 Massachusetts Commercial and Industrial Upstream Lighting Initiative	Impact Evaluation	C&I - Lighting C&I Upstream Lighting Initiative	The primary goal of this impact evaluation is to quantify the electric energy savings and demand reduction attributable to the program. This study provides results at the state-wide level using metered data collected from each site. We have developed savings factors that may be applied retrospectively and to future initiative assumption updates.	This study included a variety of lamp types. The study team selected a sample size of 170 sites across the lighting measure categories. Data collection for the impact work included physical inspection and inventory, interviews with facility personnel, observation of site operating conditions and equipment, and short-term metering of lighting HOU.	DNV GL, ERS, NMR Group

Appendix B: New York Studies Table

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY – NYSERDA	Res/C&I	Jan-21	2019 Energy Storage Market Evaluation	Market Evaluation	Energy Storage	This report presents results from primary and secondary data collection efforts including a market actor survey and literature review completed by the market evaluation team for the following two NYSERDA energy storage initiatives: 1. Reducing Barriers to Deploying Distributed Energy Storage (DES) Investment Plan and 2. Energy Storage Technology and Product Development Investment Plan.	N/A	Guidehouse
NY – NYSERDA	Residential	Jan-21	HPwES On Bill Recovery Impact Evaluation	Impact Evaluation	HPwES On-Bill Recovery	On-Bill Recovery (OBR) was started in 2012 to offer Home Performance with ENERGY STAR® (HPwES) program participants the opportunity to obtain financing for qualified measures and make the payments on their utility bills. To be eligible for OBR financing, the estimated average monthly savings from the energy efficiency improvements must equal at least one-twelfth of the annual loan payment, using the program reported savings. OBR projects	Consumption history pre- and post-retrofit (billing records) from electric and natural gas utilities. Also mentions monthly meter reads.	WestHill Energy and Computing

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						tend to be larger in scope than HPwES projects as a whole. The evaluation period includes projects completed between January 2014 and September 2016.		
NY – NYSERDA	C&I	Jan-21	NYSERDA Innovation and Technology Energy Storage Case Study	Case Study	Renewables Optimization and Energy Storage Innovation Program	This case study takes a closer look at the support NYSERDA has provided and the impacts of that support for two energy storage companies: Urban Electric Power (UEP) and Ecolectro. Table 1 shows that NYSERDA has provided the companies with nearly $4 million in awards as well as other assistance over nearly a decade. The study describes how NYSERDA has supported the companies in each stage of development (research and development, product demonstration, and product commercialization), along with the benefits of that support.	N/A	DNV GL
NY – NYSERDA	C&I	Jan-21	NYSERDA Smart Grid Evaluation Case Study: Micatu's Real-Time Voltage Sensors	Case Study	Smart Grid Program	This case study summarizes the key benefits that resulted or are expected to result from NYSERDA's projects with Micatu, including business development, economic benefits, avoided CO2 emissions, and increased safety. The	N/A	Industrial Economics, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						information for this case study was collected through interviews with Micatu and two New York utilities (Orange and Rockland and Con Edison), review of Micatu's project materials, and research conducted by one of NYSERDA's independent evaluation consultants, Industrial Economics.		
NY – NYSERDA	C&I	Jan-21	NYSERDA Smart Grid Evaluation Case Study: Central Hudson's Grid Modernization Investments	Case Study	Smart Grid Program	This case study quantifies the key benefits that resulted from Central Hudson's and NYSERDA's funding for Central Hudson's grid modernization improvements, including improved grid reliability, economic cost savings, and avoided CO2 emissions. Qualitative benefits related to knowledge sharing across utilities including Central Hudson, National Grid and Con Edison are noted but not quantified. Information f or this case study was collected through interviews with Central Hudson, National Grid and Con Edison staff, review of NYSERDA's and Central Hudson's project materials, and supplementary research.	N/A	Industrial Economics, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY – NYSERDA	C&I	Jan-21	NYSERDA Clean Technology Incubator Evaluation Case Study: ACRE	Case Study	ACRE Clean Technology Incubator	Since 2009, the New York State Energy and Research Development Authority (NYSERDA) has supported six clean energy business incubators with a goal of accelerating the market entry of clean energy solutions. This case study details NYSERDA's support of ACRE, the activities and support ACRE provides its clients, and highlights three companies and the successes they have achieved.	N/A	Opinion Dynamics
NY – NYSERDA	C&I	Jan-21	NYSERDA Clean Transportation Research & Development Evaluation Case Study: Clear-Vu Lighting Subway Lights	Case Study	Clear-Vu Lighting Subway Lights	Using NYSERDA funding, Clear-Vu Lighting designed, developed, and tested a novel lighting fixture for subway tunnels in New York City. This document supplements the Clear-Vu Lighting Subway Lights case study that described the benefits of the lighting technology as installed in a limited portion of the New York subway system. The case study comprises findings from in-depth interviews and previous reporting on the lighting technology.	N/A	NMR Group
NY-NYSERDA	C&I	Jan-21	NYSERDA Clean Transportation Research &	Case Study	Adaptive Traffic Lights	The Adaptive Control Decision Support System (ACDSS) is an evolution of Internal Metering	N/A	NMR Group

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
			Development Evaluation Case Study: KLD Engineering – Adaptive Traffic Lights			Policy to Optimize Signal Timing (IMPOST), a traffic control algorithm developed by KLD with NYSERDA support in 1999. This document supplements the KLD Engineering Adaptive Traffic Lights case study that described the benefits of the technology as installed in New York City. The case study comprises findings from in-depth interviews, previous reporting on the technology, and general literature on adaptive traffic controls.		
NY – Con Edison	C&I	Dec-20	Small and Medium Business Program PY2019 Impact Evaluation	Impact Evaluation	Small and Medium Business Program	Con Edison's Small and Medium Business (SMB) Program reported 114 GWh, 31 MW and 113,155 therms savings in 2019. Guide house completed an impact evaluation to verify the annual electric energy and peak demand savings and natural gas savings claimed by the program in 2019. Guidehouse developed recommendations on improving the efficiency and accuracy of future evaluations of the SMB program.	Con Edison provided monthly billing data for all meters at the site for each flagged project. Guidehouse subsequently cleaned the data for each account using only the verified meter readings and converted the data to calendar months.	Guidehouse

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY – Con Edison	Resident	Dec-20	Con Edison Pilot Residential Weatherization Program – 2018 Preliminary Impact Evaluation	Impact Evaluation	Pilot Residential Weatherization Program	This preliminary evaluation covered the initial group of homes treated by the Con Edison Pilot Residential Weatherization Program in Q4 2018. This program encourages homeowners to complete thermal envelope improvements using financing and utility incentives. The primary objective was to ascertain the natural gas and electric energy savings as well as peak period natural gas and electric demand reductions from the pilot program for comparison to the ex-ante savings and to compare the accuracy of billing, AMI, and metered results and how they change during the 3-, 6-, 9-, and 12-month report periods.	Homes were evaluated using billing analysis, metered data, and AMI data. Analyzing savings with AMI data is sometimes referred to Measurement and Verification (M&V) 2.0, as it is assumed that accurate results can be obtained in a shorter time span due to the granularity of the data. This hypothesis was tested as part of this evaluation. All three methods (billing, AMI and metering) provided consistent results for the 12-month reports and should be reasonably reliable for this time period.	West Hill Energy and Computing
NY - NYSERDA	Res/C&I	Dec-20	Clean Heating and Cooling: Heat Pumps and Solar Thermal Market Evaluation	Market Evaluation	Clean Heating and Cooling	NYSERDA filed the Renewable Heating and Cooling (RH&C) chapter 1 under the Clean Energy Fund (CEF) on May 8, 2017. The RH&C chapter included the Ground Source Heat Pump (GSHP) and Air Source Heat Pump (ASHP)	N/A	DNV - GL

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						initiatives which targeted general soft cost reduction strategies for all renewable heating and cooling technologies. Initiatives evaluated in this study address the multi-pronged market support strategy to encourage greater adoption of GSHPs and high efficiency ASHPs.		
NY - NYSERDA	Residential	Dec-20	Green Jobs – Green New York Audit Only Measure Adoption Rate Impact Evaluation 2016 – 2018	Impact Evaluation	Green Jobs Green New York Low Income Residential Energy Audit	This program provides New Yorkers in targeted communities with no cost in-home energy assessments and auditors identify and report on cost-effective energy efficiency upgrade opportunities. This report describes an impact evaluation that assessed the measure adoption rate (MAR) of measures recommended through residential audit reports as well as the customer satisfaction of NYSERDA's Audit It includes participants that received a program-funded in-home audit between Jan 2016 and Dec 2018.	N/A	ERS
NY – National Grid	Res/C&I	Dec-20	National Grid New York Gas Measure and Market Evaluation	Market Evaluation	Natural Gas Programs	In 2019, National Grid engaged DNV GL to conduct a measure and market evaluation of natural gas energy savings and peak-day	N/A	DNV GL

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						demand savings for their Downstate New York gas operations. This was a follow-up study building upon the prior analytical framework applied to Niagara Mohawk Power Corporation's d/b/a ("National Grid") Upstate New York gas analysis as presented in the National Grid Measure and Market Study 2018-2027.		
NY – Con Edison	Residential	Dec-20	Home Energy Reports: 2019 Comprehensive Report	Impact Evaluation	Home Energy Reports	Guidehouse completed an impact evaluation of the 2019 program activities to determine realization rates (RRs)	N/A	Guidehouse
NY - NYSERDA	Residential	Nov-20	NYSERDA Residential Retrofit Impact Evaluation Report (PY2012—2016)	Impact Evaluation	Residential Retrofit Programs	This study is a final evaluation of EEPS2- funded residential programs. The report presents the methods and gross energy savings from the evaluation of NYSERDA's home retrofit programs: Home Performance with ENERGY STAR® (HPwES) and EmPower New York, which also administers National Fuel Gas Distribution Corporation's (NFGDC) Low Income Usage Reduction Program (LIURP). The analysis incorporates residential electricity and natural gas	NMR Group, Inc. aggregated estimated meter reads to obtain an accurate total consumption spanning multiple billing periods. The total consumption for the aggregated period was divided by duration to get average daily use. Accounts with over 50 percent estimated reads in their billing data were removed from the	NMR Group, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						consumption data and NYSERDA and NFGDC program tracking data of participating program homes to estimate first year gross energy savings using a billing analysis. This evaluation of projects installed from 2012 through 2016 with EEPS2 funding and focuses on NYSERDA's residential programs funded by EEPS2 and supplemented by Regional Green House Gas Initiative (RGGI).	analysis as they may fail to capture seasonal variation.	
NY - NYSERDA	C&I	Nov-20	EEPS Commercial & Multifamily Close-Out Impact Evaluation, including National Fuel Gas Distribution Corporation's Non-Residential Rebate Program	Impact Evaluation	Existing Facilities Program (EFP), Multifamily Performanc e Program (MPP); the Commercial New Constructio n Program (CNCP)	This impact evaluation studies the gross impact of three NYSERDA Energy Efficiency Portfolio Standard (EEPS)–funded legacy programs and one National Fuel Gas Distribution Corporation (NFGDC) program. The projects included in the evaluation were initiated through NYSERDA's Energy Efficiency Portfolio Standard (EEPS-2). NFGDC's program from 2016 on is funded by the Energy Efficiency Transition Implementation Plan and System Energy Efficiency Plan (ETIP/SEEP)	N/A	ERS

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - NYSERDA	Res/C&I	Nov-20	NY-Sun Solar Photovoltaic Program Impact Evaluation for May 1,2016 through March 31, 2018	Impact Evaluation	New York Green Bank (NYGB)	This report presents the impact evaluation of solar photovoltaic (PV) projects installed under NYSERDA's NY-Sun program from May 2016 through March 2018. A subset of solar PV installations under the NY-Sun program benefitted from support by NY Green Bank (NYGB), a division of NYSERDA. Previous installations under the NY-Sun and predecessor programs were evaluated in the NYSERDA Solar Photovoltaic Program Impact Evaluation for 2008 and 2011-2016.	Collected production data (in kWh), first-year monthly (13 months) and pre-installation annual energy use for net-metered sites.	DNV GL
NY - NYSERDA	Res/C&I	Nov-20	NYSERDA Innovation & Research Demonstration Project Impact Evaluation	Impact Evaluation	Innovation & Research Demonstration Projects	This report presents results of NYSERDA's Innovation and Research Demonstration Projects from online surveys, phone verification, and project research efforts. DNV GL evaluated the portfolio of NYSERDA-funded demonstration projects that were completed between 2014 and 2018.	N/A	DNV GL
NY - NYSERDA	Res/C&I	Nov-20	Technology and Market Development 2014 – 2018	Evaluation Plan	Innovation & Research Demonstration Projects	The current study updates the R&D demonstration survey with projects that were completed from 2014-2018. NYSERDA finalized the	N/A	DNV GL

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
			Impact Evaluation Plan			first two studies of its R&D demonstration projects in 2012 and 2014. The first study covered projects that were completed from 2004-2007. The second and third studies surveyed projects completed during 2008-2010 and 2011-2013, respectively. These studies assessed: demonstration impacts, NYSERDA's influence on the demonstrations, replications and sales, demonstration influence on the replications, replication impacts, and participant satisfaction		
NY – NYSERDA	C&I	Nov-20	REV Campus Challenge Evaluation Plan	Evaluation Plan	REV Campus Challenge	This evaluation plan includes tasks related to the investment plan for the REV Campus Challenge.	N/A	Cadmus
NY – NYSERDA	Res/C&I	Nov-20	2019 Energy Efficiency Soft Costs in New York Baseline Study	Baseline Study	Energy Efficiency Soft Costs	This study includes research to quantify soft costs across nine energy efficiency "prototypical projects," specifically surveying contractors across the residential, commercial, and multifamily sectors.	N/A	Cadmus
NY – NYSERDA	C&I	Nov-20	2019 Energy Storage Market Evaluation	Market Evaluation	Energy Storage Initiatives	This report presents results from primary and secondary data collection efforts completed for the following two NYSERDA energy	N/A	Navigant Consulting, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						storage initiatives: Reducing Barriers to Deploying Distributed Energy Storage (DES) Investment Plan and Energy Storage Technology and Product Development Investment Plan.		
NY – NYSERDA	C&I	Nov-20	Continuous Energy Improvement Market Evaluation	Market Evaluation	Continuous Energy Improvement	This is a five-year study to monitor the adoption of CEI practices in the industrial sector in New York. The study is designed to run in parallel with NYSERDA's CEI initiative.	N/A	Cadmus
NY – NYSERDA	Res/C&I	Nov-20	Commercial Real Estate Tenant Initiative Baseline Market Evaluation Study	Market Evaluation	Commercial Real Estate (CRE) Tenant Initiative	This report presents the methodology and results of the initial (2017) market study. The results of this study will be utilized to set baseline metrics; subsequent studies will re-evaluate the same metrics to assess progress of the initiative over time.	N/A	Opinion Dynamics
NY - NYSERDA	Res/C&I	Nov-20	Code to Zero Initiative Market Evaluation Report	Market Evaluation	Code to Zero Initiatives	This report presents the evaluation findings for NYSERDA's Code to Zero Initiative based on a Delphi Panel process, representative jurisdiction in-depth interviews, and a broad literature review conducted from March 2019 - March 2020. Through this research, the team established	N/A	Cadmus

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						baseline measurements for and evaluated progress toward the three main Initiative goals.		
NY – NYSERDA	C&I	Nov-20	Agriculture Market Evaluation	Market Evaluation	Agriculture Initiatives	This is a market evaluation of NYSERDA's Agriculture Initiatives: Advancing Agriculture Energy Technologies (AAET), Agriculture Technical Services, and Greenhouse Lighting and Systems Engineering (GLASE) Consortium.	N/A	Guidehouse and Apprise
NY – Con Edison	Residential	Sept-20	Residential Downstream Impact Evaluation Report	Evaluation Report	Residential Downstream Rebate Program	This study evaluates Con Edison's 2018 and 2019 (Q1-Q2) Residential Downstream Rebate Program and recommends improvements to the New York Technical Resource Manual (NY TRM) based on program savings and a literature review/comparison with regional TRMs and other evaluation resources. The evaluation had two components: a prescriptive review of savings as compared to the NY TRM and a literature review.	N/A	West Hill Energy and Computing
NY – Con Edison	Residential	Sept-20	Residential Retail Lighting 2018 Program Evaluation	Evaluation Report	Residential Retail Lighting Program (RRL)	This report provides a summary of Guidehouse's evaluation activities for Con Edison's 2018 Residential Retail Lighting program (RRL), an upstream lighting program focused on providing incentives to	N/A	Guidehouse

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						customers purchasing new light bulbs at the point of sale through retail channels.		
NY - Central Hudson Gas & Electric	Res/C&I	Aug-20	Electric Assessment of Potential Report	N/A	N/A	This report identifies available energy efficiency potential for electric and natural gas, natural gas demand response, and heat pump electrification potential within its territory as part of its long-term planning process.	N/A	Cadmus
NY - NYSERDA	Residential	Jun-20	Residential Retrofit Impact Evaluation Report (PY2012-2016)	Impact Evaluation	N/A	This evaluation estimates the first-year gross energy savings for EEPS-funded projects installed from 2012-2016 through HPwES, EmPower, and the NFGDC LIURP projects. Also presents results of NYSERDA Empower and HPwES measures funded through RGGI.	N/A	NMR Group
NY - Central Hudson Gas & Electric	Res/C&I	Jun-20	Evaluation Plans and Proposals	Evaluation Plans	N/A	Central Hudson G&E Corp released a number of plans and proposals for projects involving various lighting, technology, and rebate evaluations.	N/A	Cadmus
NY - NYSERDA	Res/C&I	Jun-20	Clean Energy Fund Quarterly Performance Report through March 31, 2020	Performance Report	Clean Energy Fund	NYSERDA files a scorecard with the Public Service Commission containing metrics for each investment plan. This data fulfills part of the ordered reporting	N/A	NYSERDA

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						requirements and is featured in the public NY Clean Energy Dashboard, along with metrics for utility programs.		
NY - Con Edison	Multifamily	Mar-20	Expanded Natural Gas Billing Analysis	Analysis	Multifamily Program	The primary purpose of the expanded billing analysis was to verify *ex post* EMS energy savings and realization rates with a larger model.	To conduct the billing analysis, secondary data from several sources (programs, billing, NOAA weather, and PLUTO) was combined. Of the 1548 natural gas accounts with billing records, 49% were included in the final model. Of the 757 accounts in the final billing analysis, 628 were used to estimate pre-installation consumption, 460 to estimate EFLH where a boiler size was missing (using building square footage to estimate boiler size), and 227 to estimate the EFLH for high-rise buildings prior to 1979 with the actual boiler size.	West Hill Energy and Computing

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - Con Edison	Residential	Mar-20	New Movers Energy Efficiency Program Fiscal Years 2017-2018	Evaluation Report	New Movers Program	This research provided energy and demand savings estimates for electricity and natural gas attributable to the New Movers program as well as increased understanding of available data on key variables to inform future research and program designs. The ultimate goal was to help Con Edison determine whether to continue the program.	N/A	West Hill Energy and Computing
NY - Con Edison	Residential	Mar-20	Smart Kids Energy Efficiency Program Fiscal Years 2017-2018	Market Evaluation	Smart Kids Energy Efficiency Program	This report presents verified savings estimates for the Smart Kids EE Program for program years 2017 and 2018 and summarizes key results across the two-year period.	N/A	West Hill Energy and Computing ; Cx Associates
NY - NYSEG/RG&E	C&I	Mar-20	Non-Residential Programs Impact Evaluation Report	Impact Evaluation	C&I Rebate Program	The primary objectives of this study were to determine the verified gross savings for electric energy, electric demand, and natural gas energy, and to calculate corresponding realization rates for each of the following program types: C&I Prescriptive Electric, C&I Custom Electric, SBDI, C&I Prescriptive Gas, C&I Custom Gas.	ERS employed a “rolling sampling” technique in this concurrent evaluation. With rolling sampling, the evaluators drew a sample at the end of every quarter of program implementation. In total, 192 sites were sampled over the seven evaluated quarters and then these	Energy Resource Solutions

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
							samples were organized by program, fuel, delivery type, and savings stratum.	
NY - Con Edison	Residential	Feb-20	Home Energy 2018 Final Comprehensive Report	Impact Evaluation	Home Energy Reports Program	Navigant completed an impact evaluation of the 2018 program activities to determine realization rates.	N/A	Navigant
NY - Con Edison	Multifamily	Jan-20	Program Year 2017 Impact Evaluation	Impact Evaluation	Multifamily Program	The primary objectives of this evaluation are to estimate annual energy savings (electric and natural gas) and peak period demand reductions for the 2017 program year. Secondary objectives include providing insight into reasons for discrepancies between *ex ante* and *ex post* savings and suggesting refinements to the TRM characterizations, if indicated.	For natural gas measures with incomplete input data, a review of the Willdan tools for three pipe insulation projects (of 28 total) found that all required inputs were present and seem reasonable. For electric measures with particularly high or low realization rates (RR), eleven projects were selected for review. Of these, ten projects had a RR less than 80% or greater than 120% for kW and one project was selected with an RR below 95% for kWh.	West Hill Energy and Computing

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - Con Edison	C&I	Dec-19	2018 Building Energy Performance Pilot Program Evaluation Report	Impact and Process Evaluation	Building Energy Performance Pilot Program	This program includes: engaging building operators in trainings, campaigns, and competitions related to energy efficient building O&M; providing building operators with detailed data on their energy consumption; and engaging tenants in EE campaigns within commercial office spaces. This report focuses on documenting and distilling the lessons learned during the first year of program implementation and evaluation, before Con Edison decided to consider changes to program design.	N/A	EMI Consulting
NY - NYSERDA	Res	Oct-19	HPwES On Bill Recovery Impact Evaluation	Impact Evaluation	Home Performance with ENERGY STAR®	The evaluation period includes projects completed between January 2014 and September 2016. The study estimates gross impacts, investigates program savings, and provides a cash flow analysis.	Methods included: billing analysis, cash flow analysis, review of modeling files and comparison to other studies. Measures included: insulation, air sealing and water and space heating system replacement. Sample = 175 homes.	West Hill Energy and Computing

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY- Central Hudson Gas & Electric	C&I	Oct-19	2019 Non-Residential Baseline Study	Baseline Study	N/A	An initial step in the process of developing an energy-efficiency potential assessment for the Central Hudson service territory in New York is to establish baseline energy usage characteristics for the non-residential customers served by Central Hudson. This report documents the methodology and findings of the end use and saturation study and provides baseline energy use characteristics by business type and for the non-residential customer class as a whole. Findings from this Baseline Study will be used to inform the C&I Market Potential Study currently under development by Cadmus. Findings from the 2018 NYSERDA Commercial Building Stock Assessment (CBSA) will be utilized in the assessment of residential energy-efficiency potential. Additionally, the team will review and may use some data collected from Central Hudson's 2018 Residential Appliance Saturation Survey (RASS).	Primary and secondary data collection through on-site surveys and phone surveys. Electric and natural gas sales and accounts were analyzed based on annualized usage derived from billing data provided by Central Hudson for the past 24 meter reads. The sample design targeted 25 completes for each building type (education, grocery, health, industrial, lodging, miscellaneous, office, restaurant, retail, warehouse).	Demand Side Analytics & Cadmus

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - Niagara Mohawk	Res/C&I	Sept-19	Niagara Mohawk Power Corporation, d/b/a National Grid, Measure and Market Study 2018-2027	Potential Study	N/A	This study assesses the potential for electric and natural gas energy and electric demand savings from company-sponsored residential, commercial, and industrial demand side management (DSM) programs. The method used for estimating potential is a "bottom-up" approach, in which EE costs and savings are assessed at the customer segment and EE measure level. For cost-effective measures (based on the Total Resource Cost, or TRC, test), achievable savings potential is estimated as a function of measure economics, rebate levels, and program marketing and education efforts.	The energy efficiency analysis was modeled using DNV GL's DSM Assyst® 2.0 model. It is an Excel-based, customizable model, which uses a bottom-up approach for building-based energy efficiency measures and emerging technologies, as illustrated in Figure 3-1. Each technology was characterized by measure costs, savings, and applicability that reflect National Grid's program offerings and customer base. Energy usage by sector and business type was developed from National Grid electricity forecasts and billing data.	DNV GL

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - Con Edison	C&I	Sept -19	Con Edison Large C&I Program (PY 2018) Impact Evaluation	Impact Evaluation	Large C&I Program	This impact evaluation for PY 2018 calculates annual ex-post gross energy and demand savings for electricity and natural gas Identify opportunities to increase program peak demand reduction to inform program planning to address Con Edison's system peak demand constraints. Includes metering: All projects were desk reviewed, 20% of projects received a verification-only onsite, and 18% projects received an onsite with metering or trend data	A stratified random sample of 103 projects (21% of total population) was selected for inclusion in the project-level analysis, targeting 90% confidence and 10% precision at the program-level. All projects were desk reviewed; 63 (61%) projects received only a desk review, 21 (20%) projects received a verification-only onsite, 19 (18%) projects received an onsite with metering or trend data. Analysis was divided into lighting and non-lighting measures.	Navigant Consulting
NY - Con Edison	C&I	Aug-19	Instant Lighting Incentive Program (ILIP) Evaluation	Impact Evaluation	Instant Lighting Incentive Program	This Program is available to separately-metered customers on commercial rates. It provides point-of-purchase discounts for eligible customers. Navigant targeted an initial sample of 66 projects, drawn continuously over the course of the program year, to receive an on-site verification. The evaluation team conducted	Navigant targeted an initial sample of 66 projects, drawn continuously over the course of the program year, to receive an on-site verification, based on sampling assumptions to achieve 10% precision at 90% confidence. All	Navigant Consulting

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						continuous project evaluations for the program, which included confirming measure installations and baseline technologies, estimating hours of use and coincidence factors, and estimating HVAC interactive effects.	sampled projects received a verification site visit. The study focused on light bulbs with mid-stream incentives sold as part of the program.	
NY - Con Edison	C&I	Aug-19	Con Edison Large C&I Program Impact and Process Evaluation	Impact and Process Evaluation	Large C&I Program	This report covers the 2017 impact evaluation and a thorough process evaluation for 2017 and 2018 program activity. Targeting 90% confidence and 10% precision at the program level, a stratified random sample of 100 projects was selected for inclusion in the impact evaluation. Sampled projects were randomly selected from the year-end Demand Management Tracking System (DMTS) data, stratified by program type, measure type, initial implementer, and project size	Targeting 90% confidence and 10% precision at the program level, a stratified random sample of 100 projects was selected for inclusion in the impact evaluation. Gas projects and large projects were intentionally oversampled. All projects were desk reviewed; 87 projects only received a desk review. 4 projects received a verification-only onsite. 9 projects received an onsite with metering or trend data. Analysis was divided into lighting and non-lighting measures.	Navigant Consulting

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - NYSERDA	C&I	Jul-19	Commercial Energy Management Evaluation	Market Evaluation	Commercial Energy Management initiative	The overall objective of this market research study is to develop a baseline of market conditions and track progress towards the goals of the CEM initiative, which includes Real-Time Energy Management (RTEM) and Remote Energy Management (REM)	N/A	Opinion Dynamics Corp
NY - NYSERDA	C&I	Jul-19	2018 Energy Storage Market Evaluation	Market Evaluation	Energy Storage Initiatives	This report presents results from primary data collection efforts completed by the evaluator for the following two NYSERDA energy storage initiatives: 1) Reducing Barriers to Deploying Distributed Energy Storage (DES) Investment Plan and 2) Energy Storage Technology and Product Development Investment Plan.	N/A	Navigant Consulting, Inc.
NY - NYSERDA	C&I	Mar-19	NY Green Bank Financial Market Transformation Study	Market Transformation Study	New York Green Bank (NYGB)	This study includes a baseline assessment that appraised the state of the market during 2015–2018, representing conditions before NYGB financing activity began in earnest and as it ramped up, using the set of market indicators specified by NYSERDA and NYGB as part of the Study plan. It also includes an attribution	N/A	DNV GL

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						analysis addressing how and to what extent NYGB's activities contributed to changes observed in the clean energy finance market during that time.		
NY - NYSERDA	Gov't	Mar-19	Clean Energy Communities Market Evaluation	Market Evaluation	Clean Energy Communities	This study used phone interviews with community representatives to understand and present costs and impacts of, and barriers to, completed clean energy project actions. The report also presents Time 1 metrics per the Clean Energy Investment Fund Plan: Communities Chapter, and estimates performance metrics such as number of actions completed.	N/A	Research Into Action, Inc.
NY - Niagara Mohawk/ National Grid	Res/C&I	Mar-19	National Grid Commercial & Industrial and Multifamily Gas Program Assessment Study	Implementation Study	Gas Programs	The objective of this study is to provide recommendations to help National Grid cost-effectively broaden the scale of participation and savings from its New York state gas energy efficiency programs. The results of this report are based on the following analyses and investigations: program staff interviews; customer information and usage data	The results of this report are based on the following analyses and investigations: program staff interviews, customer information and usage data analysis, program participant data analysis, and market research. Nexant utilized data provided by	Nexant, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						analysis; program participant data analysis; and market research.	National Grid to analyze C&I and multifamily gas customers by sector, rate code, business type, size, location, and other identifiable characteristics to analyze each customer segment's gas energy usage totals and trends. This data was then supplemented with secondary data from national sources to develop the final analysis data set.	
NY - Con Edison	Res	Feb-19	Smart Charge Electric Vehicle Program Impact Evaluation Final Report	Impact Evaluation	Smart Charge Electric Vehicle Program	This report describes the results and findings from an impact evaluation of Con Edison's 2018 SmartCharge NY program, which was designed to reduce electric vehicle (EV) charging during Con Edison's peak period. This evaluation focuses solely on the private vehicle portion of the program, which uses a FleetCarma C2 device to record program participant EV charging events. The impact evaluation calculated the peak demand reductions attributable to the program for	ERS created two 24-hour average per-vehicle load profiles – one for program participant EVs and the other for baseline vehicles – and calculated the reduction as the difference between them over each peak period. The participant profile was calculated from metered charging data for 688 program participants provided by the	ERS, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						two peak periods: the NYISO peak period and the Con Edison summer weekday peak period. The participant profile was calculated from metered charging data for 688 program participants provided by the program's implementer, FleetCarma.	program's implementer, FleetCarma. The baseline profile was based on 85 respondents to a survey of program nonparticipants and recent signups, where respondents were asked to report when they had charged in the previous five days.	
NY - Con Edison	Res	Feb-19	Smart AC Demand Control Program: Impact Evaluation Final Report	Impact Evaluation	Smart AC Demand Control Program	This study had two objectives: 1) estimate 2018 demand savings for manufacturer Wi-Fi enabled units during demand control events. This includes developing a methodology for estimating demand savings in future years. 2) estimate kWh savings for smartAC kit units resulting from the addition of wireless controls on the units.	Meters were installed on 44 wi-fi enabled Smart AC units.	ERS, Inc.
NY - NYSERDA	C&I	Feb-19	Clean Energy Fund Workforce Development and Training Industry Partnerships Baseline Study	Baseline Study	Workforce Development and Training Initiative	The primary objective of this study was to develop baseline indicators for the WFD Industry Partnerships Initiative.	N/A	Research Into Action, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - NYSERDA	Res/ C&I	Jan-19	EEPS Commercial and Multi-Family Close-Out Impact Evaluation	Impact Evaluation	Existing Facilities Program, Non-Residential Rebate Program, Multi-family Performanc e Program	This study is the close-out impact evaluation of three NYSERDA EEPS-funded legacy programs: 1) the Existing Facilities Program (EFP), including National Fuel Gas Distribution Corporation's (NFGDC) Non-Residential Rebate Program, which was administered by NYSERDA; 2) the Multifamily Performance Program (MPP); and 3) the Commercial New Construction Program (CNCP). The evaluation of EFP and the NFGDC's Non-Residential Rebate Program is a joint NYSERDA-utility effort, with NFGDC as the lead participant on its rebate program with respect to post EEPS program years. It evaluates gross energy impacts, develops realization rates, and applies lessons learned to other programs. Findings are based on desk review, billing analysis, energy modeling and metering.		ERS, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - NYSERDA	C&I	Jan-19	2017 Energy Storage Market Evaluation	Market Evaluation	Energy Storage Initiatives	This report presents the evaluation results from two of NYSERDA's energy storage initiatives: Energy Storage Technology and Product Development Investment Plan and Reducing Barriers to Deploying Distributed Energy Storage Investment Plan. Objectives include: 1) develop a reliable, detailed, New York based estimate of current soft costs ($/kWh) of distributed energy storage systems as a component of the total installed cost ($/kWh, duration). 2) Develop a reliable, detailed estimate of the current performance of energy storage systems.	N/A	Navigant Consulting
NY - NYSERDA	C&I	Dec-18	Commercial Energy Management Market Baseline Evaluation	Market Baseline Evaluation	Commercial Energy Management initiative	Opinion Dynamics is evaluating the CEM initiative by conducting research on several metrics. The initial step involves research to develop a baseline of market conditions, followed by ongoing research to track progress towards the EM initiative goals over a five-year period, from 2017-2021. This report presents the methodology and results of the initial (2017) market study. Results will be	N/A	Opinion Dynamics Corp

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						utilized to set baseline metrics; subsequent studies will re-evaluate the same metrics to assess progress of the initiative over time.		
NY - Central Hudson Gas & Electric	Res	Dec-18	Residential Appliance Saturation Survey Results	Saturation Survey	N/A	This study was designed to achieve the following objectives: 1) Develop end use and technology saturations by service territory and district, 2) Assess changes in saturations since 2012, 3) Understand customer perceptions regarding future heating and cooling purchases, 4) Determine awareness of Central Hudson EE programs, 5) Estimate the likelihood that customers will participate in future EE programs, 6) Provide inputs for the development of segment market profiles and to provide appropriate inputs for AEG's LoadMAP end use forecast model for use in a future energy efficiency potential study.	N/A	Applied Energy Group
NY - NYSERDA	C&I	Sept-18	2014-2017 Industrial and Process Efficiency	Impact Evaluation	Industrial and Process Efficiency Program	This evaluation's primary objective is to independently estimate the program's electric and natural gas energy savings. The evaluated	Evaluated savings are based on project-specific M&V performed on a statistically	ERS, Inc. and ADM Associates

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
			Program Impact Evaluation			savings are based on project-specific M&V performed on a statistically representative sample of 55 electric energy savings and 30 natural gas savings projects.	representative sample of 55 electric energy savings and 30 natural gas savings projects. Ten projects had a combination of both electric and natural gas savings. Measure types studied: non-process/industrial; process/industrial; process/data center.	
NY - NYSERDA	C&I	Sept -18	Continuous Energy Improvement Market Evaluation - Year 2	Market Evaluation	Continuous Energy Improvement Initiative	This report presents the findings from the Year 2 CEI market evaluation activities. It includes qualitative research to better understand the market for EMIS, and to refine evaluation methods for future research.	N/A	The Cadmus Group, LLC
NY - NYSERDA	C&I	Aug-18	High Performance Grid Indicator Tracking Report 2016 Baseline and 2018 Update	Baseline Study	High Performing Grid Initiative	This report presents baseline indicator values and current 2018 values related to the planned outputs and outcomes for the High Performing Grid initiative. This analysis was conducted in-house by NYSERDA staff given the availability of credible data sources, and focused on 2016 baseline values, the year the	N/A	NYSERDA

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						investment plan was filed, as well as the current status in 2018. A comprehensive Grid Modernization-related market evaluation is planned for 2019.		
NY - NYSERDA	Res	Aug-18	Low-Income Community Solar Indicator Tracking Report 2018 Baseline	Baseline Study	Low-Income Community Solar Initiative	This report presents baseline indicator values related to the planned outputs and outcomes for the Low-Income Community Solar initiative. This analysis was conducted in-house by NYSERDA staff given the availability of credible data sources, and focused on 2017 baseline values, the year the investment plan was filed. A comprehensive study focused on solar balance of system costs is planned for 2019.	N/A	NYSERDA
NY - NYSERDA	C&I	Aug-18	Industrial and Process Efficiency Program Concurrent Evaluation 2017-2018 Annual Report	Annual Report	Industrial and Process Efficiency Program	The concurrent evaluation engineers work with the IPE program staff and technical reviewers on the largest and most complex projects to ensure projects are well documented with defensible baselines and reasonable energy savings calculations and assumptions. The concurrent evaluation team	N/A	Michaels Energy

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						provides feedback on baseline characterization, metering strategies, and analysis methods through the review of energy savings calculations, engineering analysis reports, M&V plans, and post-installation review reports.		
NY - NYSERDA	C&I	Jul-18	Cleantech Startup Growth Initiative Baseline Study	Baseline Study	Cleantech Startup Growth Initiative	This study's primary objective is to develop baseline indicators for the Cleantech Startup Growth Initiative. The secondary objective is to leverage the Cleantech Startup Growth Initiative data to capture baseline conditions for the M-Corps Initiative.	N/A	Research Into Action, Inc.
NY - NYSERDA	Res/C&I	Jun-18	Solar Photovoltaic Program Impact Evaluation for 2011-2016	Impact Evaluation	Solar Photovoltaic Program	This is an impact evaluation of projects installed in 2008 and from 2011-2016 under NYSERDA solar photovoltaic (PV) programs. The primary impact results for this evaluation are capacity factor results. As such, the accuracy of these estimates are reviewed for different categories relative to the 90/10 precision target. All results presented in the executive summary met the 90/10 precision target.	Metering: M&V using on-site logged data (inverter data) from a representative sample of program participants. First-year annualized production data was collected from participants, contractors, and NYSERDA. Sample: The sample design has 52 strata and a total target sample of 523 sites, where a site is	DNV GL

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
							a single installed solar PV system enrolled through a NYSERDA program.	
NY - Con Edison	Res	Jun-18	Con Edison Retail Products Platform (RPP) Evaluation	Impact Evaluation	Retail Products Platform	The ENERGY STAR Retail Products Platform (ESRPP) Program uses a nationally-coordinated midstream design aimed at influencing retailers to alter their assortment (i.e., the variety of models offered for sale) and to sell, promote, and demand more energy efficient models of home appliances and consumer electronics in targeted product categories: air cleaners, room air conditioners, dryers, washing machines, refrigerators, freezers, and sound bars. This evaluation estimates the short-term energy savings and demand reductions attributable to program activities, and to assess key components of the program logic model.	N/A	EMI Consulting and Illume Advising

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - National Grid	Res/C&I	Apr-18	National Grid Evaluation Status Report - Q4 2017	Various Studies	Various National Grid Programs	Included in this file are the following corresponding studies cited within the Status Report: 1.) Advanced Monitoring & Verification ("M&V") Review: Residential High Efficiency Heating and Water Heating and Controls Programs in New York; 2.) Residential and Commercial & Industrial Gas Heating Hours Study; 3.) Prescriptive and Custom Lighting Impact Evaluation for the Commercial & Industrial Electric Program, with separate program summary; 4.) Process Evaluation of the Electric Small Business Services Program; 5.) Process Evaluation of the Energy Initiative – Commercial & Industrial Program's Peer Review Process; and 6.) Retro-commissioning Gap & Market Assessment.	The Advanced M&V Review: Residential High Efficiency Heating and Water Heating and Controls Programs in New York included analyzing whole building consumption meter data to arrive at energy savings estimates for the program, including the measures comprising the program: boilers, furnaces, thermostats, and water heating. The Prescriptive and Custom Lighting Impact Evaluation for the C&I Industrial Electric program included on-site verification at 36 sites of the installed measure quantities and technologies installed. The hours of operation of the lighting measures were determined through lighting fixture level run time metering for a minimum of four	NMR Group, Inc., Applied Energy Group, Inc., ERS Inc., Nexant, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
							weeks at each project. It also included desk review of 42 sites.	
NY - NYSEG & RGE	C&I	Mar-18	Silver Creek DER-EE Pilot Program Impact Evaluation Final Report	Impact Evaluation	Silver Creek DER-EE Pilot Program	This evaluation involves independent calculation of electric energy (kWh) and peak demand reduction (kW) through M&V of the upgraded lighting systems of the 73 lighting upgrade projects. The lighting upgrades typically involved replacements of incandescent bulbs and magnetic T12 linear fluorescent fixtures with screw-in LEDs and high-performance electronic T8 linear fluorescents, respectively. Through M&V of 58 of the 73 lighting projects funded by the program, ERS calculated coincidence factors associated with the circuit/substation, utility system, and NY ISO peak demand period.	The study team recruited and verified 58 sites out of the 73 sites that participated in the program. The study included short-term metering of installed lighting operating hours.	ERS, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY-National Grid	C&I	Jan-18	Evaluation Status Report - 3rd Quarter 2017	Impact Evaluation	Custom HVAC Program	This report includes National Grid's August 2017 Energy Initiative – Commercial & Industrial Electric Program: Impact Evaluation of Custom Gas Heating, Ventilation and Air Conditioning Installations ("Custom HVAC Evaluation") cited within the Status Report, as well as a separate summary of the Custom HVAC Evaluation.	The C&I Industrial Electric Program impact evaluation utilized on-site M&V for 21 program participants to assess gross impacts and achieve ±10.0% at the 90% confidence level for gross energy kWh savings. Measures included HVAC systems, lighting, lighting controls, energy management systems, economizer controls and air compressors. The Impact Evaluation of Custom Gas HVAC Installations included 21 temporary data loggers for power monitoring at a statistically selected sample of program participants. Custom HVAC measures include high efficiency HVAC equipment, HVAC controls as part of EMS, operations and maintenance, retro-	DNV GL

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
							commissioning of HVAC measures, and building shell improvements that impact HVAC loads. This impact evaluation includes only measures which primarily reduce electricity consumption.	
NY - NYSERDA	Res/C&I	Jan-18	REVitalize CBO Survey Study	Baseline Study	REVitalize Initiative	This research supports the REVitalize Initiative by identifying community-based organization's (CBOs) baseline interest in, and experience developing, community-scale clean energy projects in low-moderate income (LMI) or environmental justice (EJ) communities. It also seeks to glean insights from CBOs that have experience developing community-scale clean energy projects or other large, community-scale infrastructure projects, so that NYSERDA can develop resources of most value to CBOs interested in these projects.	N/A	Research Into Action, Inc.
NY - NYSERDA	Res/C&I	Nov-17	Baseline Market Evaluation for Energy Storage	Market Evaluation	N/A	This report documents the first annual survey of conditions of the major cost components of deployed distributed energy	N/A	Research Into Action, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						storage systems in New York State (NYS), with an emphasis on soft costs. Contacts provided responses based on their 2016 activities in the energy storage market.		
NY - Rochester Gas & Electric	Res	Oct-17	Rochester Gas and Electric Your Energy Savings Store Evaluation	Process Evaluation	Your Energy Savings (YES) Store	The objective of this study is to understand customer motivations and barriers to use of RG&E's YES Store with an aim of using this insight to increase traffic to and purchases at the store.	Study used CIS data for over 180,000 RG&E residential customers that included variables that indicate participation in other RG&E energy efficiency programs, use of auto bill pay, receipt of e-bills, customer contact with the utility, reporting of problems, level of electricity and gas consumption, and bill amounts for a 12-month period preceding the start of this evaluation.	DNV GL
NY - Central Hudson Gas & Electric	C&I	Sept -17	C&I Prescriptive and Custom Program Process Evaluation Report	Process Evaluation	C&I Prescriptive and Custom Program	The 2016-2017 process evaluation for these programs to examine both internal program processes and customer response to the program.	N/A	Applied Energy Group

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - National Grid	Res/C&I	Sept-17	Evaluation Status Report - 2nd Quarter 2017	Impact Evaluation	Custom Gas Installations	This evaluation quantifies the gross annual energy impacts of custom gas measures installed through National Grid's Programs, including the gross annual therm savings realization rate.	The study was designed to utilize on-site verification and monitoring to assess gross impacts. The evaluation was designed to achieve ±10.0% at the 90% confidence level for gross energy (therm) savings. DNV GL performed on-site assessments at 31 custom gas participants from the 2011/12 program years. These on-site visits were statistically selected, and included comprehensive inventories and on-site metering performed for 1-6 months.	DNV GL
NY - NYSERDA	C&I	Sept-17	Continuous Energy Improvement Evaluation 2017	Market Evaluation	Continuous Energy Improvement Initiative	This study quantifies the baseline values for four of the six indicators established by NYSERDA to track market progress and provides information about baseline market characteristics.	N/A	The Cadmus Group, LLC

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - Con Edison	Multi-family	Jul-17	Multifamily Boiler Effective Useful Life Study and Appendices	Effective Useful Life Study	N/A	This study's primary research objectives are: 1. Investigate the actual age and characteristics of multifamily boilers in NYC; 2. Estimate the potential savings opportunity from beyond-EUL boilers; and 3. Compare how current TRM methods and potential changes affect savings. Methods included surveys with building supervisors and operators.	N/A	ERS, Inc.
NY - NYSERDA	Res/ C&I	May -17	Advanced Energy Codes Program: Process Evaluation Phase II	Process Evaluation	Advanced Energy Codes and Standards Program	NYSERDA provides a range of training and support services through the Codes initiative of its Advanced Energy Codes and Standards program. The primary goal of this Phase II process evaluation is to understand the contribution of NYSERDA training to behavioral changes among training participants that improve Energy Code compliance. A secondary goal is to evaluate the effectiveness of NYSERDA's Energy Code support services to municipalities.	N/A	Industrial Economics, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - NYSERDA		May -17	Characterizing New York State's Cleantech Ecosystem and the Role of NYSERDA'S ICBD Program - Final Report	Market Characterization	Innovation Capacity and Business Development Program	This report measures the broader "market" of cleantech companies, and the entrepreneurial ecosystem that affects them. It provides a picture of the current size and "vibrancy" of the overall market for cleantech, the resources available in the ecosystem, and the key factors that drive and/or form a barrier to market actors, affecting the pace and scale of cleantech innovation in NYS. The ecosystem includes NYSERDA's ICBD services, and the MCA helps to document ICBD's role and contribution to the market.	N/A	Industrial Economics, Inc.
NY - NYSERDA	C&I	May -17	ETAC and Advanced Buildings Solid State Lighting and Controls Market Adoption Curve Analysis	Market Adoption Curve Analysis	Emerging Technologies and Accelerated Commercialization (ETAC) Program	This report examines the use of theoretical and empirical "market adoption curves for solid state lighting, in particular LEDs and LEDs with networked controls, i.e., LEDs governed by software that generate additional efficiencies and savings by altering lighting patterns. Market adoption curves estimated in this report are based on the Bass Diffusion Model, a standard product adoption model that follows the s-curve shape to describe the total adoption of a	N/A	Industrial Economics, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						technology or product within a population.		
NY - NYSERDA	Res/C&I	May-17	Solar Balance-of-System Costs Baseline Cost Study	Baseline Study	Solar Balance of Systems Cost (BOS)	This report provides estimates of baseline balance-of-system (BOS) soft costs for photo-voltaic (PV) systems installed in New York in 2016.	N/A	Industrial Economics, Inc.
NY - NYSERDA	C&I	May-17	Characterizing New York State's Cleantech Ecosystem and the Role of NYSERDA's IBCD Program	Evaluation Report	IBCD Program	The Innovation Capacity and Business Development (IBCD) aims to help entrepreneurs and companies develop business skills and capacities that will enable them to advance technologies to market more rapidly and with greater success rates.	N/A	Industrial Economics, Inc.
NY - NYSERDA	Res/C&I	Apr-17	Combined Heat and Power Baseline Assessment	Program Assessment	Combined Heat and Power (CHP) Program	NYSERDA's CHP program seeks to advance the modular CHP market by reducing soft costs and development time and increasing the penetration of CHP. Major program activities focus on providing cost-shared incentives to support the installation of CHP equipment at eligible host site locations. Additionally, and to a lesser extent, the program provides cost-shared incentives to support site-specific feasibility studies. NYSERDA has procured a	N/A	Industrial Economics, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						variety of technical outreach services to raise awareness of the opportunity for CHP among good-prospect candidate sites.		
NY - Central Hudson Gas & Electric	Res	Apr-17	Residential Lighting Program Process Evaluation Report	Process Evaluation	Residential Lighting Program	The 2016-2017 process evaluation for this program examines both internal program processes and customer response to the program. AEG reviewed program materials and the program tracking system, conducted interviews with utility staff, representatives of the implementation contractor, and store managers, and conducted store intercept surveys with consumers.	N/A	Applied Energy Group, Inc.
NY - NYSERDA	Res/C&I	Apr-17	R&D Demonstration Survey Round 2: Projects Completed from 2011-2013 Final Report	Impact and Process Evaluation	R&D Demonstration Programs	This evaluation assesses the impacts of NYSERDA's R&D demonstration portfolio based on projects completed in 2011–2013. The evaluation: Estimates the resource savings (e.g., kW, MWh, etc.), revenues, cost savings, and other impacts resulting from NYSERDA-funded demonstrations	N/A	Industrial Economics, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						and replication projects; Characterizes the number, scale, and type of replication projects; Determines the factors that helped or hindered replication; Assesses the cost-effectiveness of NYSERDA's R&D demonstration portfolio; Evaluates participant satisfaction with NYSERDA's R&D Program.		
NY - NYSERDA	Res	Mar-17	NYSERDA Ductless Mini-Split Heat Pump (DMSHP) Market Characterization Study	Market Characterization	N/A	The goal of this study is to: 1) establish current baseline and market activity for ductless mini-split heat pumps (DMSHP) in New York state; and 2) identify key indicators to track change in market activity over time.	N/A	NEEP, ERS, EFG

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - NYSERDA	Res	Mar-17	Quantification of Non-Energy Impacts for Residential Programs Phase I: Final Report	Non-Energy Impacts	Residential Programs	This report describes research done on non-energy impacts (NEIs) from small residential EE programs. The study examined monetized NEI values established by industry research from around the U.S. focusing on studies published since 2006. After pairing the research values with the program implementation data, the study output was a prioritized list of NEIs, if tracked and quantified, that would have the largest impact on NYSERDA programs and their evaluated benefits. The final step identified and determined the most cost-effective primary data collection methods for the NEIs associated with the most prominent and impactful energy efficiency measures within NYSERDA residential programs. Insulation, ENERGY STAR home design, and air sealing measures are the readiest for a cost-effective primary research effort to further substantiate their related NEI values for enhancing program design, marketing efforts, and cost-benefit analysis.	N/A	ICF International

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - NYSERDA	C&I	Mar-17	NYSERDA Energy Storage and NY-Best Program: Impact Evaluation	Impact Evaluation	NYSERDA Energy Storage and NY-Best Program	This evaluation assesses the impact on New York State's energy storage industry and market by the NYSERDA-supported NY-BEST Consortium. The evaluation period primarily covers the period from 2010 to 2015 with updates on the number of members and project status provided in the first quarter of 2016.	N/A	EMI Consulting, Industrial Economics, Inc.
NY - NYSERDA	C&I	Mar-17	NYSERDA Transportation Program	Case Study	Transportation Program	This project was conducted as part of NYSERDA's efforts to support ChargeNY, a statewide initiative that aims to increase the number of plug-in EVs in New York State to more than 30,000 by 2018.	N/A	Industrial Economics, Inc.
NY - NYSERDA	Res/C&I	Mar-17	NYSERDA Power Systems Program and Clean Power Technology Innovation Program: Impact Evaluation	Impact Evaluation	Power Systems Program/Clean Power Technology Innovation Program	This report presents the results of the impact evaluation of NYSERDA's Clean Power Technology Innovation Program, previously known as the Power Systems program. It documents program achievements and project growth and identifies lessons learned that can be incorporated into the Renewable Resource Optimization (RRO) program.	N/A	Industrial Economics, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - NYSERDA	Res/ C&I	Mar-17	Wastewater Efficiency Program Impact Evaluation Report 2011-2013	Impact Evaluation	Wastewater Efficiency Program	This an impact evaluation of NYSERDA's RGGI-funded EE studies that were completed as a result of the Wastewater Efficiency Program. It estimates the evaluated gross savings, which includes the electric energy and demand and fossil fuel energy savings for projects with known installed measures. The evaluated savings are based on desk reviews and interviews performed on a statistically valid sample of 14 projects from the population.	N/A	ERS, Inc.
NY - NYSERDA	Res	Mar-17	Quantification of Non-Energy Impacts for Residential Programs Phase I: Final Report	Evaluation Report	Residential	This document summarizes the results of the activities competed under the Quantification of Non-Energy Impacts for Residential Programs" Task Work Order. The project examines NEIs associated with NYSERDA programs and measures to more comprehensively understand the total benefit to program participants.	N/A	ICF International

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - NYSERDA	Res	Mar-17	Residential Net Zero Energy: Performance Assessments (2008–2015)	Baseline Study	Low-Rise Residential New Construction	This report is an energy performance baseline determination of a group of residential new construction homes in New York. It establishes energy use and energy use per square foot for two performance tiers of residential new construction: nonparticipant market typical and NYSERDA Low-rise Residential New Construction (LRNC) program participant construction.	This study included M&V on a group of participant homes to determine as-built performance and energy metrics. 26 homes were metered for the full study period. Metering intervals were generally 1 hour, and some were reduced to 15 minutes in homes where metering was extended into the winter.	ERS, Inc.
NY - NYSERDA	Res/C&I	Feb-17	NYSERDA Energy Storage and NY-Best Program: Market Characterization and Assessment	Market Characterization	N/A	This market characterization and assessment focuses on determining the status of the global energy storage market, with particular focus on states actively supporting energy storage and a close review of the energy storage industry in New York State. The assessment includes a review of existing New York State energy storage industry resources and capabilities and provides NYSERDA staff with a baseline against which future assessments can be measured.	N/A	Industrial Economics, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - NYSERDA	Res	Feb-17	NYSERDA Low- to Moderate-Income Market Characterization Report	Market Characterization	N/A	This study develops information on LMI households to support NYSERDA's design and implementation of a comprehensive LMI market strategy. The study identifies and analyzes secondary data sources on LMI demographics, housing characteristics, energy usage and expenditures, and financial capacity to assess the size, geographic distribution, and energy saving potential associated with the LMI Market. It also develops an inventory of the LMI housing units served over the past 10 years to assess needs and develop an understanding of how other state and local agencies can potentially partner with NYSERDA in serving the LMI Market.	N/A	APPRISE Incorporated
NY - NYSERDA	C&I	Jan-17	NYSERDA Advanced Buildings Technology Development Program: Process Evaluation Final Report	Process Evaluation	Advanced Buildings Technology Development Program	The goals of this process evaluation were to assess the effectiveness of recently implemented changes to the Tech DEV Program, and to formatively assess potential changes to program offerings and administration.	N/A	Industrial Economics, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - Con Edison	Schools	Dec-16	Smart Kids Pilot Program Final Report	Impact Evaluation	Smart Kids Pilot Program	This study's objectives are to: 1) determine the amount of gross electric and gas savings, 2) Calculate in-service rates (ISRs) for each measure, 3) Understand reasons for not installing measures, and 4) Provide actionable TRM algorithm and methodology recommendations.	The study team used results from a home survey that targeted students and families receiving energy and water saving kits and New York TRM Version 4 inputs to perform an engineering desk review to calculate per-unit and gross electric and gas savings.	The Cadmus Group, Inc.
NY - Con Edison	Schools	Oct-16	Smart Kids Pilot Program Process Evaluation	Process Evaluation	Smart Kids Pilot Program	This study documents and analyzes the Smart Kids Pilot Program procedures and components that lead to the ultimate goal, participation and savings, which will be verified through the impact evaluation. ERS reviewed the program activities – everything from program design to management to customer participation and future opportunities – using fifteen research questions explored through the data collection.	N/A	ERS
NY - NYSERDA	Res/C&I	Sept-16	Smart Grid Program: Market Characterization	Market Evaluation	Smart Grid	The purpose of this report is to evaluate the market for smart grid infrastructure and determine	N/A	Industrial Economics, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
			and Evaluation Baseline			NYSERDA's role and potential future contribution. The study evaluates smart grid development and market trends		
NY- Central Hudson Gas & Electric	Res/C&I	May-16	Central Hudson Gas & Electric Company Energy Efficiency Potential Study	Potential Study	N/A	This study develops EE and DR potential estimates for 2016-2035 within the Central Hudson service territory for benchmarking and future analyses, and develops a final report including summary data tables and graphs reporting incremental and cumulative potential by year from 2016-2035. The study assesses various tiers of EE potential including technical, economic, maximum achievable, and realistic achievable potential. It also developed updated baseline estimates with the latest information on federal, state, and local codes and standards for improving EE.	N/A	Applied Energy Group, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - Orange & Rockland	C&I	Mar-15	Process Evaluation for Orange and Rockland's Big Energy Solutions Program 2009-2011	Process Evaluation	Big Energy Solutions Program	The program provides customers with information on the features and benefits of energy efficient equipment as well as financial incentives to offset the higher purchase cost of specific energy efficient equipment, including lighting and HVAC equipment, motors, VFDs, and custom measures. This evaluation's objectives are to assess the effectiveness and efficiency of program design, delivery, and implementation processes. More specifically, it provides O&R with recommendations that can help to improve the program processes for the participating customers and to inform and improve the program in future program cycles.	N/A	Navigant, Inc.
NY – Con Edison	Res	Mar-15	Con Edison EERS Programs - Impact Evaluation of Multifamily Low Income Program	Impact Evaluation	Multifamily Low Income Program	The goals of this impact evaluation were to 1) evaluate the program's performance by developing gross savings realization rates (RRs) for projects acquired during program years 2009–2011 and 2) provide actionable recommendations for improving the program's implementation as a result of these assessments. The program		ERS, KEMA, Opinion Dynamics, APPRISE, Navigant

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						offers equipment and weatherization assistance through efficiency measures, energy management systems, and building shell improvements and is open to income-eligible multifamily residential buildings with natural gas heating and oil-to-gas conversion customers.		
NY - Orange & Rockland	C&I	Dec-14	Orange and Rockland EEPS Programs SBDI Final Impact Evaluation Report	Impact Evaluation	Small Business Direct Install Program	This study evaluates the program's recent performance by developing gross savings realization rates (RRs) and a net-to-gross ratio (NTGR) that measures the attribution of savings for the SBDI program. It also provides information to the New York Technical Manual authors that will help them update key deemed savings input parameters affecting the SBDI program based on New York-specific performance data. And it provides actionable recommendations for improving the program's implementation. The program research focused solely on lighting measures, which contribute approximately 95% of program savings. Results are based in part on RR analysis based on on-	Two samples were designed for the SBDI evaluation, an on-site sample to evaluate gross energy savings realization rates (RRs) and installation of measures, and a computer-assisted telephone interview (CATI) sample to verify installations and gather data for determining program attribution and SO. Program net energy savings were determined through a sample of 93 on-sites that determined gross program savings and a sample of 314 measures that determined the	ERS, KEMA, Opinion Dynamics, APPRISE, Navigant

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						site verification and 12 months of logged time-of-use performance and NTGR analysis.	attribution. Approximately 95% of the savings to date are attributable to the installation of high efficiency lighting. A mix of refrigeration and HVAC control measures constitutes the balance.	
NY - Orange & Rockland	Res	Dec-14	Residential Efficient Products Program: Process Evaluation	Process Evaluation	Residential Efficient Products Program	This study's objectives are to document the state of the program as it is currently delivered and to identify opportunities for improvement. Although all three components of the program were examined (refrigerator and freezer recycling, room A/C and dehumidifier rebates, and CFL kits), a vast majority of the resources were deployed in evaluating the recycling component, given its overwhelming importance to overall program savings.	N/A	ERS, Inc.

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
NY - Orange & Rockland	Res	Oct-14	Orange and Rockland EEPS Programs Impact Evaluation of Residential Efficient Products Program	Impact Evaluation	Residential Efficient Products Program	This evaluation: 1) provides a general assessment of the program's performance in total during the 2011–2012 evaluation period; 2) provides a focused and more robust assessment of select measures based in part on telephone surveys with O&R program participants and results of on-site metering of refrigerators of participants in a similar Consolidated Edison Company of New York (CECONY) program (Appliance Bounty); and 3) provides actionable recommendations for improving the program's implementation as a result of these assessments. The general assessment includes estimates of gross and net impacts (kWh and kW) of all the program participants and measures.	This study provides a focused and more robust assessment of select measures based in part on telephone surveys with O&R program participants and results of on-site metering of refrigerators of participants in a similar Consolidated Edison Company of New York (CECONY) program (Appliance Bounty).	ERS, KEMA, Opinion Dynamics, APPRISE, Navigant
NY - Orange & Rockland	C&I	Aug-14	Orange and Rockland EEPS Programs - Impact Evaluation of Existing Buildings Program	Impact Evaluation	Existing Buildings Program	The goals of this group impact evaluation are to: valuate the program's performance by developing gross savings realization rates (RRs) and a net-to-gross ratio (NTGR) for projects installed before the end of 2011; and provide actionable	The evaluation team used a combination of on-site metering and attribution phone surveys on sampled sites to estimate the net program impacts. The on-site metering effort	ERS, KEMA, Opinion Dynamics, APPRISE, Navigant

State/PA	Sector	Date	Study Title and Link	Study Type	Program	Study Summary	Meter Data	Study Author
						recommendations for improving the program's implementation as a result of these assessments. The report includes estimates of gross and net impacts (annual kWh and summer coincident peak kW) from all the program participants and measures.	was used to determine the gross realized energy savings and peak demand savings for a representative sample of program participants. The gross impacts were based on results from 13 sites. The sampling approach required both telephone and on-site M&V samples for O&R's Existing Building program as well as a within-site sampling protocol for selecting equipment for logger placement.	

Appendix C: Multi-State Studies Table

State/ PA	Sector	Date	Study Title	Study Type	Program	Study Summary	Metering Data	Author

RI-National Grid	C&I	Jan-21	2019 Commercial and Industrial Programs Free-Ridership and Spillover Study	Free-ridership and Spillover Study	C&I Programs	The purpose of this study was to assess program free-ridership and spillover for the programs based on projects completed in the calendar year 2019. For gas, this includes Custom and Prescriptive pathways for both New Construction and Retrofit programs, along with the Small Business Direct Install program. For electric, the study consists of the Custom and Prescriptive pathways for New Construction, Retrofit, and Small Business Direct Install programs; this includes the upstream lighting initiative, Bright Opportunities, which is part of the Retrofit program.	N/A	Tetra Tech
RI - National Grid	Res/C&I	Dec-20	Rhode Island Strategic Electrification Study	Market Evaluation	Heat Pump	The Rhode Island Strategic Electrification Study assesses the cold-climate heat pump market, optimum pathways for heat pump adoption, and opportunities to facilitate market growth. Combining a detailed market assessment with modeling analysis, the study finds that there are significant opportunities for heat pump implementation in the Rhode Island market.	N/A	Cadmus
RI-National Grid	C&I	Dec-20	Strategic Energy Management Program &	Market Evaluation	Industrial Strategic Energy Management (SEM)	National Grid Rhode Island contracted DNV GL to review and assess the methodology and calculations for estimating electric energy savings from the program year 2019 (PY2019)	N/A	DNV GL

			Savings Review		Demonstration Initiative	industrial strategic energy management (SEM) demonstration initiative administered by Cascade Energy. This report presents DNV GL's findings and recommendations based on our review of the measurement and verification (M&V) methods used to estimate electric savings at the seven non-wastewater treatment sites participating in the SEM demonstration. This report does not provide an independent evaluation of the savings estimated.		
RI - National Grid	Res/C&I	Nov-20	2019 Regional Lighting Sales Data Analysis	Market Evaluation	Lighting	This report describes recent screw-base lightbulb market share, shipments, and prices in Connecticut, Massachusetts, New Hampshire, Rhode Island, and program and non-program states (defined below). The analyses draw on light bulb sales data compiled by the LightTracker Initiative of the Consortium for Residential Energy Efficiency Data (CREED) and shipment data reported by the National Electrical Manufacturers of America (NEMA). The primary purpose of this study is to characterize the current lighting market and track market share over time.	N/A	NMR Group
RI - National Grid	C&I	Oct-20	Impact Evaluation of PY2018 Custom Gas	Impact Evaluation	Gas C&I Custom Programs	The scope of work of this impact evaluation covered the PY2018 Custom Gas impact category, which included HVAC, EMS, Steam Trap, Insulation, and	Metered and/or EMS trend data from each of the 7sites that	DNV GL

			Installations in Rhode Island			Other measures. All the measures are commercial retrofit and new construction projects.	participated in the study. Data was collected in 5 minute intervals.	
RI - National Grid	Res	Sept-20	Impact & Process Evaluation EnergyWise Single Family Program National Grid Rhode Island	Impact Evaluation	Single Family Program	National Grid uses evaluation to retrospectively assess the performance of its programs and estimate future program savings. In March 2020, National Grid contracted with Cadeo and ILLUME Advising, third-party energy efficiency program evaluators, to complete an impact and process evaluation of EWSF 2017-2019 program years. The evaluation produced verified energy savings for every EWSF measure, and yielded insights and recommendations National Grid can use to continue improving the program	Relied on metering data from previous Massachusetts studies.	Cadeo & ILLUME
RI - National Grid	Res	Sept-20	Impact & Process Evaluation EnergyWise & Income Eligible Multifamily Programs National Grid Rhode Island	Impact Evaluation	Multifamily	National Grid uses evaluation to retrospectively assess the performance of its programs and estimate savings for future program years. In March 2020, National Grid contracted with Cadeo and ILLUME Advising, third-party energy efficiency program evaluators, to complete an impact and process evaluation of both MF programs as implemented in 2017, 2018, and 2019. The evaluation produced verified energy savings for most measures, which are applicable for both EWMF and IEMF, and yielded insights and	Relied on metering data from previous Massachusetts studies.	Cadeo & ILLUME

						recommendations for better serving multifamily customers.		
RI - National Grid	Res	Aug-20	2019 Rhode Island Shelf Stocking Study	N/A	National Grid's ENERGY STAR Lighting Program	A shelf-stocking and price survey was conducted at participating retail stores to evaluate the impact of the 2019 residential lighting program on the consumer retail light bulb market in RI.	N/A	NMR Group
RI - National Grid	Res/C &I	Aug-20	Rhode Island Compliance Training and Building Permit Review	Impact Assessment	Building Codes	This memo provides documentation of the trainings held by the Rhode Island Code Compliance Enhancement Initiative (CCEI) in the years 2017, 2018, and 2019, and an assessment of the building permit data that is available online in Rhode Island. This information is intended to assist National Grid in developing placeholder values for savings that may be attributable to the CCEI as well as planning for upcoming baseline studies.	N/A	NMR Group
RI - National Grid	Res	Aug-20	Impact Evaluation Home Energy Reports Program National Grid Rhode Island	Impact Evaluation	Home Energy Reports	National Grid uses evaluation to retrospectively assess the performance of its programs and to estimate the savings in future program years. National Grid contracted with the Cadeo-ILLUME team to use monthly billing data to evaluate how much energy the HER program saved from 2017-2019 and to recommend planning values National Grid should use until the next evaluation.	N/A. Only mentioned customers with or without meters as a data point.	Cadeo & ILLUME

RI - National Grid	C&I	May-20	2017 Custom Gas Installations in Rhode Island	Impact Evaluation	N/A	The objective of this impact evaluation was to provide verification or re-estimation of energy (therms) savings for a sample of Custom Gas projects through site-specific inspections, end-use monitoring, and analysis). The site-specific results were aggregated to determine realization rates separately for National Grid's custom gas installations in RI.	Data Type: Secondary Sample Size: DNV GL completed 6 out of the designed 7 sites and the study achieved the reliable statistical precision targets (±2.3%) at 80% confidence interval.	DNV GL
RI - National Grid	Res/C &I	May-20	Rhode Island 2019 Energy Efficiency Workforce Analysis Final Report	Analysis	Energy Efficiency Program	The focus of this study was to quantify the workforce that was involved in delivering National Grid's RI programs in 2019. Reports the number of jobs associated with programs and compares them to past years in addition to addressing the requirements of Gen Law 39-2-1.2.	N/A	Guidehouse
RI - National Grid	C&I	Mar-20	RI C&I Market Characterization Data Collection Study	Market Evaluation	C&I Programs Potential Study	The DNV GL team made up of DNV GL, ERS, Inc., NMR, and PMR conducted the Rhode Island (RI) C&I Market Characterization Data Collection Study to help the RI OER and National Grid better understand the state's existing C&I building and equipment stock, support the efficiency potential study and lighting baseline determination, and	N/A	DNV GL

						otherwise identify ways to expand RI statewide energy efficiency initiatives		
RI - National Grid	C&I	Jan-20	Industrial Impact Evaluation of 2016 Custom Electric Installations	Impact Evaluation	C&I New Construction	The objective of this impact evaluation was to provide verification or re-estimation of electric energy and demand savings estimates for a sample of custom lighting and non-lighting electric projects through site-specific inspection, monitoring, and analysis.	Data Type: Secondary Sample Size: 11 End Use: Lighting Demand (kW)	DNV GL
RI - National Grid	C&I	Dec-19	Impact Evaluation of PY2016 Custom Gas Installations in Rhode Island	Impact Evaluation	Large C&I New Construction and Retrofit Programs	The scope of this impact evaluation was all custom natural gas measures incentivized in 2016.The primary objective was to provide verification and re-estimation of energy savings for a sample of statistically selected custom gas projects through site-specific inspection, monitoring and analysis. Another objective was to establish a long-term staged M&V approach to achieve a relative precision of +/-10% at a confidence interval of 80% by combining at least 3 program years (2015, 2016 and 2017). The results will be aggregated after the 2017 program year is analyzed.	Data Type: Billing Analysis Sample Size 29 End Use: high efficiency heating; EMSs; controls; steam traps; pipe insulation	DNV GL
RI - National Grid	Res	Sept-19	Rhode Island 2018 Lighting Sales Data Analysis	Market Characterization	Lighting	NMR conducted a study to examine light bulb marker shares obtained from retail locations in Rhode Island. The study compares market share and bulb prices in Rhode Island, the Unites States, and various comparison areas	N/A	NMR Group, Inc.

						with different levels of lighting program activity. The report explores 2018 market share by bulb type, shape, and ENERGY STAR status; compares bulb prices; and considers trends in market share from 2015 to 2018, Although the sales data suggest that the ENERGY STAR Lighting Program still has positive effect, the impact may be dwindling as transformation of the LED market progresses across the nation.		
RI - National Grid	Res	Aug-19	National Grid Rhode Island Income Eligible Services Program Process Evaluation	Process Evaluation	Income Eligible Services Program	This evaluation builds off of the 2014 process evaluation but focuses on Income Eligible Services delivery in 2018. The assessment identified IES elements that are functioning as intended, as well as those not being delivered optimally and contributing to delivery inefficiencies, barriers to participation, or gaps in service. The evaluation team conducted stakeholder interviews, materials review, participant surveys, non-participant surveys, and program data review.	N/A	Cadeo
RI - National Grid	Res	Aug-19	2018 Rhode Island Shelf Stocking Study	Market Characterization	Lighting	NMR analyzed light bulb stocking and pricing data collected by Lockheed Martin in the autumns of 2016–2018 to investigate the impact of National Grid's residential lighting program on the retail market.	N/A	NMR Group, Inc.

RI - National Grid	C&I	Jun-19	PY2016 Rhode Island Commercial and Industrial Small Business Initiative Impact Evaluation	Impact Evaluation	C&I Small Business Initiative	The primary objective of this impact evaluation was to provide verification or re-estimation of electric energy and demand savings estimates for a sample of custom and prescriptive electric lighting small business projects through site-specific inspection, monitoring, and analysis. Site-specific results were aggregated and combined with a Massachusetts sample to determine energy and demand realization rates. Realization rates were also determined for a number of other characteristics such as connected kW, installation rate, delta watts, and hours of use. Other factors investigated were summer and winter on-peak hours and coincident factors, % on-peak kWh, kWh and summer and winter kW HVAC interactive effects, and gas heating penalty.	Data Type: Primary Sample Size: 30 End Use: Lighting Hours-of-use	DNV GL
RI - National Grid	Res/C &I	May-19	Analysis and Recommendations regarding the Current and Future Workforce associated with Rhode Island Energy	Process Evaluation	N/A	This workforce assessment reports on numbers and types of workers associated with National Grid's Programs in Rhode Island in 2018 and compares 2018 with past years. It also explores what workforce adjustments may be required to deliver future programs. Methods included: Quantitative analysis of efficiency measures installed in all market sectors; Interviews with stakeholders and	N/A	Peregrine Energy Group

			Efficiency Programs			workforce, including program managers, contractors, and installers; Calculation of full time equivalent (FTE) employees associated with Programs.		
RI - National Grid	Res/C &I	May-19	Quantitative analysis of efficiency measures installed in all market sectors	Process Evaluation	Code Compliance	This report provides an analysis and evaluation of the compliance status with the current 2012 IECC energy code for the residential and commercial building sector in the City of Providence. The objectives of this study were to: 1.Estimate energy code compliance rates for residential and commercial new construction. 2. Estimate potential energy savings from improved compliance. 3. Provide recommendations to the building inspections staff for further improvement in plan reviews and inspections of energy code requirements. To achieve these goals, the Evaluation team: 1. Interviewed 10 DIS staff. 2. Conducted plan reviews and site visits of a sample of 5 buildings permitted under the residential code (1-2 -unit homes) and 8 buildings permitted under the commercial code (including low and high rise multifamily). 3. Developed energy models for the selected residential and commercial buildings to determine the magnitude of energy savings	N/A	Slipstream

						opportunities resulting from non-compliance.		
RI - National Grid	Res	Apr-19	Rhode Island Statewide Behavioral Evaluation: Savings Persistence Literature Review	Potential Study	Home Energy Report Program	This report investigates how energy savings change when the recipients of Home Energy Reports no longer receive reports or receive them at a reduced cadence. The team reviewed research from 11 utilities involving, in total, 17 customer groups. Accounting for gas, electric, and dual fuel customers, and research studies conducted over multiple years. The team developed four predictive scenarios, suggesting the possible impact on savings if National Grid Rhode Island altered the report cadence of its Statewide Behavioral Program customer groups.	N/A	Illume Advising, LLC
RI - National Grid	Res	Mar-19	2017 Residential Wi-Fi Thermostat DR Evaluation	Impact Evaluation; Process Evaluation	Residential Wi-Fi Thermostat DR Program	This 2017 evaluation builds upon the 2016 Impact and process evaluation by further focusing the evaluation objectives and refining the evaluation approaches. The study divided key research questions into 4 categories: Technology and Program Offering; Program Design and Implementation; DR Impacts; Scalability. Three primary methods were used: 1. Post-season survey to gain feedback from 2017 MA program participants 2. Thermostat usage assessment that combines and analyzes thermostat telemetry data and event participation data. Regression	Data Type: Thermostat telemetry Sample Size: 399 End Use: Smart Thermostats	Navigant

						analysis to estimate demand and energy impacts. This study confirmed the technical feasibility of using thermostats to reduce household peak demands; however, it has not looked at whether that control will be cost-effective for the electric system, program administrators, and/or customers.		
RI - National Grid	C&I	Jan-19	Rhode Island Commercial and Industrial Impact Evaluation of 2013-2015 Custom CDA Installations	Impact Evaluation	C&I New Construction	This is an impact evaluation for Comprehensive Design Approach (CDA) Installations. The main objective is to provide verification and re-estimation of energy and demand savings for a sample of statistically selected Custom CDA projects through site specific inspection, monitoring, and analysis. The results of this study will be used to determine the gross realization rates for Custom CDA energy efficiency projects implemented for future energy projects in this impact category.	Data Type: Secondary Sample Size: 11 End Use: whole building	DNV GL
RI - National Grid	Res	Nov-18	HEAT Loan Assessment	Process Evaluation	EnergyWise	The main objectives of this assessment were to: Understand the extent to which HEAT Loans enable EnergyWise and HVAC projects(weatherization only, HVAC/DHW only, and weatherization with HVAC/DHW), and Identify opportunities for changes to the HEAT Loan offering that will enable higher uptake of measures offered through the EnergyWise and HVAC programs. Four methods were used: program database	N/A	Research Into Action

						analysis; participant survey; interviews with HVAC contractors; interviews with HEAT Loan Lenders.		
RI - National Grid	Res	Oct-18	National Grid Rhode Island Appliance Saturation Survey Report	Market Characterization	Residential Appliances	This report estimates the penetration and characterization of a variety of end-uses among the customer population. The study consisted of web surveys and on-site verification. This report provides a database user guide and inventory of residential end-uses, including appliances, consumer electronics, heating and cooling equipment, thermostats, water heating, and building characteristics.	N/A	NMR Group, Inc.
RI - National Grid	Res/C &I	Oct-18	Avoided Energy Supply Components in New England: 2018 Report	Potential Study	N/A	This document contains projections of marginal energy supply components that can be avoided in future years due to reductions in the use of electricity, natural gas, and other fuels as a result of program-based energy efficiency or other demand-side measures across all six New England states. To determine the values of energy efficiency (and other demand-side measures), avoided costs are calculated and provided for each New England state in a hypothetical future in which no new energy efficiency measures are installed in 2018 or later years. This study examines avoided costs of energy, capacity, natural gas, fuel oil, other fuels, other environmental costs, and	N/A	Synapse Energy Economics

						demand reduction induced price effects (DRIPE).		
RI - National Grid	C&I	Sept-18	Impact Evaluation of PY2015 Rhode Island Commercial and Industrial Upstream Lighting Initiative	Impact Evaluation	C&I Upstream Lighting Program	The primary goal of this impact evaluation is to quantify the electric energy savings and demand reduction attributable to the Rhode Island C&I Upstream Lighting Program. This study's research objectives include updating the following assumptions with Rhode Island-specific research: In-service rate of purchased lamps by facility; Hours of use of purchased lamps; baseline replaced lamps for estimating delta watts; gross savings realization rates; estimates of summer and winter on-peak coincidence factors; estimates of HVAC interactives effects; percent energy on-peak savings; non-electric HVAC interactive effects. This study provides results at a combined RI and MA National Grid territory-level using metered data collected from each site.	Data Type: Primary Sample Size: 170 End Use: Lighting Hours-Of-Use	DNV GL
RI - National Grid	Res	Aug-18	National Grid Rhode Island Income Eligible Services Impact Evaluation	Impact Evaluation	Income Eligible Services Program	This is an impact evaluation of the 2015 and 2016 Income Eligible Services Program. The evaluation team aggregated the 16 program measures into 7 different measure groups. The team focused on Weatherization, lighting, HVAC, and Refrigerator Replacement because these measure groups accounted for 94% of the ex-	Data Type: Billing Analysis Sample Size: 904	Cadeo

						ante savings. National Grid established three objectives for the 2015 and 2016 IES impact evaluation: Estimate the overall average energy savings attributable to the IES program, Provide credible energy savings and realization rates for each electric, natural gas, propane and heating oil measures and/or measure groups, Report findings and observations and provide recommendations on program design to help improve the effectiveness of the program. To meet these three objectives, Cadeo used a combination of billing analysis, technical reference manual-based (TRM) engineering algorithms and building simulation modeling.		
RI - National Grid	Res	Jul-18	National Grid Rhode Island Lighting Market Assessment	Market Characterization	Lighting	The study was designed to estimate lighting saturation and other critical market indicators in Rhode Island. The data for this study came from on-site lighting inventories of homes in Rhode Island completed in April and May of 2018.	N/A	NMR Group, Inc.
RI - National Grid	Res/C &I	Jul-18	National Grid Rhode Island System Reliability Procurement Pilot: 2012-2017	Summary Report	System Reliability Procurement Pilot	This is a summary report that draws on 2012-2016 annual evaluation reports intended to provide a big picture synthesis of the pilot program's efforts. This report therefore does not repeat detailed findings from the earlier reports. The annual reports focus on	N/A	Opinion Dynamics

			Summary Report			two main topics: 1. the effectiveness of marketing activities in promoting and increasing program participation and 2. the load impacts realized by the pilot. In addition, some of the evaluations covered process-related topics such as drivers of and barriers to participation and participant experience during demand response events.		
RI - National Grid	Res/C &I	Apr-18	ANALYSIS OF JOB CREATION from 2017 Expenditures for Energy Efficiency in Rhode Island by National Grid	Process Evaluation	N/A	This workforce assessment reports on numbers and types of workers associated with National Grid's Programs in Rhode Island in 2017. It also explores what workforce adjustments may be required to deliver future programs. Methods included: Quantitative analysis of efficiency measures installed in all market sectors; Interviews with stakeholders and workforce, including program managers, contractors, and installers; Calculation of full time equivalent (FTE) employees associated with Programs.	N/A	Peregrine Energy Group
RI - National Grid	Res	Mar-18	2017 Seasonal Savings Evaluation	Impact Evaluation	Thermostat Optimization	This report is split into an exploratory analysis and Impact evaluation. The exploratory analysis answered the questions: How many devices/customers enrolled in the program? And Did the program have the intended effect on schedules set-points and corresponding impact on cooling runtime? The impact analysis	Data Type: Thermostat Telemetry Sample Size: 8,336 End Use: Smart Thermostats	Navigant

						answered the questions: What are the energy and demand impacts of customer with thermostat optimization? What are the energy and demand impacts of customers that were randomly assigned to receive thermostat optimization?		
RI - National Grid	Res	Mar-18	Rhode Island Home Energy Report Program Impact and Process Evaluation	Impact Evaluation	Home Energy Report Program	This report evaluated the savings associated with National Grid's Home Energy Report Program. The evaluation team conducted a number activities including: Program process and materials review; Existing customers HER report impacts assessment; New Movers impacts assessment; Electronic HER impacts assessment; Baseline segmentation impacts assessment; Secondary research.	Data Type: Billing Analysis	Illume Advising, LLC
RI - National Grid	Res	Jan-18	Rhode Island Baseline Study of Single-Family Residential New Construction	Baseline Study	Code Compliance Enhancement Initiative	The baseline study had two primary goals: to assess the code compliance of new homes built under the 2012 International Energy Conservation Code (IECC) cycle, and to update the User Defined Reference Home (UDRH) for National Grid's Residential New Construction (RNC) program. NMR conducted a three-part evaluation of the CCEI's impacts on code compliance, including 1) immediate surveys of CCEI training attendees, 2) follow-up interviews with CCEI trainees to see how training affected their work, and 3)	N/A	NMR Group, Inc.

						a baseline study of 40 non-program homes to assess residential new construction (RNC) building practices.		
RI - National Grid	Res/C &I	Dec-17	Rhode Island Code Compliance Enhancement Initiative Attribution and Savings Study	Impact Evaluation	Residential and Commercial New Construction	The overall goal of this study was to estimate the savings in the residential and commercial new construction markets that may be attributable to the CCEI due to enhanced code compliance. The primary tasks were to determine the proportion of residential and commercial new construction savings that are attributable to the CCEI and to review and update the related CCEI savings models through 2020.	N/A	NMR Group, Inc.
RI - National Grid	C&I	Dec-17	Impact Evaluation of 2014 Custom HVAC Installations	Impact Evaluation	C&I New Construction and Major Renovation; C&I Large Retrofit	This document summarizes the work performed by the DNV GL team, between 2016 and 2017 to quantify the actual energy and demand savings due to the installation of 88 custom heating, ventilation and air-conditioning (HVAC) measures. The impact evaluation includes only measures which primarily reduce electricity consumption. The primary objective of determining realization rates at the state (RI and MA National Grid territory) and overall end-use level was accomplished by conducting on-site M&V at a statistically selected sample of 88 participant sites in MA and RI. The impact study consisted of five tasks: 1.Develop sample design. 2. Develop site	Data Type: "on-site data gathering" Sample Size: 29 End Use: High Efficiency HVAC	DNV GL

						measurement and evaluation plans. 3. On-site data gathering and site analysis. 4. Site report writing and follow-up. 5. Expansion analysis and evaluation report.		
RI - National Grid	C&I	Oct-17	2014 RI Custom Process Impact Evaluation	Impact Evaluation	Custom Process Installations	The scope of work of this impact evaluation covered the 2014 Custom Process impact category in Rhode Island, which included new equipment for which energy consumption and savings is primarily driven by a quantified non-weather load, such as tons of production or total hours of operation. The project was completed between 2016 and 2017. The objective of this impact evaluation is to provide verification or re-estimation of electric energy and demand savings estimates for a sample of custom electric projects through: Site-specific inspection, monitoring, and analysis. The results of this study are realization rates for custom process electric energy efficiency measures. Realization rates were determined at the statewide level and also at the combined National Grid territory level in both Rhode Island and Massachusetts.	Data Type: Secondary Sample Size: 24 End use: Custom Process EE measures	DNV GL
RI - National Grid	Res	Oct-17	Rhode Island 2017 Code	Impact Evaluation	Residential New Construction	The focus of this study was to compare savings of new homes in Rhode Island using IECC 2012 code vs. the latest RI UDRH. The same methodology has been	N/A	ICF

			vs. UDRH Study			exercised for Rhode Island in the past, as well as for programs in Massachusetts. Eight different home configurations and variable characteristics (i.e. HVAC system type) were modeled. Each of these homes were modeled using IECC 2012 code minimums and federal minimum standards for HVAC equipment efficiency. Each characteristic was assigned a weight according to its relative prevalence among new homes in Rhode Island.		
RI - National Grid	Res/C &I	Oct-17	Energy Efficiency Program Customer Participation Study	Process Evaluation	Residential and Small Business Energy Efficiency Programs	This study assesses customer participation in its Rhode Island residential and small business energy efficiency programs between 2009 and 2015. Navigant investigated customer participation in each energy efficiency program with the following study objectives: 1. Understand the characteristics of residential and small business customers that participate in energy efficiency programs. 2. Communicate information about program participants and nonparticipants to regulators and stakeholders. 3. Estimate the number of potential candidate accounts available for increasing participation. National grid provided customer account data, participation data, and customer usage	N/A	Navigant Consulting, Inc.

						data, as well as third-party household, business, and property data.		
RI - National Grid	C&I	Sept-17	2016 Commercial and Industrial Programs Free-Ridership and Spillover Study (Draft)	Free-ridership and Spillover Study	C&I New Construction; C&I Retrofit; Design 2000plus; Energy Initiative; Small Business; Bright Opportunities	The primary objective of the 2016 program year Free-Ridership and Spillover Study was to assist National Grid in quantifying the net impacts of their commercial and industrial electric and natural gas energy efficiency programs in Rhode Island by estimating the extent of: Program free-ridership; Early participant like and unlike spillover; Nonparticipant like spillover. The report includes the free-ridership, participant like spillover, and nonparticipant like spillover estimates at the program and statewide levels by fuel type. The full report provides more detail on the results for each individual program at the measure type. Early observations of participant unlike spillover are also included the full report. The objectives were accomplished primarily with telephone surveys of participants and design professionals and equipment vendors.	N/A	Tetra Tech
RI - National Grid	Res	Jul-17	Final 2017 UDRH Inputs for the Rhode Island Residential New	Specification Update	Residential New Construction	This document provides a summary of the following items: The current UDRH specification used by the RNC program; The non-program average from the RNC baseline study; The program average from single-family homes that participated in the 2015 RNC program;	N/A	NMR Group, Inc.

			Construction Program			The final agreed-upon value for the new UDRH. The UDRH was developed based on 40 on-site inspections of non-program single-family homes and an analysis of the single-family home that participated in the 2015 RNC program.		
RI - National Grid	C&I	Jul-17	Final Report on Energy Impacts of Commercial Building Code Compliance in Rhode Island	Impact Evaluation	Commercial Building Code	This analysis is intended to provide a mechanism to quantify the energy impacts of energy code compliance patterns seen in recent field data collection and analysis of building characteristics .The analysis in this report is based on field work conducted in 2016 by DNV-GL which surveyed 21 commercial buildings to estimate state-wide energy code compliance rates. In this 2017 study, the energy impacts of compliance have been evaluated by using the results of field observation to guide an energy modeling analysis which compares the predicted energy use of a set of building prototypes (office, retail, and school) which just meet code requirements with a set of prototypes that have the performance characteristics observed in the field study of compliance rates.	N/A	New Buildings Institute
RI - National Grid	Res/C &I	Jun-17	National Grid Rhode Island System Reliability Procurement	Annual Evaluation	System Reliability Procurement Pilot	This report presents evaluation findings for the fifth year of the Rhode Island System Reliability Procurement (SRP) pilot, conducted by Opinion Dynamics Corporation under contract to National	N/A	Opinion Dynamics

			Pilot: 2016 Annual Evaluation Report			Grid. Research activities included two primary data collection efforts: an online survey of customers in the pilot area and a telephone survey of DemandLink participants. This evaluation included an analysis of load reduction for the two major pilot offerings: the Energy Wise Program and the DemandLink demand response events. While demand savings were realized by other components of the pilot, these were not included in the evaluation of the 2016 program year.		
RI - National Grid	C&I	Oct-16	Rhode Island Commercial Energy Code Compliance Study	Code Compliance Study	Energy Code Compliance	The principal research objectives of this study are to: 1.Update the overall state-wide compliance rate for Rhode Island commercial buildings provided in the Rhode Island Energy Code Compliance Baseline Study (2012 study) 2.Provide feedback on patterns of compliance and non-compliance 3.Provide qualitative assessment of the effectiveness of Code Compliance Enhancement Initiative (CCEI) and its influence on changes in compliance 4. Provide qualitative feedback on suggestions for improving the code compliance process.	N/A	DNV GL
RI - National Grid	Res/C &I	Aug-16	National Grid Rhode Island System Reliability Procurement	Annual Evaluation	System Reliability Procurement Pilot	This report presents evaluation findings for the fourth year of the Rhode Island System Reliability Procurement (SRP) pilot, conducted by Opinion Dynamics Corporation under contract to National	N/A	Opinion Dynamics

			Pilot: 2015 Annual Evaluation Report Final			Grid. Research activities included three primary data collection efforts: an online survey of customers in the pilot area and a telephone survey of DemandLink participants and a telephone survey of SRP program leads. The evaluation team conducted analyses of gross impact on the substation for 1) measures installed through the EnergyWise Program, 2) measures installed through the Small Business Direct Install (SBDI) Program, 3) 2015 demand response events, and 4) rebated new ENERGY STAR® window AC units and recycled old Window AC units.		
RI - National Grid	Res	Aug-16	Massachusetts Special and Cross-Cutting Research Area: Low-Income Single-Family Health- and Safety-Related Non-Energy Impacts (NEIs) Study	Non-Energy Impact Study	Income Eligible Services Program	Study of Non-Energy Impacts experienced by recipients of energy efficiency services residing in income-eligible households in the state of MA. Three3 assessed and monetized eight health and household-related impacts attributable to the weatherization of income-eligible single-family (SF) homes. The impacts were selected based on their estimable, direct impact on the household. They are: 1) reduced asthma (lower medical costs); 2) reduced cold-related thermal stress (lower medical costs and fewer deaths); 3) reduced heat-related thermal stress (lower medical costs and fewer deaths);	N/A	Three3, Inc.; NMR Group, Inc.

						4) reduced missed days at work (reduction in lost income); 5) reduced use of short-term, high interest loans (lower interest payments and loan fees); 6) increased home productivity due to improvements in sleep (higher productivity for housekeeping); 7) reduced carbon monoxide (CO) poisoning (lower medical costs and fewer deaths); and reduced home fires (fewer fire-related injuries, deaths, and property damage).		
RI - National Grid	C&I	Jul-16	Impact Evaluation of 2012 National Grid-Rhode Island Prescriptive Chiller Program	Impact Evaluation	Prescriptive Chiller Program	This document presents the results of DNV GL's Impact Evaluation of 2012 and 2013 Prescriptive High Efficiency Chiller (HE Chiller) Installations for National Grid Rhode Island. The objective of this Impact Evaluation of 2012 Prescriptive HE Chiller Installations is to provide verification or re-estimation of gross energy and demand savings through site specific inspection, monitoring and analysis. The results of this study will be used prospectively to adjust energy and demand savings estimates in future program years. In addition, the impact evaluation provides new deemed savings estimates, savings algorithms and/or savings factors (such as Effective Full Load Hours, or ELFH) to be used to inform future savings estimates.	Data Type: Primary Sample Size: 20 End Use: Chiller	DNV GL; KEMA, Inc.

RI - National Grid	C&I	Jul-16	Impact Evaluation of 2014 Custom Gas Installations in Rhode Island	Impact Evaluation	Custom Gas Installations	This study presents final realization rates for custom gas energy efficiency measures installed in 2014. The site specific results were aggregated to determine realization rates separately for National Grid's custom gas program in RI and MA combined. The objective of this Impact Evaluation of 2014 Custom Gas Installations is to provide verification or re-estimation of energy (Therms) savings for selected Custom Gas projects through site specific inspections, end use monitoring and analysis.	Data Type: primary Sample Size: 22 End Use: HVAC; DHW; Steam Traps; Boiler Controls; EMS	DNV GL; KEMA, Inc.
RI - National Grid	Res/C &I	Apr-16	ANALYSIS OF JOB CREATION from 2016Expenditures for Energy Efficiency in Rhode Island by National Grid	Process Evaluation	N/A	The objective of this study was to estimate the number of direct jobs attributable to National Grid's 2016 Energy Efficiency Program. Methods included: Quantitative analysis of efficiency measures installed in all market sectors; Interviews with stakeholders and workforce, including program managers, contractors, and installers; Calculation of full time equivalent (FTE) employees associated with programs.	N/A	Peregrine Energy Group

Vermont

State	Sector	Date	Study Title	Study Type	Program	Study Summary	Metering Data	Author
VT- DPS	Res/C&I	Nov-19	Vermont Energy Efficiency Market Potential Study	Market Evaluation	All Programs	The scope of this study includes assessing the energy efficiency potential associated with the state's three designated EEUs. This study assesses both electric and natural gas energy efficiency potential throughout Vermont for a period of 20 years (2021-2040)	The GDS/Cadmus team used data compiled from metering studies, EM&V, and engineering algorithms to further disaggregate energy intensities into more granular end uses and technologies.	GDS/Cadmus
VT	C&I	Jun-19	Evaluation of Continuous Energy Improvement-Draft Report	Impact Evaluation and Process Evaluation	Continuous Energy Improvement Pilot	The evaluation had the following objectives: Measure Cohort 1 and Cohort 2 energy savings: Independently estimate OM&B electricity and natural gas savings at each CEI participant site, accounting for impacts of any capital measures in 2016; Verify EVT's estimates of site-specific OM&B, capital measures, and total pilot savings; Assess Cohort 1 savings persistence; Measure the pilot's overall cost-effectiveness; Assess customers' satisfaction and perceived value of the program; Develop recommendations for	Facility data reporting and sub-metering Data Type: Primary; Sub-metering Sample Size:11 End Use: Heating and ammonia refrigeration	Cadmus Group

						improving the pilot data collection, measurement and verification (M&V), and impact evaluation approaches; Identify potential OM&B savings for future program planning. Cadmus estimated energy savings, conducted interviews with CEI program managers, and conducted a cost-effectiveness analysis. For the process evaluation, Cadmus interviewed 11 participants from both cohorts to gather information about program implementation and participant experience		
VT	Res/C&I	Mar-19	Benchmarking 2014-2015 Demand Side Management Results for Vermont	Program Benchmarking	All Programs	This report benchmarks the three current Vermont EEUs against other efficiency program administrators (PAs) in the Northeast and Mid-Atlantic states for the years 2014 and 2015. Efficiency Vermont (EVT) and City of Burlington Electric Department (BED) were benchmarked against 17 PAs and Vermont Gas Services (VGS) was benchmarked against 16 PAs.	Data Type: Secondary End Use: Whole Building Electric and Gas	Energy Futures Group
VT	Res	Nov-18	Thermal Energy Efficiency Program Process Evaluation for 2014 - 2016.	Process Evaluation	Home Performance with Energy Star Program; Home Retrofit Program	The process evaluation sought to provide insights to inform four broad program goals, each of which was associated with a more detailed set of research objectives. The Four program goals are: 1. Increase participation rates; 2. Increase average savings per participant; 3. Reduce administrative cost; 3. Improve installed measure quality and longevity. Data was drawn from program staff interviews and	N/A	Research Into Action, Inc.; West Hill Energy and Computing

						data, contractor interviews and a participant survey.		
VT	Res	Sept-18	Impact Evaluation of the Home Performance with Energy Star program for 2014 to 2016	Impact Evaluation	Home Performance with Energy Star Program	This impact evaluation was designed to determine the evaluated gross energy savings, peak demand reduction, and realization rates for major measures installed in program years 2014 through 2016. Both electric and unregulated fuel energy savings were evaluated. The primary method used to estimate program savings was billing analysis. Electric savings from heating-related measures were verified through AMI analysis. All homes with sufficient electric billing data were included in the analysis. Verified unregulated fuel savings were estimated using a normalized annualized consumption (NAC) model.	Data Type: Billing Analysis and AMI Sample Size: 101 End Use: Electric Heating	West Hill Energy and Computing; GDS Associates
VT	Res	Sept-18	Impact Evaluation of Vermont Gas Systems' Home Energy Retrofit program for 2014 - 2016	Impact Evaluation	Home Retrofit Program	The objective of this impact evaluation was to determine the evaluated gross natural gas savings for the Residential Retrofit program. Billing analysis was the method used to estimate the program savings. A fixed effects, cross-sectional, time series model was conducted to estimate the normalized annual savings. No sampling was done as all projects with sufficient data were included in the analysis.	Data Type: Billing Analysis Sample Size: 426 End Use: Whole Building Natural Gas	West Hill Energy and Computing; GDS Associates; Research Into Action, Ink.
VT	Res	Aug-18	Residential Customer	Impact Evaluation	Residential Customer	The Public Service Commission tasked Cadmus with estimating the Residential	Data Type: Billing Analysis and AMI	Cadmus Group

			Behavioral Savings Pilot Evaluation	and Process Evaluation	Behavioral Savings Pilot	Customer Behavioral Saving Pilot's electricity savings, identifying behavior changes and energy efficiency improvements caused by the Home Energy Reports (HERS) assessing customer satisfaction with the HERs, and assessing the program cost-effectiveness. This evaluation report covers the program year from January to December 2017, with impact findings for the three waves that tracks the progress of the Wave 1 and Wave 2 treatment groups since they first received HERs.	Sample Size: 806 End Use: Whole home electric	
VT	Res/C&I	Aug-18	Verification of the 2017 Efficiency Savings Claim of the Natural Gas Energy Efficiency Utility operated by Vermont Gas Systems	Savings Claims Summary	Vermont Gas Systems' Programs	This is a summary letter from the PSD to the PUC. It contains results from and evaluation performed by Energy Resource Solutions. The actual report could not be found. This letter describes the two-step review process undertaken by the Department to assess the performance of the EEU. This report covers the first year of the appointment of VGS as an EEU, and the first year of the two-year Transition Period Plan. The report verifies that savings assumptions have been applied appropriately and calculations performed correctly. It also verifies Calculated savings.	N/A	Vermont Public Service Department
VT	Res/C&I	Jun-18	Report to Verify Efficiency Vermont	Savings Claims Summary	Efficiency Vermont Programs	This report summarizes the evaluation of savings claimed for the entire EVT portfolio, including programs within commercial and industrial, multifamily,	N/A	Cadmus Group

			2017 Savings Claim			and single-family residential sectors. Cadmus reviewed project files and an extensive database of measure data to accomplish the following: Verify that savings values and calculations had been applied correctly; Calculate evaluated savings that incorporate any necessary corrections.		
VT	Res/C&I	Apr-18	2017 Gross-To-Net Factors	Gross To Net Factors		Adjustments to all savings were made to account for free riders, spillover, and line losses. This section lists the adjustments that were used for the annual report	N/A	Efficiency Vermont
VT	Res/C&I	Apr-18	2018 Gross-To-Net Factors	Gross To Net Factors		Adjustments to all savings were made to account for free riders, spillover, and line losses. This section lists the adjustments that were used for the annual report	N/A	Efficiency Vermont
VT	Res / C&I	Jan-18	Verification of the 2016 Efficiency Savings Claim of the Natural Gas Energy Efficiency Utility operated by Vermont Gas Systems	Savings Claims Summary	Vermont Gas Systems' Programs	This is a summary letter from the PSD to the PUC. It contains results from and evaluation performed by Energy Resource Solutions. The actual report could not be found. This letter describes the two-step review process undertaken by the Department to assess the performance of the EEU. This report covers the first year of the appointment of VGS as an EEU, and the first year of the two-year Transition Period Plan. The report verifies that savings assumptions have been applied appropriately and calculations performed correctly. It also verifies calculated savings.	N/A	Vermont Public Service Department

VT	Res/C&I	Jun-17	Report to Verify Efficiency Vermont 2016 Savings Claim	Savings Claims Summary	Efficiency Vermont Programs	This report summarizes the evaluation of savings claimed for the entire EVT portfolio, including programs within commercial and industrial, multifamily, and single-family residential sectors. Cadmus reviewed project files and an extensive database of measure data to accomplish the following: Verify that savings values and calculations had been applied correctly; Calculate evaluated savings that incorporate any necessary corrections.	N/A	Cadmus Group
VT	Res/C&I	Apr-17	2016 Gross-To-Net Factors	Gross To Net Factors		Adjustments to all savings were made to a ccount for free riders, spillover, and line lo sses. This section lists the adjustments tha t were used for the annual report.	N/A	Efficiency Vermont
VT	Res/C&I	Nov-16	2015 Gross-To-Net Factors	Gross To Net Factors		Adjustments to all savings were made to a ccount for free riders, spillover, and line lo sses. This section lists the adjustments tha t were used for the annual report.	N/A	Efficiency Vermont
VT	Res	Sept-16	Evaluation of Residential Customer Behavioral Savings Pilot	Impact Evaluation and Process Evaluation	Residential Customer Behavioral Savings Pilot	The Public Service Commission tasked Cadmus with estimating the Residential Customer Behavioral Saving Pilot's energy and peak efficiency savings impacts and to identify specific behavior changes and energy-efficient measures prompted by the Home Energy Reports. Cadmus set out to answer what the impact was on household electricity consumption, customer energy use behaviors, participation in EE programs and what the	Data Type: Billing analysis and AMI Sample Size: 126000 End Use: Whole building electric	Cadmus Group

						savings were attributable to the behavior changes. Methods used included: interviews with stakeholders, document review, customer surveys, billing analysis, cost effectiveness analysis.		
VT	C&I	Aug-16	Evaluation of Continuous Energy Improvement Pilot	Impact Evaluation and Process Evaluation	Continuous Energy Improvement Pilot	This report estimates the energy savings from the first cohort of Continuous Energy improvement (CEI) Pilot Sites, documents the program design and implementation, and assesses the customer experience. The goals included: estimating the energy savings for each participant in 2014 and 2015; Verify Efficiency Vermont's estimates of site-specific CEI, capital measure and total pilot savings; develop recommendations for improving the Pilot data collection, measurement and verification, and impact evaluation approaches. Methods included: Interviews with stakeholders, participant surveys, analysis of first-year pilot outcomes, collection of data or site-level energy use, individual regression analysis of each site's energy use and estimation of savings, estimation of Pilot savings, cost effectiveness analysis.	Data Type: Primary; Sub-metering Sample Size:7 End Use: Heating and ammonia refrigeration	Cadmus Group
VT	Res/C&I	Jul-16	Report to Verify Efficiency Vermont 2015	Savings Claims Summary	Efficiency Vermont Programs	This report summarizes the evaluation of savings claimed for the entire EVT portfolio, including programs within commercial and industrial, multifamily, and single-family residential sectors. Cadmus reviewed project files and an	N/A	Cadmus Group

			Savings Claim			extensive database of measure data to accomplish the following: Verify that savings values and calculations had been applied correctly; Calculate evaluated savings that incorporate any necessary corrections.		

Maine

State	Sector	Date	Study Title	Study Type	Program	Study Summary	Metering Data	Author
ME - Efficiency Maine Trust	Res/C&I	Nov-20	Efficiency Maine FY2020 Annual Report	Annual Report	Efficiency Maine Trust	Annual Report of the Efficiency Maine Trust describes activities during Fiscal Year 2020(FY2020), which covered the period from July 1, 2019, to June 30, 2020. The report includes the budgets, activities, and results for all programs and related activities administered by the Trust. In total, these programs will generate more than 1.7 billion kWh and more than 3.3 million MMBtu in cost-effective lifetime energy savings for Maine ratepayers.	N/A	

ME - Efficiency Maine Trust	Res/C&I	Jun-20	HPWH Free-Ridership and Baseline Assessment Results Memo	Memo	HPWH Free-Ridership	This memo outlines the results of a survey study of recent program participants to answer three key questions: 1) What is the free-ridership rate for HPWHs incented through the program? 2) What is the appropriate baseline to use to determine the savings from the HPWH program? 3) What percentage of program participants are low income?	N/A	Michaels Energy
Maine	N/A	Jan-20	Beneficial Electrification: Barriers and Opportunities in Maine	Legislative Report	N/A	This is intended to serve as a primer for Maine legislators on beneficial electrification. It covers strategic electrification technologies. How they can help reach the states GHG reduction goals, barriers to electrification, and recommendations among other things. This report is in response to the Maine Legislation L.D. 1464 - An Act To Support Electrification of Certain Technologies for the Benefit of Maine Consumers, Utility Systems and the Environment. The Act required Energy Efficiency Maine to study barriers to beneficial electrification.	N/A	

ME – Efficiency Maine Trust	Res	Dec-19	Efficiency Maine Trust Heat Pump Water Heater Initiatives Impact Evaluation	Impact Evaluation	Consumer Products Program; Low-Income Direct Install Initiative	The purpose of this study was to develop estimates for the gross energy savings, peak demand reduction, and realization rates for heat pump water heaters installed between July 2014 and June 2017 (FY2015-FY2017). 58 CPP and 58 LIDI homes were evaluated using on-site measurement and verification. The benefit-cost analysis showed that all measures offered through the CPP and LIDI programs are cost-effective.	Data Type: Primary Sample Size: 116 End Use: Heat Pump Water Heater	West Hill Energy and Computing, Lexicon Energy consulting, Ridge & Associates, Analytical Evaluation Consultants
ME - Efficiency Maine Trust	Res/C&I	Nov-19	Efficiency Maine FY2019 Annual Report	Annual Report	Efficiency Maine Trust	Annual Report of the Efficiency Maine Trust describes activities during Fiscal Year 2019 (FY2019), which covered the period from July 1, 2018, to June 30, 2019. The report includes the budgets, activities, and results for all programs and related activities administered by the Trust. In total, these programs will generate more than 2.0 billion kWh and more than 6.9 million MMBtu in cost-effective lifetime energy savings for Maine ratepayers.	N/A	

ME – Efficiency Maine Trust	Res	Aug-19	Efficiency Maine Trust Home Energy Savings Program Impact Evaluation	Impact Evaluation	Home Energy Savings Program	The purpose of this study was to develop estimates for the gross energy savings, peak demand reduction, and realization rates for measures installed between September 2014 and June 2016 (FY2014-FY2016). The measures covered by this study are: natural gas boilers, ductless heat pump, air sealing and insulation. Billing analysis was the primary method used to estimate unregulated fuels and natural gas savings while on-site M&V was used to measure ductless heat pumps.	Data Type: Primary Sample Size: 40 End Use: Ductless Heat Pump	West Hill Energy and Computing, Ridge & Associates, Analytical Evaluation Consultants
ME - Efficiency Maine Trust	Res/C&I	Nov-18	Efficiency Maine FY2018 Annual Report	Annual Report	Efficiency Maine Trust	Annual Report of the Efficiency Maine describes activities during Fiscal Year 2018 (FY2018), which covered the period from July 1, 2017 to June 30, 2018. The report includes the budgets, activities, and results for all programs and related activities administered by the Trust. In total, these programs will generate more than 1.8 billion kWh and more than 4.5 million MMBtu in cost-effective lifetime energy savings for Maine ratepayers.	N/A	

ME - Efficiency Maine Trust	Res/C&I	Jan-18	Efficiency Maine FY2017 Annual Report	Annual Report	Efficiency Maine Trust	Annual Report of the Efficiency Maine Trust describes activities during Fiscal Year 2017 (FY2017), which covered the period from July 1, 2016 to June 30, 2017. The report includes the budgets, activities, and results for all programs and related activities administered by the Trust during this period. In total, these programs generated more than 1.5 billion kWh and more than 7.7 million MMBtu in cost-effective lifetime energy savings for Maine ratepayers.	N/A	
ME – Efficiency Maine Trust	C&I	Nov-17	Business Incentive Program Process Evaluation	Process Evaluation and Impact Evaluation	Business Incentive Program	This study incorporates impact and process evaluation methods for Efficiency Maine's commercial, demand-side management programs through fiscal year 2014 and 2015 under the Business Incentive Programs Umbrella. The 13 evaluated programs were divided into 4 discrete groups by similar program characteristics and end uses. The goals for the evaluation are to verify and adjust gross electric energy and demand savings (summer and winter peak), compare adjusted gross savings with claimed savings and analyze the cost effectiveness of the program. Methods included: on-site	Data Type: On-Site Measurements Sample Size: 98 End Use: Custom rebates; prescriptive lighting; prescriptive non-lighting ; ductless heat pump	

						inspections and measurements, telephone surveys, documentation review, secondary data source review, and interviews with program participants.		

Connecticut

State	Sector	Date	Study Title	Study Type	Program	Study Summary	Metering Data	Author
CT - EEB	C&I	Oct-20	C1634 Energy Conscious Blueprint Impact Evaluation	Impact Evaluation	Energy Conscious Blueprint (ECB)	An impact evaluation of Energize Connecticut's Energy Conscious Blueprint (ECB) program for 2017 and 2018. Four utilities—Eversource, United Illuminating, Connecticut Natural Gas, and Southern Connecticut Gas Company—participate in the ECB program to provide incentives for new construction, major renovation, tenant fit-out measures, and new (or end of useful life) equipment measures for commercial, industrial, or municipal customers throughout Connecticut. The goals for this evaluation were to assess the retrospective and prospective savings impacts of electric energy, electric demand, and natural gas through the ECB program.	Validate reported savings using engineering calculations, model simulations, meter data, and other forms of analysis techniques	Cadmus
CT - EEB	Res/C &I	Sept-20	2020 Connecticut Clean Energy Industry Report	Jobs Report	Clean Energy in CT	The report details all clean energy-related jobs across the state from 2017 to 2019, specific to the Connecticut definition of clean energy activities.	N/A	BW Research Partnership
CT-EEB	Res	Sept-20	R1963 Short-Term Residential Lighting Report	Market Evaluation	Lighting	NMR conducted a study to explore the current and short-term future of the lighting market in Connecticut. The study also compares market share and bulb prices in Connecticut, the United States, and comparison areas with different	N/A	NMR Group

						levels of lighting program activity. Supplier interviews provide insights into qualitative product and market trends and factors influencing the lighting market. The report provides recommendations on how the Energize Connecticut upstream lighting program can best adapt in the coming years		
CT - EEB	C&I	Aug-20	Impact Evaluation of PY 2016 & 2017 Energy Opportunities Program	Impact Evaluation	Energy Opportunities	This study was commissioned to understand the extent to which program performance is meeting program and policy goals and objectives and to recommend revisions to the Program Savings Document (PSD) to improve claimed savings estimates moving forward.	Data Type: Secondary Sample Size: 32 End Use: Lighting	DNV GL
CT - EEB	Res/C &I	Jul-20	X1931 Prospective Realization Rate Update Guidance	Evaluation of Realization Rates for Programs	All	Examined data to see if the programs immediately make a programs savings document change in response to an X1931 recommendation, should the presumptive prospective realization rate be adjusted in the reverse direction so that the program gross savings are not adjusted twice.	N/A	ERS
CT – EEB	Res/C &I	Jul-20	CT R1973 Retail Non-Lighting Evaluation	Program Evaluation	Retail Non-Lighting	The report had two objectives. The primary objective was to develop improved impact parameters for retail non-lighting programs. The secondary objective was to recommend improvements to program design and implementation.	N/A	PSD

CT - EEB	Res	Nov-19	R1705 R1609 Multifamily Baseline and Weatherization Opportunity Study	Opportunity Study	Multifamily	The goal of this study is to establish a weatherization baseline of multi-family (MF) units to estimate potential savings if all systems in multifamily units were converted to high efficiency alternatives. This research is intended to inform the EEB's and utilities' strategies to achieve the Public Act 11-80 mandate to weatherize 80% of residential units in the State by 2030. The Study estimates the number of MF units in the State and their key characteristics and collects detailed information on key energy consuming systems and weatherization characteristics for a sample of units.	N/A	Energy and Resource Solutions
CT	Res	Oct-19	R1706 Residential Appliance Saturation Survey & R1616/R1708 Residential Lighting Impact Saturation Studies	Impact Saturation	Appliance and Lighting	This report includes results from the Residential Appliance saturation survey and Lighting Impact Saturation Studies. The goal was to provide an inventory of residential end-uses, including heating and cooling equipment, water heating, appliances, consumer electronics, and lighting. As well as estimating lighting saturation and building characterizations. The study consisted of ~2,500 web surveys and ~230 site verification visits.	N/A	NMR Group, Inc.
CT	Res	Oct-19	CT Home Energy Services- Income Eligible and Home Energy	Impact Evaluation	Home Energy Solutions (HES); Home Energy	This report uses billing analysis to evaluate the impact of the HES and HES-IE programs during 2015 and 2016. This study covered the single-family component of the programs. The results showed substantial savings consistent	Data Type: Billing Analysis	West Hill Energy and Computing

			Solutions Impact Evaluation		Solutions-Income Eligible (HES-IE)	with other northeast states however, lower than the savings reported.		
CT	C&I	Sept-19	Connecticut Energy Efficiency Board C1644 EO Net-to-Gross Study	Market Evaluation	Energy Opportunities Program	Net-to-gross ratios estimated for the Energy Opportunities program. Also estimated free-ridership, like spillover, and unlike-spillover from the custom and prescriptive components of the EO program, disaggregated for each of the nine electric and 5 gas measure categories in the program. Relied on telephone interviews with EO program participants and design professionals and vendors.	N/A	EMI Consulting
CT - EEB	Res	Jun-19	R1617 Connecticut Residential Ductless Heat Pumps	Market Evaluation	Ductless Heat Pumps	The R1617 Ductless Heat Pump (DHP) study examines the installation circumstances, impacts, and estimated adoption rate of program DHPs installed in Connecticut. The study: 1) systematically determined the savings baseline from rebated DHP units in 2015 and 2016, 2) determined the electric and fossil fuel impacts of those units under each baseline condition, 3) explored the DHP marketplace from the contractor perspective, 4) developed a tool to estimate market adoption rates under various rebate and fuel cost levels, and 5) provided guidance for documenting DHP	The estimate of the consumption impacts for the key heating and cooling baselines used the analysis of metered data from a 2016 study of DHPs in Massachusetts and Rhode Island.	DNV GL

						impacts in the CT Program Savings Document (PSD).		
CT	Res	Dec-18	Connecticut Non-Energy Impacts Literature Review: R1709	Impact Literature Review	N/A	This report is a literature review to assess how Non-Energy Impacts (NEIs) could be incorporated into cost-effectiveness analysis. The study includes research completed in 2000 and later and provides a rigorous examination of the models and assumptions made in the past studies. The following NEI categories are covered: medical/health, safety, comfort, affordability, operation & maintenance costs, water usage, economic, property value, utility rates and arrearage reduction, transmission & distribution, avoided emissions, participant environmental valuation.	N/A	APPRISE Inc.
CT	Res	Oct-18	R1707 Net-to-Gross Study (NTG) of Connecticut Residential New Construction	Market Evaluation	Residential New Construction	The R1707 Residential New Construction (RNC) Net-to-Gross (NTG) study, detailed in this report, carried out the following goals: 1) estimated savings and an overall NTG ratio for the Connecticut RNC program, 2) gained feedback about the program's impacts on solar PV adoption, Net Zero designs, lighting, and multifamily homes relative to single-family homes, and 3) determined if future evaluations should adjust the savings baseline to include program home efficiency values. A Delphi Panel approach was used to develop estimates of measure-level building practices for a	N/A	NMR Group, Inc.

						hypothetical situation in which there was no RNC program. The results were compared to the program's gross savings to estimate an overall NTG ratio.		
CT	C&I	Sept-18	C1641: Impact Evaluation of the Business and Energy Sustainability Program	Impact Evaluation	Business and Energy Sustainability	Examines the performance of projects completed in 2015. The goals of the report are to develop electric and natural gas energy savings estimates, program level electric demand savings coincident with summer and winter on-peak and seasonal peak periods, recommendations to support future iterations of the Connecticut Program Savings Document, non-energy impacts, and realization rates. ERS assessed a statistically selected sample of project sites to verify measure installations.	Data Type: Primary Sample Size: 81 End Use: Electric and natural gas	Energy and Resource Solutions
CT	Res	Jun-18	R1702/R1710 Codes and Standards Assessment	Potential Study	Residential New Construction	This report estimates code compliance rates and potential savings from compliance enhancement for new single-family homes in Connecticut that were built at the end of the 2009 International Energy Conservation Code (IECC) cycle and the amended 2012 IECC adopted in Connecticut (2012 IECC-CT). The study followed the MA-REC methodology which scores homes based on their performance against a hypothetical counterpart home to prescriptive code requirements. Compliance scores were	N/A	NMR Group, Inc.

						developed for a sample of Residential New Construction program participants.		
CT	C&I	Apr-18	REPORTC1630 Largest Savers Evaluation Final Report	Impact Evaluation	Energy Opportunities; Energy Conscious Blueprint	The Largest Savers Evaluation's overall goal was to assess the levels and sources of variance, in order to minimize these in the future. To achieve this goal, the study focused on two primary objectives: 1.evaluate the energy and peak demand savings impacts for a census of the largest projects supported by the Energize CT initiative, and 2. provide stakeholders with findings that are relevant and useful to potentially reducing future evaluation costs.	Data Type: Primary Sample Size: 34 End Use: Boiler; Compressed air; EMS' Envelope; HVAC; Lighting; Motors; Refrigeration; VFD; Whole Building	Nexant
CT	Res	Jul-18	CT HVAC and Water Heater Process and Impact Evaluation and CT heat Pump Water Heater Impact Evaluation	Impact Evaluation; Process Evaluation	Residential Upstream HVAC and Water Heating; Heat Pump Water Heater	The report covers impact and process evaluation studies of the Connecticut Residential Upstream HVAC and Water Heating Program ("Upstream HVAC Program") and the impact evaluation of Heat Pump Water Heater Program. The evaluation covers 5 out of the 8 program measures. The evaluation determined gross energy savings, peak demand reduction and realization rates for the evaluated measures. It also calculated the Net-To-Gross ratios and assessed program effectiveness. The evaluation team identified substantial issues with missing data and quality which had direct consequences on the evaluation.	Data Type: Primary Sample Size: 37; 53; 41; 111 End Use: Boilers; ECM furnace fan; Heat pump water heater; Boiler circulation pump	West Hill Energy and Computing; EMI Consulting; Lexicon Energy Consulting

CT	Res	Dec-17	R1602 Residential New Construction Program Baseline Study	Baseline Evaluation	Residential New Construction	This is a baseline study for single-family residential new construction. The study assessed how the market has changed over time and what changes in building practices have occurred since the previous baseline study. It included site visits to 70 non-program houses constructed with 2009 IECC codes, and data collection covered all aspects of energy performance as well as a HERS rating. Billing analysis assessed the accuracy of energy use as estimated by REM/Rate models in comparison to actual billing data.	N/A	NMR Group, Inc.
CT	Res	Aug-17	Light - Emitting Diode Net to Gross Evaluation	Market Evaluation	Retail Products	This study estimated NTG ratios for LEDs in 2015 and predicted prospective ratios through 2018 and beyond for the Retail Products Program. This study also laid the groundwork for an upcoming lighting study, R1616/R1708 Residential Lighting Impact Saturation Study. The study undertook five research activities: in-depth interviews with suppliers and program staff, sales data modeling, demand elasticity modeling, benchmarking, and a consensus panel.	N/A	NMR Group, Inc.; DNV GL; Cadmus Group

New Hampshire

State	Sector	Date	Study Title	Study Type	Program	Study Summary	Metering Data	Author
NH PAs	Res/C&I	Oct-20	New Hampshire Potential Study Statewide Assessment of Energy Efficiency and Active Demand Opportunities, 2021-2023	Potential Study	Energy Efficiency Program 2021–2023	This report presents the results of the New Hampshire potential study. The study provides a statewide overview of modeled potential for savings from energy efficiency and active demand programs over the 2021-2023 period.	N/A	Dunsky
NH PAs	Res/C&I	Aug-20	New Hampshire Lighting Supplier Insights	Market Evaluation	Lighting	This report summarizes findings from 19 in-depth interviews (IDIs) conducted in 2020 with manufacturers, retail buyers (collectively termed suppliers), and advocacy groups with knowledge of the lighting market. The study, co-sponsored with the Energy Efficiency Board in Connecticut and the PAs in Massachusetts, was designed to provide information on the current state of the market and the regulatory environment for the electric program administrators in New Hampshire.	N/A	NMR and DNV GL
NH PAs	C&I	Jul-20	Home Energy Assistance Program Evaluation Report 2016-2017	Program Evaluation	NHSaves HEA	This report presents the results of the evaluation of the NHSaves HEA Program for NH gas and electric utilities including energy savings, design effectiveness, and more.	Data Type: Primary (Site Visits) Sample Size: 50	Opinion Dynamics

							End Use: Primary Heating	
NH PAs	C&I	Jun-20	NH Non-Energy Impacts Sensitivity Analysis	Analysis	N/A	This memo provides an overview of the effects of including measure-level NEIs on the NH benefit-cost results for PAs.	N/A	DNV GL
NH PAs	Res	Jun-20	Home Performance Evaluation Report 2016-2017	Impact and Process Evaluation	NHSaves	This evaluation analyzed both the impacts and process of the HPwE program during the 2016 and 2017 calendar years including energy savings, feedback, and overall effectiveness.	Data Type: Primary (Site Visits) Sample Size: 67 End Use: Primary Heating Fuel Type	Opinion Dynamics
NH PAs	Res	Jun-20	New Hampshire Residential Baseline Study	Baseline Evaluation	N/A	This study characterizes the energy-using equipment present in NH homes (including their efficiency and age) and assesses the extent to which these equipment baselines differ from those in neighboring jurisdictions where similar studies have been conducted.	N/A	Itron
NH	C&I	Apr-20	Cross-State C&I Active Demand Reduction Initiative Summer 2019 Evaluation Report	Impact and Process Evaluation	C&I interruptible and targeted battery storage projects	The primary objectives of the evaluation are to independently assess program initiative impact and identify process improvement opportunities. The evaluation also attempts to understand the overlap between the PA ADR initiatives and the ISO-NE Forward Capacity Market (FCM) and	Data Type: Secondary Sample Size: >10 End Use: Demand reduction; battery storage	Energy and Resource Solutions; DNV GL

						provide input on other opportunities for peak demand management. For the process evaluation, the team reviewed initiative materials, performed a participant survey and conducted in-depth phone interviews with PA program managers, ISO-NE Price Responsive Demand (PRD) program managers, and CSPs. The impact evaluation was based on account-level analysis of interval data of all available participants.		
NH	Res/C&I	Oct-19	New Hampshire Cost-Effectiveness Review	Cost Effectiveness Evaluation	Cost Effectiveness test	This report identified NH's existing energy efficiency program policy and discussed an energy efficiency cost-effectiveness framework that is intended to fully reflect those policies using the fundamental principles outlined in the NSPM.	N/A	Synapse Energy Economics, Inc.
NH	Res/C&I	Sept-19	Energy Optimization through Fuel Switching Study	Potential Study	Energy Optimization and Fuel switching	A study on how energy optimization through fuel switching is commonly treated in cost-effectiveness testing. This study first looked at how NH's programs currently handle energy optimization, then how other Northeast states handled it, and finally compares different state policy goals with activities that states are pursuing.	N/A	Navigant

NH	C&I	Jul-19	New Hampshire Non-Lighting Commercial and Industrial Programs	Impact and Process Evaluation	C&I Demand-side Management	This report presents the key evaluation findings related to programs' operations, performance, and energy savings and demand reduction impacts. EM&V objectives include: 1. Assess the accuracy of claimed energy savings during the 2016-2017 program years for the Municipal, Small Business Energy Solutions, and Retail and Large Business programs. 2. Compare actual savings against claimed savings and make recommendations to improve the accuracy of claimed savings. 3. Assess the effectiveness of program design, delivery, and performance of and coordination with vendors and contractors. 4. Assess utility, participant, and vendor, contractor, and technical service provider satisfaction with the program 5. Identify opportunities to improve program penetration and savings. 6. Assess baseline efficiencies offered in the marketplace.	Data Type: Primary Sample Size: 15 End Use: HVAC; Refrigeration; Motors	Cadmus Group
NH	Res/C&I	Apr-19	NH Saves Market Assessment	Market Evaluation	N/A	The study assesses residential and non-residential customer knowledge and awareness of energy efficiency and of the New Hampshire utilities' energy	N/A	Navigant; Illume

						efficiency program brand NHSaves®, attitudes and behaviors toward energy efficiency, motivations and barriers to participating in utility-sponsored efficiency programs, and preferred communication channels.		
NH	Res	Oct-18	New Hampshire ENERGY STAR® Products Program 2016 EVALUATION REPORT	Impact and Process Evaluation	Energy Star Products Program	This report details the objectives, methods, and findings from the impact and process evaluations of the New Hampshire ENERGY STAR Products program in 2016. The EM&V objectives included: Verify electric and gas energy savings, water savings, and electric demand reduction associated with the ENERGY STAR Products program in 2016; Review the 2018–2020 energy savings calculations for accuracy and appropriateness; Assess the current and proposed design and implementation of the ENERGY STAR Products program; Identify opportunities for increasing the program's effectiveness and the satisfaction of participants and partners (e.g., retailers, suppliers, others)	Data Type: Primary Sample Size: 48 End Use: HVAC; Lighting; Thermostats	Cadmus Group
NH	C&I	Jun-18	Impact Evaluation of 2016 New Hampshire Commercial & Industrial Small	Impact Evaluation	C&I Small Business and	The overall objective of this evaluation was to quantify the electric energy and peak demand savings and the on-peak coincident	Data Type: Primary	DNV GL

			Business and Municipal Lighting		Municipal Program	factors (as defined by ISO-NE) associated with high efficiency lighting measures through site-specific inspection, monitoring, and analysis. Impacts and realization rates were determined for New Hampshire as well as New Hampshire and Massachusetts combined.	Sample Size: NH:30 MA:48 End Use: Lighting	
NH	Res/C&I	Mar-18	Avoided Energy Supply Components in New England: 2018 Report	Program Evaluation	Avoided Energy Supply Component	The 2018 AESC Study provides estimates of avoided costs associated with energy efficiency measures for program administrators (PAs) throughout New England states for purposes of both internal decision-making and regulatory filings. , this study examines avoided costs of energy, capacity, natural gas, fuel oil, other fuels, other environmental costs, and demand reduction induced price effects (DRIPE).	N/A	Synapse Energy Economics, Inc.
NH PUC	Res	Dec-17	New Hampshire ENERGY STAR Homes Program Impact Evaluation	Impact and Process Evaluation	Energy Star Residential New Construction	This report describes the impact and process evaluation of the New Hampshire utilities (the "Utilities") ENERGY STAR Residential New Construction Program. The objective of the impact evaluation was two-fold: a) to provide a process evaluation to assess the efficiency of program delivery and b) to estimate the evaluated	Data Type: Billing Analysis Sample Size:150 End Use:	Energy and Resource Solutions

						savings for the Program, which includes electric and thermal savings.		
PAs from NH, ME, RI, VT	Res	Dec-16	Background to AESC 2015 Update	Program Evaluation	Avoided Energy Supply Component	This memo presents the results from the AESC 2015 Update and the underlying assumptions. The AESC 2015 Update provides limited updates of Appendix B (Avoided Electricity Costs), Appendix C (Avoided Natural Gas Costs), and Appendix D (Avoided Costs of Petroleum and Other Fuels).The updates are limited as follows: Updates of only six input assumptions -crude oil/fuel oil prices, natural gas commodity costs, electric generating capacity retirements, additions and Forward Capacity Market (FCM) results, and a new ISO-NE zone; calculations based on the methodologies and models the TCR team used to prepare AESC 2015; no updates of renewable energy compliance costs or DRIPE; update results reported for Maine, New Hampshire, Rhode Island and Vermont in constant 2017 dollars, starting in 2017.	N/A	Tabors Caramanis Rudkevich (TCR)

NH	Res	Mar-16	Addendum to Avoided Energy Supply Costs in New England: 2015 Report	Program Evaluation	Avoided Energy Supply Component	In August of 2015, the AESC Study Group asked TCR to perform a supplemental study of more granular costing periods for the on-peak period for each of the New England states. In the absence of generally accepted terms for these more granular costing periods, the Study Group has asked TCR to use the terms “four-hour on-peak” blocks and “other on-peak” blocks. TCR performed 3 studies: Electric costing periods, natural gas costing periods, and an assessment of active Demand Response.	N/A	Tabors Caramanis Rudkevich (TCR)