Workforce Development
Building Operations & Maintenance
Impact Evaluation
Final Report

Prepared for:
New York State Energy Research and Development Authority
Albany, New York

Tracey DeSimone, Project Manager
Tricia Gonzales, Senior Project Manager

Prepared by:
DNV
1430 Broadway Suite 1609
New York 10018
Mersiha McClaren
Principal
Sue Haselhorst
Senior Principal Engineer

NYSERDA Contract #151663

TWO ID No. 164974A

March 2025

NYSERDA Record of Revision

Workforce Development
Building Operations & Maintenance Impact Evaluation Retrospective Report March 2025

Revision Date	Description of Changes	Revision on Page(s)
March 2025	Original Issue	Original Issue

Contents

1 INTRODUCTION

The report presents the results of the Retrospective Evaluation of select WFD projects assessed in Phase 2 of the WFD multi-phase evaluation. At the conclusion of the Phase 1 evaluation, there was a consensus that future WFD evaluations should collect evaluation data in real-time through the life cycle of the projects. WFD projects entail a long implementation period, and participants have difficulty recalling actions they may have taken years previously and the individuals that are interviewed may not be aware of improvements implemented by the, potentially numerous, trainees. The real-time data collection will interview participants at six month intervals to gather fresh recollection of actions influenced by the training. Phase 2 has commenced real-time data collection for projects that are still in-progress. However, 22 projects that were not evaluated in Phase 1, had completed training and thus did not qualify for real-time data collection. This report presents the retrospective evaluation of these 22 projects.

The report begins with the description of the program, the study goals, and prior WFD BOM impact results to offer context for the results that follow.

1.1 Program description

Presently, the WFD program consists of two initiatives: 1) the BOM initiative and 2) the Talent Pipeline initiative. This report focuses on the findings from the WFD Phase 2 evaluation (referred to as the "Phase 2" study), which focused on evaluating the impacts of the BOM initiative.

The BOM initiative is designed to achieve energy savings by training operations and maintenance (O&M) staff to operate their buildings better, thereby reducing energy usage. The BOM effort targets employers, managers, and O&M service providers involved in building operations and maintenance across commercial, institutional, multifamily, and other sectors, especially larger organizations responsible for a portfolio of buildings. The program is designed to increase O&M staff competencies through training in a manner that leads to improved building operations and measurable savings.

The initiative included training select O&M staff to train co-workers, also called "training the trainer" instruction (or NYTTs,[1] which refers to NYSERDA-trained trainers), as well as the direct training of O&M staff via third-party training contractors.

The BOM initiative has also evolved since its initial roll-out. Initially, it funded suitable training projects that were proposed by the building owners and their training consultants. The first PON, PON 3442, expected the primary applicants to be the owners and operators of buildings, with O&M staff applying for grants to train their O&M staff. The owners/operators of buildings were expected to be working with the training providers. The subsequent PONs, PON 3715 and 5357, allowed for training organizations to be the primary applicant, and it was still expected that training organizations would work with specific entities employing O&M staff that were served by New York utilities.

[1] Workers trained under the NYSERDA-sponsored training to train co-workers in O&M, hence, NYSERDA-trained trainers (NYTT).

1.2 BOM evaluation objectives

1.2.1 Current BOM study

Table 1-1 summarizes the objectives of this study for the BOM initiative and the data sources used to meet those objectives. In Table 1-1 and throughout this document, the evaluation team refers to organizations participating in the initiatives as "participants" or "participating organizations."

Table 1-1. BOM – Impact evaluation objectives and main research questions

Objective	Evaluation question(s)	Data source(s) & analytic method(s)
Verified gross savings	What is the verified gross savings for the BOM sub-initiative? What is the appropriate average savings to be used for the sub-initiative?	Gross savings were estimated using an engineering analysis of nearly all completed projects from Q4-2021 to Q4-2023. The analysis relied on: 1) the interviews with the trainers and organizations that implemented the BOM funded training, 2) any available building energy consumption data before, during, and after the training concluded for O&M staff managing the buildings, and 3) information from the training materials. The IPMVP Option 3 or the Billing Analysis approach for all completed projects from Q4-2021 to Q4-2023, although attempted, was not feasible for estimating the gross energy savings due to findings being compromised by the COVID-19 impact.
Indirect impacts	What are the indirect effects that are expected to accrue over the longer term from follow-on market activity that results from NYSERDA's investments?	Phone interviews and/or surveys with: • Participant Building Owners (their O&M staff) and property management companies • Participant Training Providers – those who provided the training to organizations with O&M staff

1.2.2 Comparison of prior to current study samples and impact results

The WFD BOM was evaluated before, in what is referred to as the "Phase 1" study. The Phase 1 results were based on a small sample of the population where customers could be recruited to report measures installed because of training. That is, the sampled projects had confirmed installations provided by the customer and were evaluated using billing analysis approach and the "Good Evidence" engineering methods approach (for more details on the methods, see Section 3 of this report) with corroboration with an engineering estimate.

Figure 1-1 compares Phase 1 and 2 samples of retrospective projects (i.e., the WFD BOM training projects that have concluded) and illustrates differences between the two samples. The Phase 1 impact sample was small and consisted predominantly of buildings in the institutional sector, whereas the Phase 2 impact sample was dominated by the buildings in the multifamily and office sectors.

As a reminder, the energy savings (if observed) will occur in the buildings managed by the O&M staff who attended the BOM-funded training.

Figure 1-1. Phase 1 and 2 samples of retrospective projects for estimating impacts

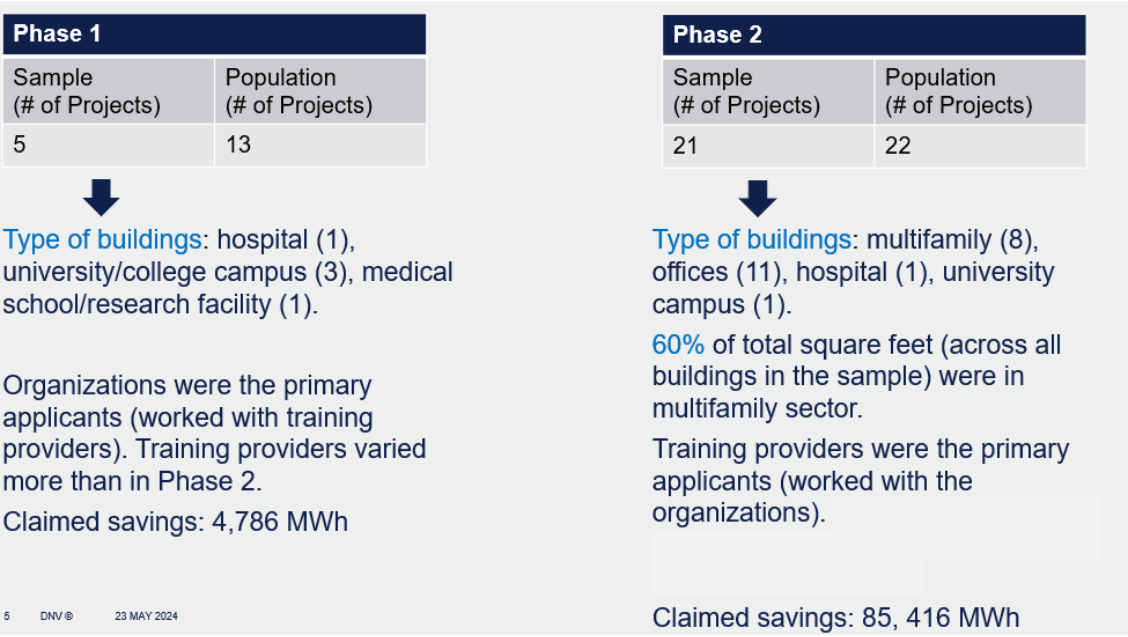


Table 1-2 summarizes the impacts by project for the five projects in the Phase 1 sample. The ratio of the sum of the evaluated savings divided by the sum of the ex-ante estimated savings is the verified gross savings realization rate (VGSRR). The natural gas VGSRR is presented in two ways, in the first, considering only impacts on purchased natural gas, while the second includes the impacts of significant district steam consumption impacts that would not otherwise be accounted for.

Table 1-2. Program VGSRR Development

Project ID*	Scorecard elec (MWH)	Evaluated elec (MWH)	Scorecard purchased NG (MMBtu)	Evaluated purchased (MMBtu)	Evaluated contributing NG (MMBtu)
1	415	1,857	3,695	(690)	96,938
2	599	392	4,716	5,069	5,069
3	1,275	2,734	11,363	977	(52,460)
4	261	743	2,326	556	3,011
5	2,237	-	19,932	0	-
Total	4,786	5,726	42,033	5,912	52,559
VGSRR		120%		14%	125%

The Phase 2 results show lower VGSRR for both electric and non-electric savings, discussed in detail in the next Section.

Due to the small sample and limited data, the following conclusions emerged from the Phase 1 BOM impact evaluation:

1. **There was uncertainty in the estimates of savings.** The billing analysis relied on six-month data intervals provided through the BOM Program about half of the time and monthly billing data for the balance.
2. There was robust average savings for the five sites included in the VGSRR. However, **the small sample size and highly variable results led to poor precisions.** There was also uncertainty introduced by the non-random selection of projects for inclusion that is not reflected in the precision. While the findings did not meet the precision targets, they reflected the best available data for this set of projects, especially given the impact of COVID-19 and the limitation of collecting data on projects that were old (2018 and 2019) at the time the evaluation commenced.

3. **The savings estimates also appeared to not be updated when the project was complete with readily available baseline annual usage from the BOM report.** Project savings were estimated early in the customer enrollment. In the estimates, annual usage that is factored into the estimate of the project ex ante savings understates the actual electric usage by about 40%. Neither the gas nor electric actual annual usage corresponds well to the annual usage assumed by NYSERDA in the initial estimates of savings.
4. As another issue, some of the **projects did not report district steam or fuel oil impacts**, even though they were included in the BOM reporting documentation, and the training activity impacts these streams.

1.3 Evaluation methods overview

The original savings impact methodology was based on gathering evidence from customers to identify installed measures and non-routine events that might impact consumption (for example, a remodel of a wing). A billing analysis, adjusted for non-routine events, would form the basis of the savings corroborated by engineering estimates of savings of installed measures.

However, billing analysis was not feasible because all the projects in this cohort were touched by COVID, thus the changes in consumption could not be readily attributed to the program. Despite extensive efforts, only a limited number of participants were recruited to conduct an interview, and of those that did respond, only a subset could recall actions taken because of training due to the extended multi-year implementation. This outcome was not unexpected given the experience of Phase 1 and a key reason for moving to a real-time data collection approach in Phase 2.

Given the limited direct evidence of installed measures or savings, the methodology was revised to attribute savings to every project based on the available evidence. For some projects, the key source of the evidence was the training materials submitted by the vendors as a contract deliverable. The rational for leveraging the training material is that the training was designed to change attendee behavior by making them aware of opportunities, thus leading to the implementation of measures. Typical savings were estimated for the inventory of measures identified by the customer as having been installed or presented in the training materials.

With this approach, savings was attributed to every project and established a reasonable upper bound of savings. Phase 2 BOM Impact Evaluation Results, Conclusions, and Recommendations.

1.4 Training characterization

A key source of savings estimates was the training materials presented by the vendors. This section provides an overview of the training.

The WFD BOM training is intended to empower individuals with the skills and motivation to improve building operations through a combination of low-cost measures and best practices behaviors resulting in reductions in energy consumption. The WFD BOM training and related activities were delivered to O&M staff serving a wide range of facilities (multifamily high-rises, large office buildings, university facilities, etc.). Each training package was tailored to the individual participating organization, with curriculums ranging from as little as an 8-hour training to up to an estimated 70-hour training focusing on boilers, chillers, controls, and other systems in the buildings (Table 2-1). Given this variability in participating organizations and training approaches, each project was independently assessed, considering all the available evidence including project file documents, billing data, and site interviews.

Table 2-3. Training characterization

Training vendor	% of claimed savings electric/ gas MMBtu	Number of projects	Number of buildings	Average hours of classroom training	Training focus
Vendor A	66%	7	742	8-18 hours, Ave 13	6 Multifamily, 1 office. Big focus on boiler O&M. Also covered cooling & other end uses.
Vendor B	21%	10	30	30-70 hours, Ave 45	Marque office buildings (9) and 1 University Documenting existing systems, chiller plant, controls
Other	13%	5	262	40-80 hours, Ave 55	Mixed (3 Multifamily, 1 Office, 1 Hospital) General building science training and some focus on HVAC, air sealing, other systems

1.5 WFD projects categorization

The evaluation team categorized projects into “Good Evidence,” “Partial Evidence,” and “Slim Evidence” categories, then used an engineering analysis to determine savings. Section 3 describes the engineering in detail. The following sections present the project timelines and the evidence that was available to support the estimates of savings, organized by evidence category (i.e., Good Evidence, Partial Evidence, Slim Evidence).

Each project timeline shows:

- The contract effective date and the project completion date
- The period during which training or active coaching occurred
- A pre and post training period
- Availability of utility billing data. For projects without a release, the evaluation team shows the availability of BOM billing data that was supplied by the customer during participation in the training.
- Availability of interview data

Billing data was used to an extent to determine baseline building usage. A billing analysis was also attempted for corroborating engineering estimates. However, the billing analysis approach was compromised due to the COVID-19 impact on building consumption and thus abandoned.

1.5.1 Good Evidence

Good Evidence sites had the most information, including the confirmed installations or actions (i.e., measures) that occurred because of training, provided by the customer during an interview. Impacts are estimated using an engineering estimate of the measures that were reported as having been installed, although as noted previously, responders may not have a comprehensive recall of measures installed years previously.

Figure 2-2. Good Evidence projects

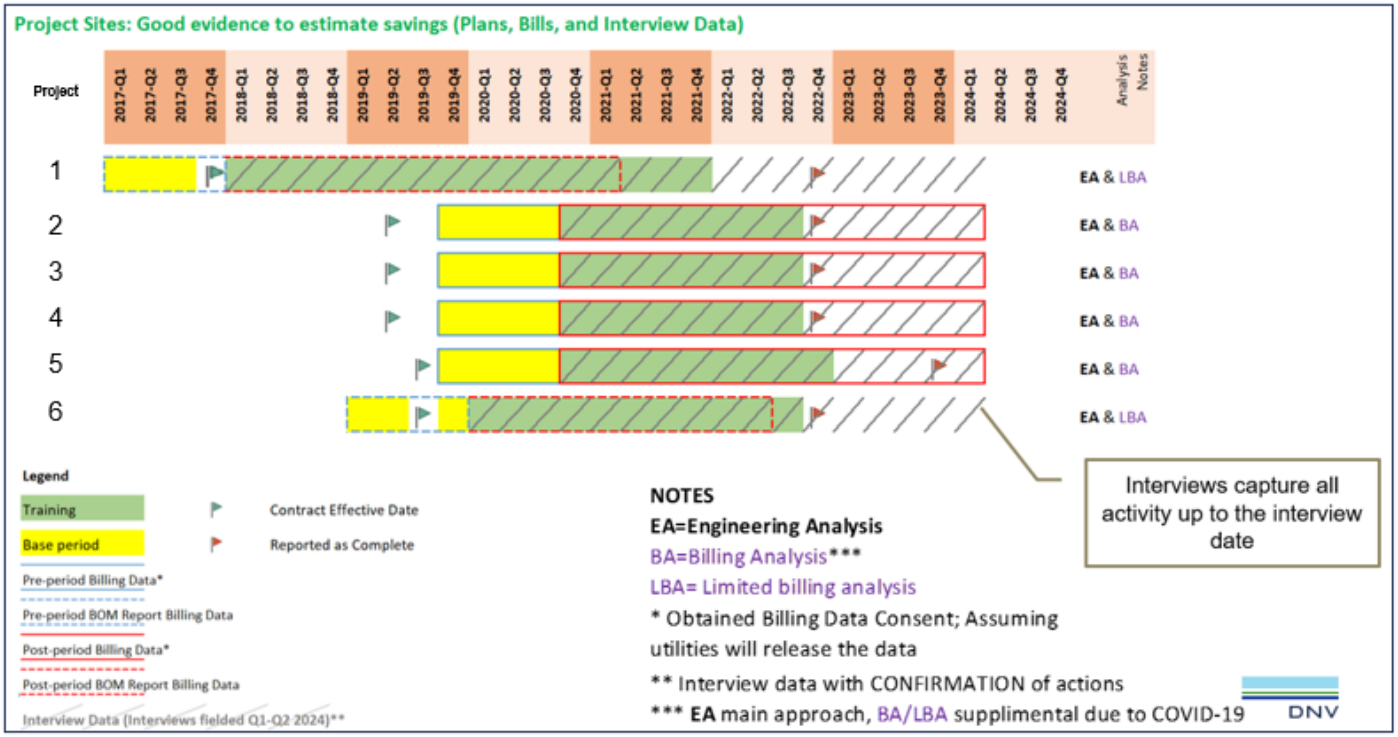


Table 2-2 shows the number of Good Evidence projects broken by training vendor.

Table 2-4. Good Evidence project coverage by training vendor

Training vendor	Good Evidence projects	Total Number of projects
Vendor A	1	7
Vendor B	3	10
Other	2	5

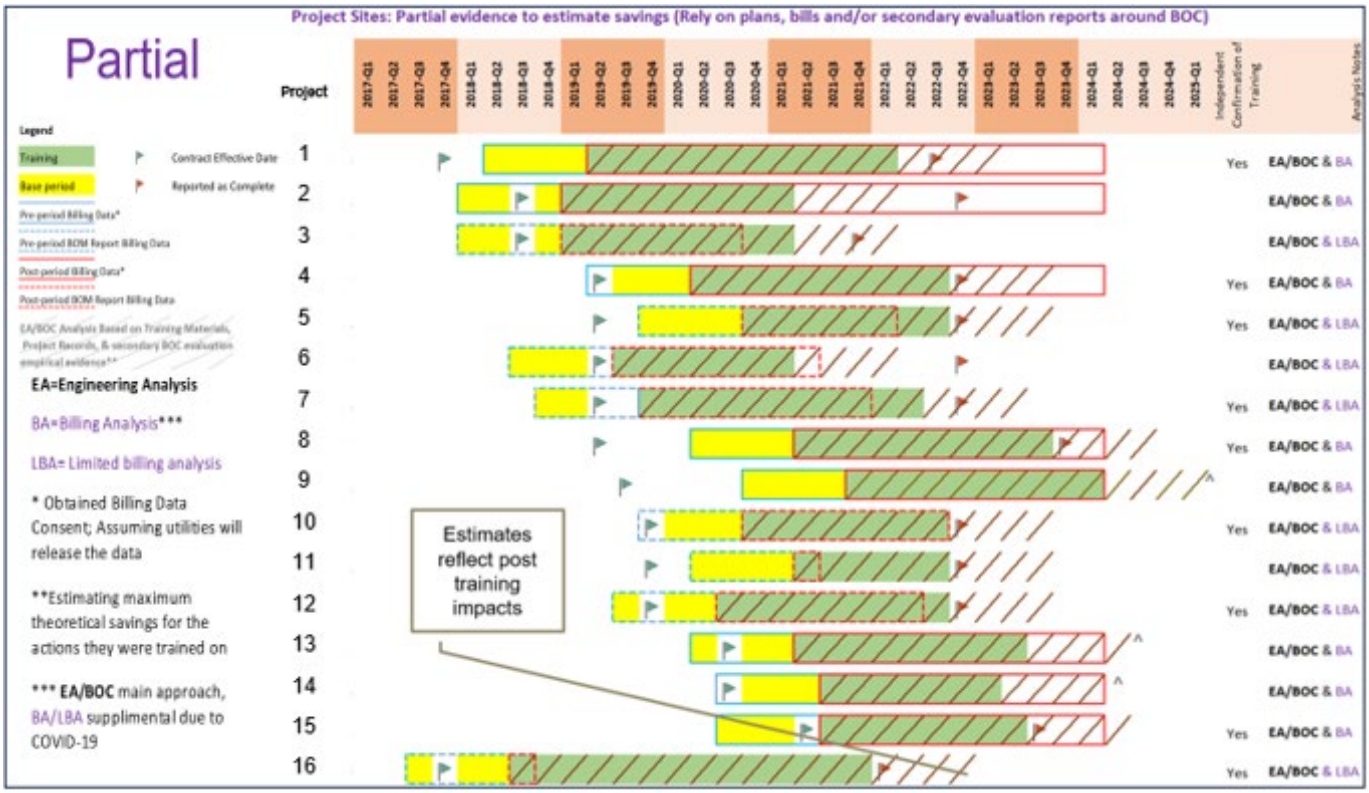
1.5.2 Partial Evidence

Most projects fell into the Partial Evidence category. These projects lacked customer confirmed installations or actions that occurred because of the training (i.e., customers failed to respond to evaluator's multiple interview requests and thus the evaluation team could not collect information on type of actions implemented because of training). While most projects did not have an interview with customers, the evaluation team did find a verification of training in the project files (like class rosters). The key source of potential measures for these projects were the training curricula and materials in the project files. This material identified what the trainees were taught and thus what they would have been empowered to do.

To estimate energy savings for these projects, the evaluation team inventoried the measures presented in the training materials and estimated typical savings for each using engineering calculations referencing authoritative sources, like the New York Technical Resource Manual (NY TRM). The evaluation team knew from Phase 1 impact results that some organizations implemented a large number of measures and some organizations did nothing. A mid-point or 50% adoption rate for the measures or actions that trainees were trained is reasonable for establishing an upper boundary to the savings.

Note that one project in this group of projects was similar to the Building Operator Certification training. The Building Operator Certification training is recognized nationally and has been evaluated multiple times in various jurisdictions. The evaluation team adopted the Building Operator Certification evaluated savings average as the basis for assigning savings for that one project.

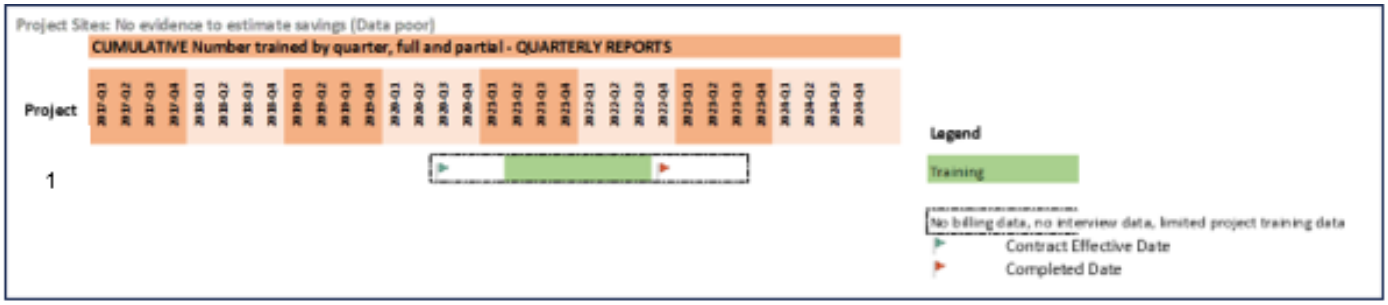
Figure 2-3. Partial Evidence projects



1.5.3 Slim Evidence

For one project, the evaluation team had poor information – no billing data, no measure specific training in the training materials, and no interview data. For this project, the team assigned an average savings estimate across the Good Evidence and Partial Evidence project sites.

Figure 2-4. Slim Evidence projects



1.6 Baseline building consumption

Both the program ex ante estimate and the evaluated engineering-based estimates of energy savings start with the baseline annual energy consumption. If the baseline energy consumption is overstated, the savings estimates will be overstated (understatement produces underestimated savings). The project baseline annual energy consumption is the sum of all the annual energy consumed by the buildings that are served by staff trained under WFD.

At project enrollment, Program Staff estimate project savings by multiplying the project's estimated annual electric and natural gas consumption by the savings fraction provided by the training vendor. The estimated annual electric and natural gas consumption is calculated as a function of the customer-reported total annual cost of energy and an assumed relationship between energy cost and energy use extracted from the "BAB Assumption workbook."[2] While the record is not clear, it appears that the savings reported for completed projects primarily relied on the initial cost-based estimate of energy consumption and were not revised to reflect actual consumption recorded in the Semi-Annual BOM report or utility provided billing data.

For the evaluated savings estimates, the evaluation team established the baseline annual energy consumption from four sources of consumption to determine the baseline project annual consumption. The sources were:

- **Semi-Annual BOM Report consumption data**. Project files usually included at least one year of prior energy consumption data for all fuels (baseline) and at least one year of performance data in the NYSERDA-defined Semi-Annual BOM Report. The Semi-Annual BOM Report is a spreadsheet structured to capture all fuels in six-month intervals aggregated across the buildings within the project portfolio. All but two of the project files included at least one year of consumption in Semi-Annual BOM Reports.
- **Utility consumption data.** In addition to the Semi-Annual BOM Report, NYSERDA attempted to acquire a billing release (if there was not one already signed) for each of the evaluated projects so that NYSERDA and the evaluation team could request historical monthly billing data. The billing data is a superior analytic dataset compared to the BOM Report consumption data because it provides consumption data in monthly intervals rather than every six-months and by building, rather than aggregated across the portfolio. Billing data also distinguishes between estimated and actual monthly values. Billing authorizations and billing account numbers were provided for 12 of the projects.
- **Unregulated fuels.** The Semi-Annual BOM Report included consumption of district steam and chilled water imported from neighboring facilities and oil consumption.
- **NYC LL87.** LL87 data was downloaded and used to develop New York City–specific average fuel consumption (electric and non-electric) per square foot. An EUI-based fuel consumption was estimated for each project as the product of the EUI and the total building area served by the project. This estimate was primarily a cross-check.

The baseline building energy consumption of the project for the engineering analysis was based on the maximum of either the utility billing data or the data in the BOM Semi-Annual Report, whichever was larger. Unregulated fuel consumption was derived exclusively from the BOM Semi-Annual Report. The period selected for the baseline consumption was typically a twelve-month period prior to the commencement of training.

Electric consumption

Figure 2-4 compares the evaluated annual baseline consumption across all projects, the program's estimate of annual baseline consumption in the BAB Assumption workbook, the baseline consumption reported in the Semi-Annual BOM Report, the baseline consumption from billing consumption records, and the LL87 EUI based consumption. Annual electricity baseline consumption was overestimated in the program ex ante estimate by about 15%. Overstated baseline consumption will lead to overstated savings.

[2] Evaluators referenced the "BAB Assumptions Impacts and Fuel Neutrality – 11.18.20" workbook for the estimates of baseline consumption and the savings fraction.

Figure 2-5. Baseline electric consumption (all projects)

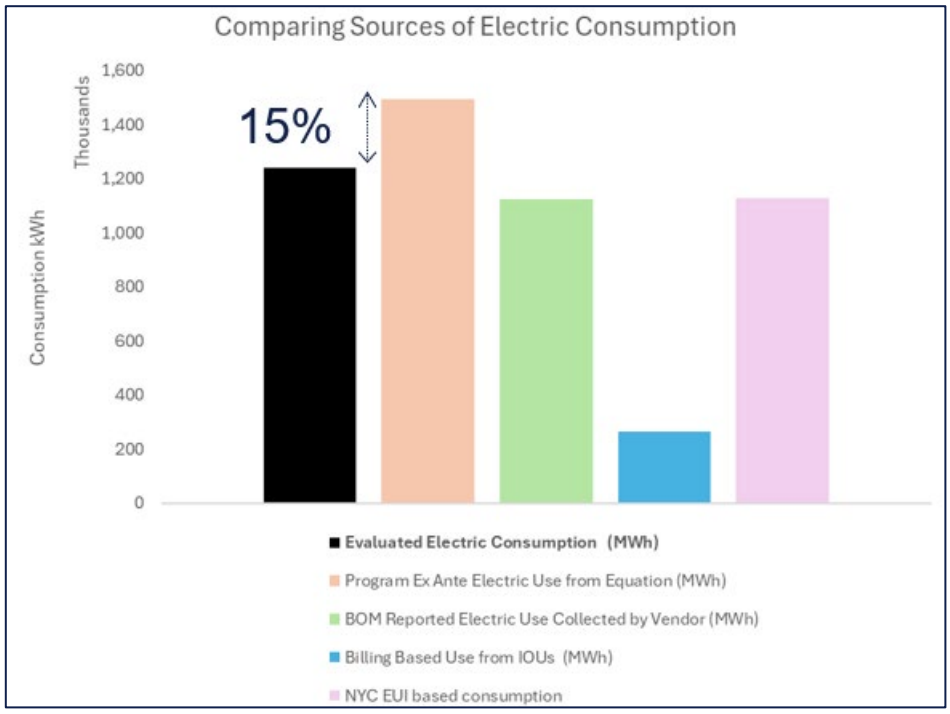
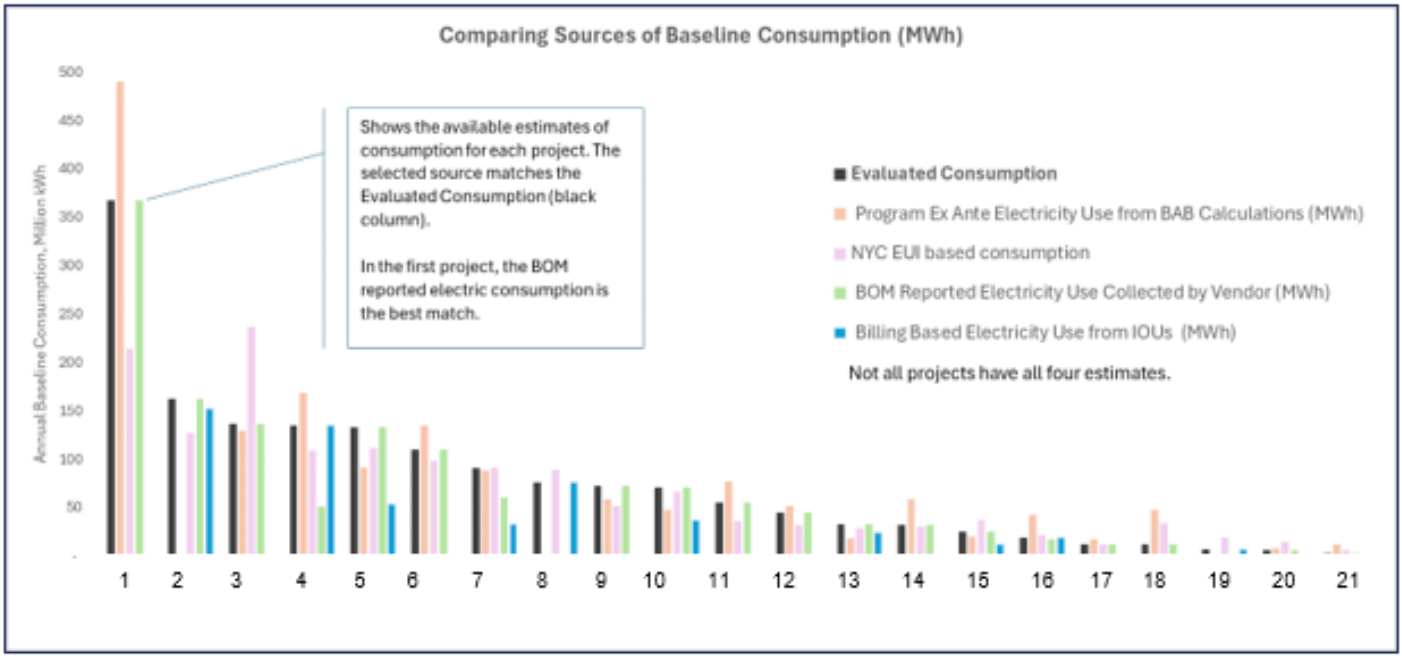


Figure 2-5 presents the same comparison as Figure 2-4, but for each individual project.

Figure 2-6. Baseline electric consumption for each project or project-associated building



While the project annual energy consumption for buildings associated with the project is not readily available at the project initiation, it is readily available in the baseline consumption reported in the first Semi-Annual BOM Report provided about six months into the project or in the billing consumption records received once the customer signs the billing data release consent.

Non-electric consumption

Annual baseline non-electric consumption was overestimated in the initial or program estimate by about 22%, on average (Figure 2-6 and Figure 2-7). As noted above, overstated baseline consumption will lead to overstated savings.

For non-electric annual baseline consumption, the evaluation team summed all non-electric fuels including natural gas, steam, oil, and imported hot and chilled water.

Figure 2-7. Baseline non-electric consumption (across all projects and associated buildings)

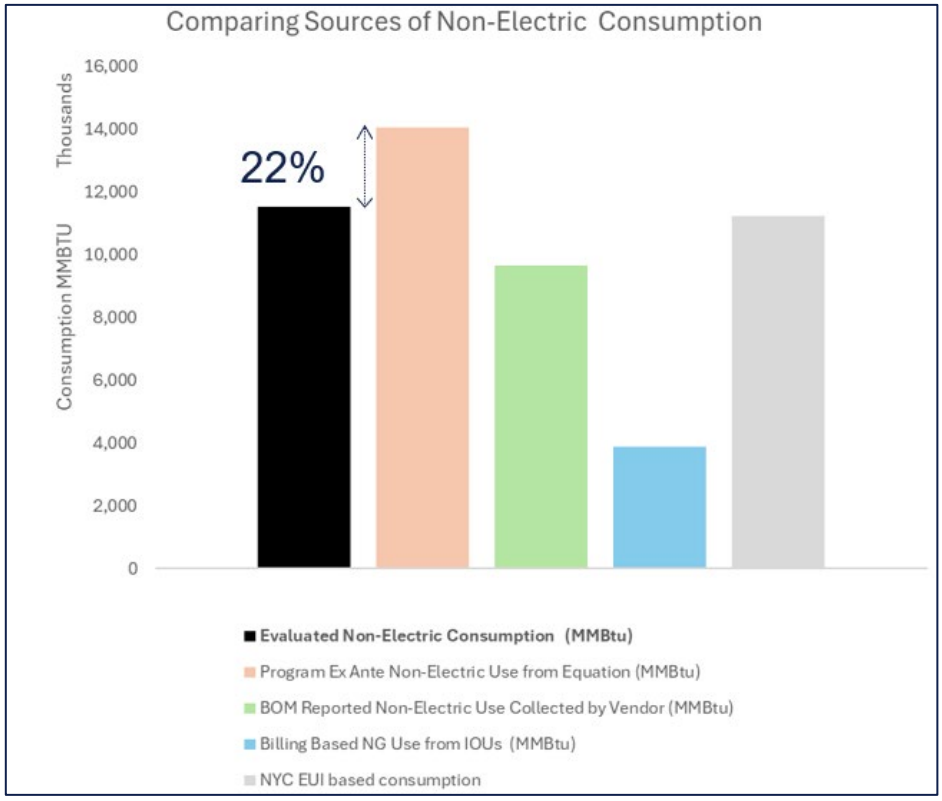
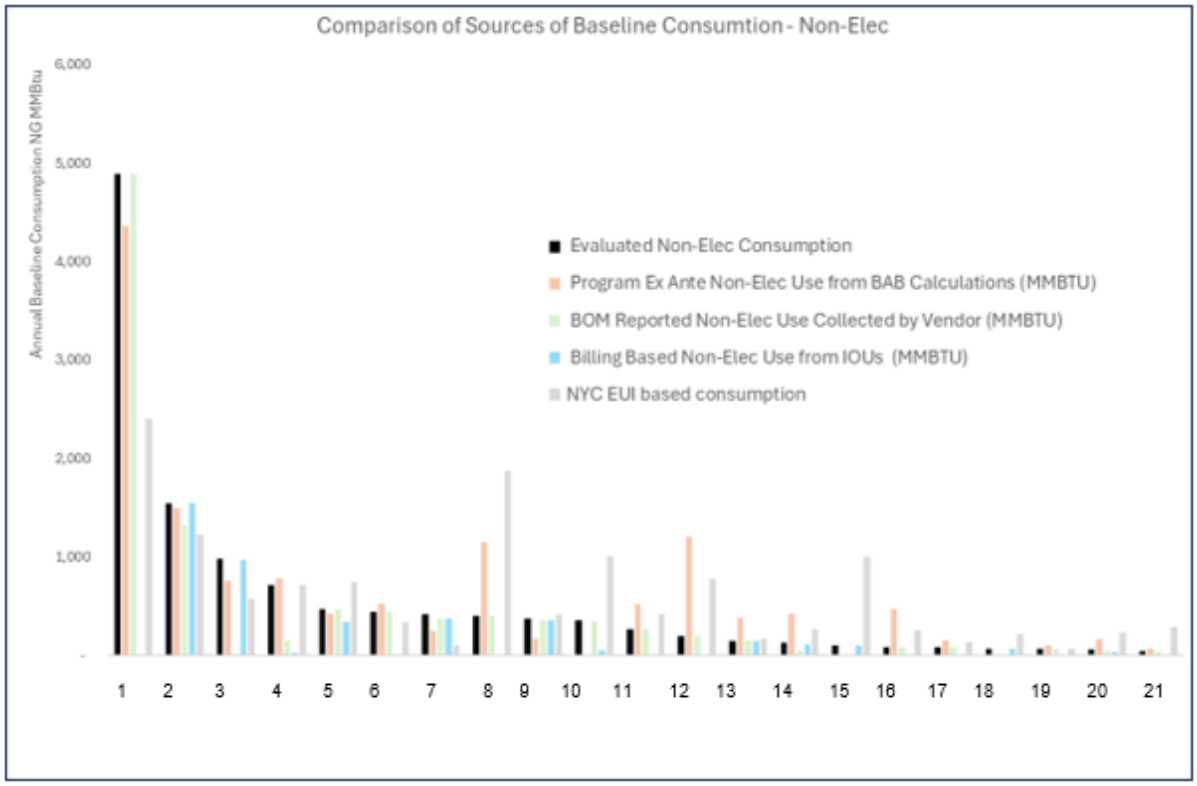


Figure 2-8. Baseline non-electric consumption for each project or project-associated building



1.7 Evaluated results – direct impacts

This section presents aggregated results and the Verified Gross Savings Realization Rate (VGSRR)[3]. The ratio of the sum of the evaluated savings divided by the sum of the CEF reported savings for the BOM projects is the VGSRR. The purpose of the evaluation was to verify that savings reported to in the CEF report and to the DPS are being realized.

Table 2-3 shows that for both electric and non-electric savings, realization rates (RR) are low. The electric VGSRR of 7.7% indicates that only 7.7 % of reported electric savings to the CEF are being realized for the projects that were evaluated in Phase 2. The non-electric VGSRR of 38% indicates that 38% of reported non-electric savings to the CEF are being realized for the projects that were evaluated in Phase 2. The next section explores potential reasons for these low RRs.

Table 2-5. BOM impact evaluation results (retrospective/completed projects)

Evidence Category	Number of Projects	Project Area (million)	Claimed MWh	Electric RR	Claimed MMBtu Non-Electric Fuels	Non-Electric RR
Good	6	27	15,588	3.8%	120,711	31.7%
Partial	15	130	68,823	8.5%	502,951	39.6%
Slim	1	1	1	7.7%	8,949	36.2%
Total	22	158	85,416	7.7%	632,611	38.0%

Table 2-4 and Table 2-5 present the Alternative Prospective Realization Rate (APRR) values in the format required by the DPS. Since this is the second evaluation of this project, evaluated results are applied prospectively in the quarter following

[3] https://it.dps.ny.gov/system/files/documents/2022/11/ce-08-gross-savings-verification-guidance.pdf

the publication of the study planned for 2025-Q1. An APPR has been provided rather than a VGSRR to reflect the adoption of the evaluator recommendation to use the participants billed consumption rather than estimates of consumption. Section 2.4.2 and Section 2.4.3 quantities the discrepancy produced by using estimated consumption. Program Staff have reported that their current practice is to use bill-based consumption to adjust final reported savings estimates, which would eliminate this discrepancy. The Effective period in the table reflects Program Staff applying bill-based consumption in projects completed beginning 2025-Q2. New York Department of Public Services guidelines[4] require that the APRR is validated within 18 months of the publication of this study.

Table 2-6. Direct impact reporting Table 1

Type (VGSRR/APRR)	Effective from date (year quarter)	Effective until date (year quarter)	Electricity savings annual MWh (RR)	Natural gas savings annual MMBtu (RR)
APRR	2025-Q2	2026-Q4	23%	60%

Table 2-7. Direct impact reporting Table 2

Parameter (Description of strata)	RR analysis type - weighted/ unweighted	RR - by strata	Confidence interval/ relative precision (by strata)	Sample size (n) (by strata)	Population size (N) (by strata)
Program	Unweighted	Program	±1% (Electric) ±1% (Gas) at the 90% confidence level	21	22

1.7.1 Reasons for low RRs

Table 2-6 lists several likely reasons for the low realization rates.

Table 2-8. Factors affecting RRs

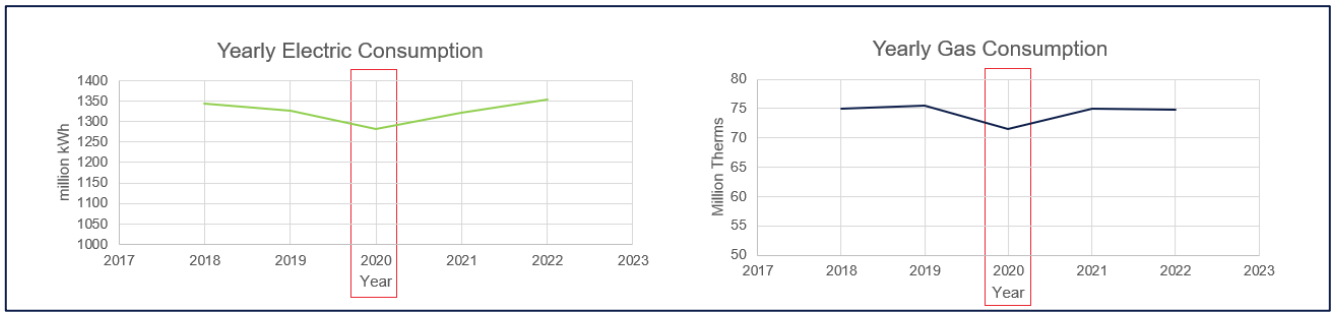
Approximate and relative contribution to reductions in the realization rates	RR% impact electricity	RR% impact thermal	RR% impact NG
<u>Overestimated baseline building consumption</u> Ex ante and evaluated savings start with the buildings' energy consumption. Ex ante estimates consumption based on the customer's energy spending may overstate consumption.	Small to Medium (-)	Small (-)	Small (-)
<u>Omitted fuels</u> Program Reported Savings did not report program savings from some fuels at some sites.	NA	Small (+)	NA
<u>Savings fractions provided by vendors were unrealistic</u> Same savings fraction assigned to both electric and non-electric fuels, although most training addresses one fuel. Most training provided a basic overview of building systems operations, trouble-shooting, and maintenance and simpler BRO measures which won't add up to the targeted savings.	Large (-)	Large (-)	Large (-)
Final Discrepancy% (1-RR%)	92%	62%	63%

The COVID-19 pandemic also impacted the training, which could have affected actions that led to energy savings.
The COVID-19 pandemic impacted the schedule and method of delivering training. In-person classroom training switched to virtual on-line classes, and in a few cases, students were directed to self-paced on-line resources. Some curricula were condensed. Field training was reduced or eliminated. The disruption was evident in the project records, although most projects delivered the training that was originally planned.

[4] https://dps.ny.gov/system/files/documents/2022/11/ce-08-gross-savings-verification-guidance.pdf

It is difficult to estimate the COVID impact on the outcomes. The billing data shows a widespread 5% dip in consumption during the most notable year of the COVID-19 pandemic (Figure 2-8). The energy consumption in the figures includes billing data for all accounts with at least four years of billing consumption data, from 2018 through 2022, and includes 2,866 electric accounts and 990 gas accounts.

Figure 2-9. Gas consumption of buildings associated with the WFD projects



The engineering estimation methods to some extent mitigate the impact of the COVID-19 pandemic for the Partial Evidence sites.

- The COVID-19 pandemic may have slowed down implementation or energy savings actions for the Good Evidence projects; however, the assumed upper-bound adoption rate is independent of a COVID-induced reduction in implementation.,
- Training materials appeared to be somewhat standardized, so the COVID-19 pandemic itself did not alter what was intended to be presented, which is the basis of the savings measures, even if the training itself was abbreviated.

Thus, Good Evidence projects reflect an upper-bound estimate of savings based on the planned curricula.

1.7.2 Overestimated baseline building consumption

Section 2.3 addressed this issue in detail.

1.7.3 Omitted fuels

Table 2-7 documents energy savings that were emitted from the program energy savings estimate. The values in red are evaluated savings for a fuel **not** reported in the CEF. Fuel oil is especially under-reported.

Omitting reporting for all fuels lowers the MMBtus captured by the program.

Table 2-9. Omitted fuels savings

Project	NG		Steam		Oil		Other – Imported chilled and hot water	
	Ex Ante	Eval	Ex Ante	Eval	Ex Ante	Eval	Ex Ante	Eval
1	27,763	11,580	-	-	872	1,260	-	-
2	8,901	960	-	-	1,372	563	-	-
3	42,747	16,595	-	-	-	-	-	-
4	33,663	14,080	-	-	-	1,365	-	-
5	19,871	1,363	-	-	-	-	-	-
6	218,218	91,918	-	21,447	-	32,212	-	-
7	15,163	6,334	-	61	-	-	-	-

8	89,279	29,777	-	-	-	14	-	-
9	-	-	1,977	402	-	-	-	-
10	3,006	447	-	-	-	-	-	-
11	3,928	1,483	-	-	-	15	-	-
12	18,743	1,342	-	-	-	-	381	9
13	1,749	518	9,568	3,923	-	-	-	-
14	16,563	5,332	-	-	-	-	1,022	409
15	3,026	579	-	-	-	-	342	58
16	1,998	68	-	-	-	-	1,548	51
17	-	-	9,756	2,690	-	-	11,759	403
18	1,149	56	8,546	1,413	-	-	10,909	224
19	1,681	225	779	-	-	-	-	-
20	401	0	4,577	36	-	-	-	-
21	52,405	20,047	-	-	-	-	-	-
22			-	-				
Savings missing from CEF Reporting				21,508		33,606		
Missing savings, Pct of fuel				61%		1498%		

1.7.4 Unrealistic savings fraction

The technical information presented in the training does not yield the expected savings. The non-electric evaluated savings estimate (across projects) is closer to the expected or ex-ante estimate compared to the electric savings estimates.

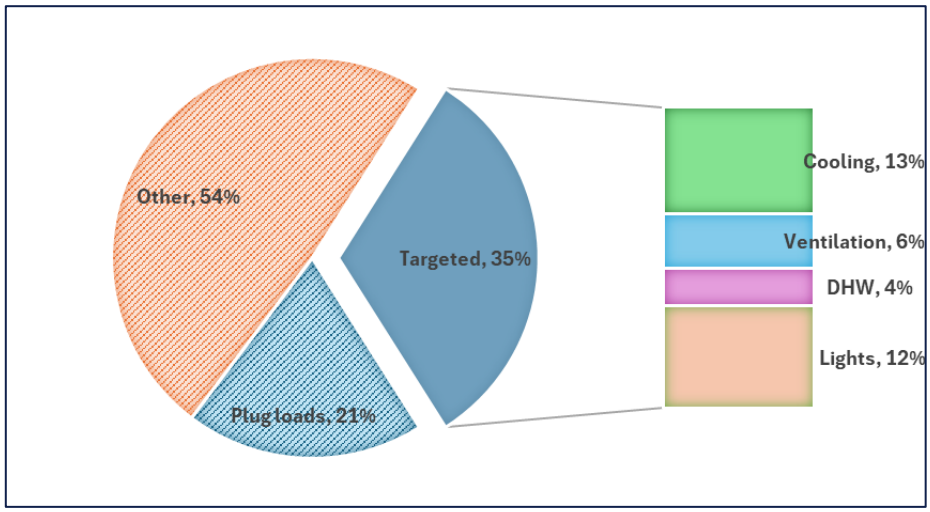
Table 2-10: Comparison of BOM ex-ante and evaluated estimates

Source	Program Ex Ante	Evaluated
Electric	4.9%	0.4%
Non-Electric	4.5%	2.2%

Measures covered in the training will not produce the expected electric savings. Since the targeted end-uses only account for about a third of electric consumption, meeting a 5% reduction in whole building electric consumption requires:

- 15% reduction in cooling
- 15% reduction in ventilation
- 15% reduction water heating and
- 15% reduction in lighting
- Or more or less of each end-use

Figure 2-10. Electric end-use consumption



Typical electric measures or actions taught in BOM-funded multifamily training cannot achieve 15% reduction in cooling, ventilation, and other end uses (see Table 2-9).

Table 2-11. Typical electric measures covered in multifamily training

End-use	Common multifamily electric measures	Estimated whole building impact
Cooling	Cooling system routine maintenance and trouble shooting	0.476%
Cooling	Air-handlers - supply air temperature reset	0.245%
DHW	DHW - fixture low flow products – Showerheads	0.012%
DHW	DHW - fixture low flow products – Aerators	0.012%
DHW	DHW - pipe insulation	0.000%
Htg/Clg	HVAC - Wi-Fi thermostats	0.922%
Htg/Clg	Weatherization - AC units covers or other sealing, assumes 75% of units	0.542%
Htg/Clg	Weatherization - air sealing apartments, assumes 75% of units	0.199%
Htg/Clg	Weatherization - doors, other exterior penetrations	0.083%
Lighting	Lighting maintenance and troubleshooting – controls	0.010%
Vent	Air-handlers - static pressure reset. Uncommon.	0.120%
Vent	Air-handlers - replace dirty filters and maintenance	0.0001%

Similarly, non-electric measures or actions covered in training will not produce the expected non-electric savings. The multifamily training targets most of the non-electric consumption and end uses with a variety of measures achieving a better savings fraction than training targeting electric consumption (Figure 2-10). However, the training still falls short of what is required to meet ex ante non-electric savings fractions (Table 2-10).

Figure 2-11. Non-electric end use consumption (Includes natural gas, steam, oil, and imported hot and chilled water)

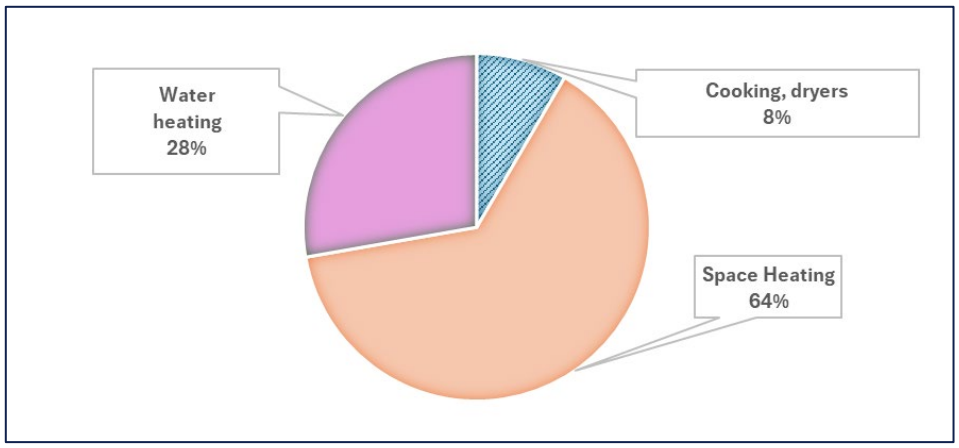


Table 2-12. Typical non-electric measures covered in multifamily training

End use	Common multifamily non-electric measures	Estimated whole building impact
DHW	DHW - fixture low flow products – Aerators	0.007%
DHW	DHW - pipe insulation	0.076%
Heating	Boiler - hot water reset, hydronic boilers	0.053%
Heating	Boiler - fixing leaks, steam	0.087%
Heating	Boiler - tuneup. Steam and hot water boilers	2.640%
Heating	Boilers - steam heat timers and other similar controls	1.750%
Heating	HVAC - hot water/steam pipe insulation	0.087%
Heating	HVAC - radiator cozies	0.481%
Htg/Clg	Weatherization - AC units covers or other sealing	2.613%
Htg/Clg	Weatherization - air sealing apartments	0.523%
Htg/Clg	Weatherization - doors, other exterior penetrations	0.045%

Additionally, while all projects claimed (or expected) about an equal portion of electric and non-electric savings, training typically emphasized one fuel (although all training did touch on all the fuels in the building). For example, project RID-04 represents 5% of this population's combined electric and gas savings. This project's curriculum allocated about an hour of classroom training to electric end uses and 10 hours of classroom training to the non-electric end uses. Ex ante estimates of the savings fraction should not be expected to be equal when the training curriculum unequally addresses each fuel.

1.7.5 Phase 2 study limitations

Interview data collection limitations. The evaluation team had to contend with the following data collection challenges:

- No contacts of participating organizations were provided in the project files or by the training provider. As a reminder, participating organizations are those that leveraged BOM-funded training to train their O&M staff.
- Once key contacts of participating organizations were identified, often those contacts in the organizations have left, or had poor recall because project initiated may have occurred seven years previously. The individuals interviewed were

typically a senior manager that may not have full visibility into the day-to-day O&M improvements implemented by, potentially numerous, trained staff, thus under reported savings.

- These issues around recall affected the interview response rate. The evaluation team interviewed and received adequate information from key staff associated with 6 out of 22 projects. The team also interviewed and received information from staff of additional 8 projects; however, the information received was inadequate due to poor recall (i.e., no information could be provided on actions taken because of the training).

The challenges referenced above resulted in the majority of completed projects (16 of 22) having notable data gaps on what was actually implemented due to the BOM-funded training. Although the evaluation team has developed a method to estimate energy savings for these projects (referred to as partial evidence projects since the team had partial data), the estimates presented should be considered as an upper bound or what is theoretically feasible to achieve in terms of energy savings for the measures the O&M staff were trained on.

Note that the evaluation team knew of the challenges referenced above from the Phase 1 research and had recommended a shift to a real-time evaluation for those projects that are in progress (or not yet complete) to mitigate the recall issues. However, the group of projects evaluated in this phase were already completed and thus could not benefit from the real-time evaluation approach.

Billing analysis limitation. All projects evaluated in this Phase 2 study had the training period span the period of the COVID-19 pandemic. The pre-period for a notable number (13 of 22) of projects also spanned the COVID-19 pandemic. The impact of the pandemic on building consumption was substantial (as discussed previously). Thus, the team was unable to leverage a whole building billing analysis approach to identify BOM-funded training program effects for the Phase 2 projects.

1.8 Evaluated results – indirect impacts

The indirect savings produced by the projects evaluated in this study were calculated by updating the indirect calculations of the Phase 1 study. The Phase 1 study followed the NYSERDA Indirect Savings methodological guidelines[5] and was a comprehensive analysis that included Phase 1 impact and participant and non-participant market research findings. This Phase 2 research did not include non-participant market research thus, the indirect savings calculations only update the impact and participant research. A more complete update of indirect impacts will be provided in the next or the Phase 3 study when the evaluation team will use real time evaluation results for direct impacts, as well as participant and non-participant market study research to estimate the market data needed to fully update the indirect impacts. The values updated in this Phase 2 evaluation are:

- Quantity of additional participant space influenced by the program, but not incentivized (influenced area, in square-feet)
- The evaluated direct savings normalized by the area served by the evaluated projects (kWh/sqft and MMBtu/sqft).

Other indirect savings data inputs came from the market surveys conducted in the Phase 1 study.

The Table 2-11 shows the update of the area influenced by the program but not incentivized (third and fourth row of data in the table) based on the surveys of this evaluation's training providers and participants.

[5] https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/PPSER/Program-Evaluation/PM-indirectben-gm-v4-acc.pdf

Table 2-13. Indirect impact estimate

Trainee type	Savings type	Area served	Square feet	Notes
O&M Staff that were not trained	No savings	Area served by un-trained staff	3,320,457,823	Un-trained O&M staff percentage = 54%
Trained O&M Staff	Direct impacts – from completed projects in the CEF BOM workbook t	Area served by staff trained under the WFD BOM initiative in the evaluation period	157,702,400	Updated leveraging Phase 2 direct impact findings
	Indirect impacts – from staff in organizations that participated in the WFD BOM training	Area served by staff offered formal non-NYSERDA training that was influenced by NYSERDA WFD BOM	9,555,285	Updated Phase 1 estimate by leveraging additional six responses from Phase 2 interviews
		Area served by staff trained under the WFD BOM that now work at another property	3,311,750	Updated Phase 1 estimate by leveraging additional six responses from Phase 2 interviews
	No savings	Area served by trained staff without WFD BOM influence	2,657,968,719	
Total Market			6,148,995,969	Trade Press Media Sample Frame area

Table 2-12 presents the indirect annual savings associated with projects with a Complete and Encumbered status in the Scorecard between September 30, 2021, and December 31, 2023. The final indirect savings calculations incorporate the Phase 2 evaluated average savings per square-feet of area served.

Table 2-14. Indirect Savings Summary

	Impacted Area	Electric Savings	Units	Natural Gas Savings	Units
Additional area influenced by the Program	12,867,035	-	Square feet (sqft)		sqft
Average evaluated direct savings per sqft*		0.063	kWh/sqft	2,492	BTU/sqft
Indirect annual savings		784	MWh	31,287	MMBTU

* combined evaluated average electric and natural gas savings is 2707 MMBTU/sqft.

The indirect savings represent an additional program contribution primarily arising from the extension of the participant training to other staff within the participant organization and through staff bringing their training to new employers.

1.9 Findings and recommendations

The WFD program, including the BOM initiative, will accept applications through 12/31/2025 or funding runs out and will cease to operate in its current format in the near future. Thus, the following findings and recommendations which are based on the results of this study should be considered for any future WFD initiatives as well.

Finding 1. NYSERDA used a simplified approach to estimate ex ante annual energy baseline consumption based on allocating customer reported energy spending using a single equation. However, when finalizing savings for a completed project, this approach will lead to errors, including misstatement of electricity (thus savings) and missing non-natural gas fuel savings.

- **Recommendation 1**. When finalizing the savings for a completed WFD project, NYSERDA should use the actual consumption, gathered as a program requirement or consider an approach noted below, in the savings calculations.
- **Consideration:** NYSERDA may wish to **consider switching to LL87 actual consumption** for both ex ante estimates and finalized savings estimates. This could be used as the basis for evaluated savings, as well.
  - Available for all building over 50,000 sq. ft. in NYC in a publicly available web resource.
  - May entail considerations of tenant space and other adjustments
  - Buildings that are not in NYC or too small will require billing releases and reporting of unregulated fuels

Response to Recommendation 1: Implemented. For active projects, NYSERDA has been collecting baseline energy use data by fuel type and is basing reported savings on that information moving forward. Participants choose the best source of this data for their portfolios (e.g. LL84 benchmarking data, data from an energy management system, or straight utility bill data)

Finding 2. The WFD BOM training did not yield the expected savings. Most of the current WFD training is designed and delivered to improve staff's understanding of building systems and their intended operation, which limits time spent on how to identify and implement energy efficiency measures. The training also does not address energy savings opportunities across fuels equally.

- **Recommendation 2.** NYSERDA should apply the APPR values presented in Table 2-4 when reporting BOM savings. The APPR incorporates the direct impact evaluation results adjusted for Program Staff's revised practices to incorporate actual billing data into reported savings at the time the project is complete. NYSERDA should evaluate whether the practices are consistent within 18 months of the publication date.
- **Recommendation 3**. When relying on the training vendor or applicant's estimate of savings, require vendor or applicant to submit a preliminary and final listing of the measures covered in training and their approximate impact on total savings by fuel. This will encourage vendors to support the claimed savings fraction.
- **Recommendation 4**. At the ex ante savings estimation stage, the vendor may not know the full extent of training, however, a preliminary plan may be acceptable at this stage. A final submission should be required that documents each measure's training, its expected savings as a fraction of the usage, and explicit references to slides or documentation in the training materials. This more directly ties the savings estimates to the training that is delivered. NYSERDA could streamline this with a reference list of measures, their expected savings impacts, and a description of appropriate training.

Response to Recommendations: Pending: The nature of operations and maintenance training is not necessarily linked to distinct ECMs as is the case with physical retrofit or upgrade projects. Instruction on building systems and proper operation of equipment empowers operators to improve operations and address issues as they come, but the nature of those issues or optimizations may not be known as part of the training.

It is not practical to request training providers catalog the universe of potential equipment adjustments or maintenance activities that an operator may implement across a portfolio of buildings as a result of their trainings. Additionally, the responses would differ a good deal across training providers working in different types of buildings and would necessitate a restructuring of the program that is not suitable for a program that is close to sunsetting.

NYSERDA has been collecting more detailed data on the specific building systems covered in the O&M training projects, which allows for a more informed review of the potential impacts of training on electricity and fuel usage for each project. NYSERDA will work with training providers to determine if separate electric- and fuel-specific savings percentages are warranted based on the balance of the training focus.

Finding 3: Indirect annual savings of 784 MWh (electric savings) and 31,287 MMBTU (natural gas savings) were associated with projects with a Complete and Encumbered status in the Scorecard between September 30, 2021, and December 31, 2023. The indirect savings represent an additional program contribution primarily arising from the extension of the participant training to other staff within the participant organization and through staff bringing their training to new employers.

- **Recommendation 5:** NYSERDA should report indirect savings using Table 2-12 values.

Response to Recommendations: Implemented: The savings are being reported within the Q1 2025 CEF report.

2 METHODOLOGY

As noted in the Introduction, the original savings impact methodology was revised, since a billing analysis was not feasible and only a small number of participants could be recruited to provide implementation details. A supplementary savings attribution approach was developed for those projects where there was limited evidence, as described in Section 2.2.

This section describes in more detail the billing analysis attempt and the engineering approach to estimating savings.

2.1 Billing analysis – abandoned

The team attempted to analyze the building consumption data to corroborate the engineering energy savings estimates. However, due to the COVID-19 pandemic impact on building consumption and operations, the team determined this approach could not reliably separate the training impacts from the COVID-19 pandemic impacts (see Figure 3-1 and Figure 3-2). The team did leverage the consumption data in billing records for certain projects to estimate the annual baseline building consumption.

Twelve of the projects authorized access to billing data and provided account numbers. The billing data was ingested, inventoried and cleaned. Table 3-1 summarizes the disposition of the utility company provided billing data for electricity and natural gas.

Table 3-1. Electric and natural gas account disposition

	Electric	Natural gas
Number of accounts requested via an archived request	4,252	1413
Number of accounts returned as valid accounts	3,809	1,768
Number of accounts with data	3,775	1,678
Number of accounts with twelve months of baseline data (used to inform annual consumption)	351	453
Number of accounts with valid data spanning 2018 – 2022.	342	428
Number of accounts with valid and sufficient pre and post data for billing analysis.	342	428
Number of projects, (of 12 with billing data) with sufficient pre and post data:	12	12

Cleaned and compiled data was used for two purposes:

- **Inform annual consumption.** Projects with twelve months of data prior to the start of training was used to inform the project annual consumption as the basis for estimating annual savings. See Section 2.3 for the development of baseline energy consumption.
- **Estimate savings via a billing analysis**. Projects with 12 months or more of billing data prior to training and twelve months after training was used to estimate changes in consumption to estimate savings.

Inform annual consumption and COVID. Annual energy consumption is the starting point for estimating savings using an engineering approach. Annual consumption was estimated using the Semi-annual BOM Reports and/or bill-based consumption as described in Section 2.3.

Figure 3-1 and Figure 3-2graph the annual consumption of all accounts with valid data between 2018 and 2022, for electricity and natural gas, illustrating the extraordinary change in consumption across the COVID event. While some buildings may have experienced an increase in energy consumption, the net effect was about a decrease of 5% in annual consumption in 2020. Figure 3-1includes 2,866 electric accounts, while Figure 3-2 includes 990 gas accounts.

Figure 3-1. Annual electric consumption through COVID event

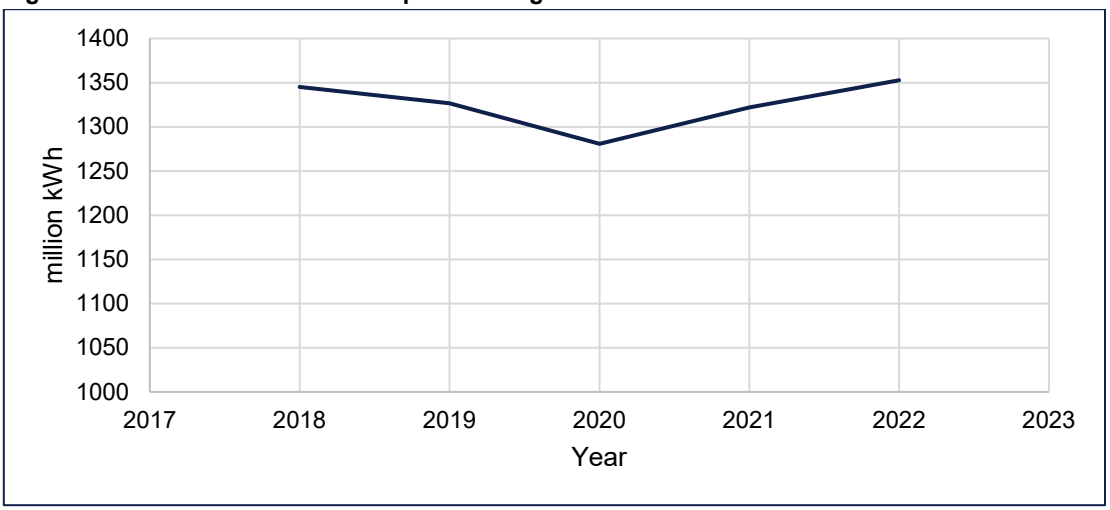
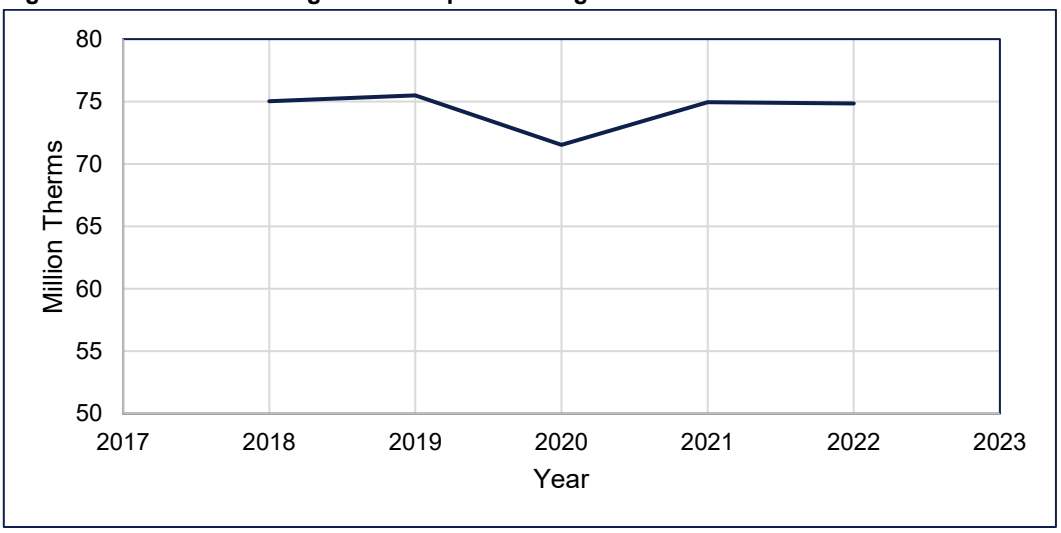


Figure 3-2. Annual natural gas consumption through COVID event

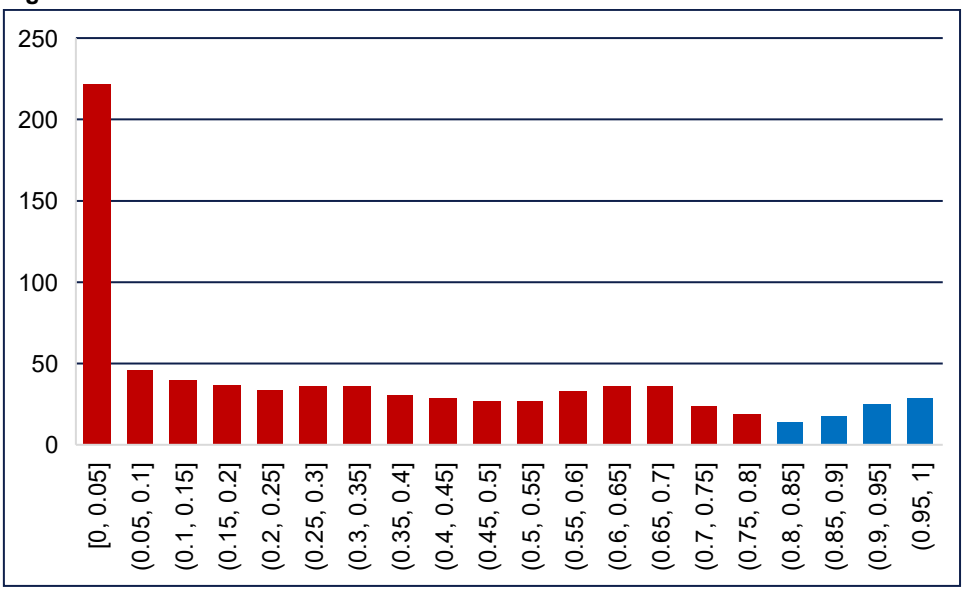


Billing analysis methods. The billing analysis was based on Caltrack's OpenEEmeter package to conduct the preliminary billing analysis. Caltrack's OpenEEmeter is an open-source python package which specifies a set of empirically tested methods to standardize the way normalized meter-based changes in energy consumption are measured and reported. The core calculation is a counterfactual - the estimated consumption of energy in a building following an intervention as if the intervention had not taken place. DNV used baseline period billing data to generate a regression model with energy consumption (kWh for electric and Therms for Gas) as the dependent variable and weather-dependent metrics of HDD and CDD as the independent variables. This baseline model was used to predict the post-consumption of the site. The savings were calculated as the difference between the predicted post consumption, and the actual post consumption of the site.

Billing analysis results. Billing analysis results show initial savings of about 4% over baseline usage. However, the results are not a reliable indicator of savings:

- Only about 69% of all billing accounts had sufficient data to be included in the billing analysis. This is insufficiently representative of the projects with utility provided billing data.
- As noted earlier in this section, the COVID event happened within the analysis period and was likely a very large contributor to the change in consumption.
- Finally, the billing results yielded poorly fit regression models with very low R^2 adjusted values due to high variance. The R^2value is a measure of how well a model explains consumption, where a value of 1.0 shows the model perfectly explains consumption, and a value of 0 means there is no correlation between the model and consumption. Acceptable models have R^2 values of > 0.85there is low/no confidence in the results. Figure 3-3 shows that only a small fraction of the models explain consumption.

Figure 3-3. Distribution of model R^2 values

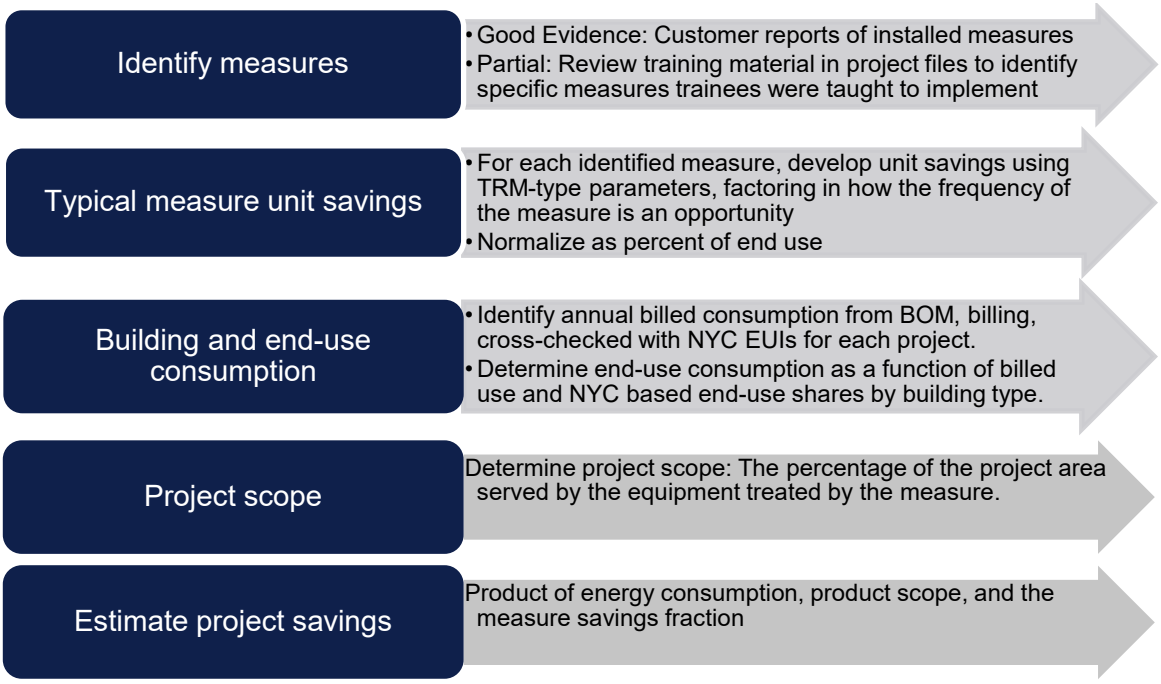


2.2 Overview of engineering savings estimate approach

This chapter describes the engineering approach to estimating savings for all projects except Projects RID-21 and Project RID-22. Project RID-21 training was like a nationally recognized building operator training certification program and was assigned savings based on evaluated results from that training. The Slim Evidence project, was assigned the savings-weighted average realization rate of all of other projects.

All other projects used the methods described in this section for estimating gross savings impacts. Figure 3-4 illustrates the process. The foundation of the savings estimates are measures, which are the actions or equipment installation undertaken by staff which will reduce building energy consumption. The outcome is energy savings by fuel (electricity, natural gas, oil, steam or other) at the project level.

Figure 3-4. Overview of estimating energy savings with engineering methods



Additional explanations of each step follow.

Identify measures. Savings is claimed for measures that are reported as installed (Good Evidence Projects) or for measures where staff received training on their implementation (Partial Evidence Projects). For the Good Evidence projects, a knowledgeable customer provided information on the measures that were installed. For Partial Evidence projects, the team was unable to interview organizations that implemented the training to confirm the energy savings actions taken by the trained O&M staff. See Section 2.2 for more details about the evidence categories. Fifty-one measures across five end uses were identified across all projects.

Typical unit savings. Typical unit savings was developed for each of the measures using authoritative sources such as the New York Technical Resource Manual (NYTRM). For example, the NY TRM identifies unit savings for economizers and VFD applications on a per ton or per horse-power basis which is then normalized per unit of end-use consumption. This savings value is adjusted to account for the typical feasibility of the measure. For example, most DHW pipe in most buildings is already insulated, as it is a code requirement, however, the analysis assumes 10% of all DHW piping will benefit from insulation.

Table 3-2 presents the identified measures and their savings fraction as a percent of the applicable end-use for multifamily buildings. There are similar tables for offices, education, and healthcare.

Table 3-2. Identified measures and end-use savings fractions – Multifamily

Code	Oppor-tunity	Measure/Action (Description of the Code)	Electric end-use savings						Non-electric end-use savings		
			Htg	Clg	Vent	Ltg	DHW	Other	Htg	DHW	Other
A01	20%	Air handlers - economizer or repair dampers/ actuators		1%							
A02	10%	Air handlers - VFD installation			4%						
A03	10%	Air-handlers - demand control ventilation	3.9%	3.3%					0.6%		
A04	20%	Air-handlers - static pressure reset			0.6%						
A05	20%	Air-handlers - supply air temperature reset	1%	0%					2%		
B01		Boiler - linkage controls upgrade. Steam and hot water boilers							1%		
B02	50%	Boiler - hot water reset, hydronic boilers							0%		
B03	5%	Boiler - fixing leaks, steam							2%		
B04	90%	Boiler – tune-up. Steam and hot water boilers							3%		
B05	40%	Boilers - 1 pipe system venting, steam							0.34%		
B06	50%	Boilers - 1 pipe radiator temperature control valves, steam							0.82%		
B07	50%	Boilers - 2 pipe steam trap repair, steam							0.34%		
B08	50%	Boilers - steam heat timers and other similar controls							4%		
B09	60%	Boiler - reduce wet steam							1%		
C01	50%	Cooling plant - Chilled water temp reset		1%							
C02	50%	Cooling plant - Condenser water temp reset		1%							
C03	50%	Cooling Tower - staging		0%							
C04	50%	Chiller plant sequencing		1%							
C05	50%	Pump staging						0.30%			
D01	25%	DHW - fixture low flow products - Aerators					0.05			0%	
D02	25%	DHW - fixture low flow products - Showerheads					0.05%			0%	
D03	10%	DHW - pipe insulation							1%		
E01	5%	Building management system - convert pneumatics to DDC						3%			
E02	25%	Building management system - optimum start/stop	2%		0%				3%		

Code	Oppor-tunity	Measure/Action (Description of the Code)	Electric end-use savings						Non-electric end-use savings		
			Htg	Clg	Vent	Ltg	DHW	Other	Htg	DHW	Other
F01	3%	Fume hoods/vents - convert to variable flow	1%	1%	1%				1%		
F02	50%	Fume hoods/vents - occupancy/timer control	1%	1%	1%				1%		
F03	50%	Fume hoods/vents - repair dampers/actuators, VAV only	1%	1%	1%				1%		
H01	5%	HVAC - hot water/steam pipe insulation							2%		
H02	10%	HVAC - radiator cozies						0%	5%		
H03	25%	HVAC Pumps - VFD installation - CHW Pumps						1%			
H04	25%	HVAC Pumps - VFD installation - CW Pumps						2%			
H05	25%	HVAC Pumps - VFD installation - HHW Pumps						2%			
H06	67%	HVAC - wifi thermostats	0%	1%					1%		
-L1	30%	Lighting - controls				1%					
-L2	10%	Lighting - non-LED to LED				2%					
M01	100%	Cooling system routine maintenance and trouble shooting		0.5%							
M02	100%	Cooling tower routine maintenance and trouble shooting		0.02%							
M03	100%	Boiler routine maintenance and trouble shooting							1.7%		
M04	100%	Pumping routine maintenance and trouble shooting				0.07%					
M05	100%	DHW Routine maintenance and trouble shooting					0.09%			0.8%	
M06	100%	Lighting maintenance and trouble-shooting - controls				0.01%					
M07	20%	Air-handlers - replace dirty filters and maintenance			0% (small)						
W01	75%	Weatherization - AC units covers or other sealing	0.7%						3.5%		
W02	75%	Weatherization - air sealing apartments	0.1%	0.1%					0.7%		
W03	25%	Weatherization - roof	0.7%	0.4%					0.7%		
W04	10%	Weatherization - window film	0.4%	0.2%					0.4%		
W05	13%	Weatherization - window upgrade replacement	0.8%	0.4%					1.0%		
W06	13%	Weatherization - doors, other exterior penetrations	0.4%	0.3%					0.4%		
Z02	5%	Custom - fix hot water bypasses in system							0.4%		

Building and end-use consumption. The project actual energy consumption is the starting point for estimating savings which is consistent with ex ante estimating methods and captures the actual energy consumption characteristics of the project. The whole building consumption is disaggregated by end-use using a typical endues breakdown by building type. The end-use consumption portions were derived from LL87 data. New York City requires an accurate tabulation of energy consumption for all buildings over 50,000 square-feet and uses the federal Department of Energy's EnergyProfiles to derive a consistent method for determining end-use consumption.

Project scope. The project scope identifies the percentage of the project area served by the equipment treated by the measure. For example, steam-trap measures will only apply to those building served by two-pipe steam boilers. Where training was provided for one-pipe, two-pipe and hydronic boilers, the analysis assumed the scope was 33% for measures that applied exclusively to these equipment types.

Project savings. The final project savings is calculated as follows:

$$Project\ savings\ (MWh, MMBTU) = Enduse\ Consumption \times Measure\ unit\ savings\ fraction \times Project\ scope \times Installation\ rate$$

Whether trainees implemented any measures because of the training is unknown. Trainees may have installed no measures or many measures. Evaluations of NYSERDA FlexTech audit programs finds a measure adoption rate of specific recommended measures is about 65% within about six years of the audit. Unlike the WFD training, the FlexTech audits identify specific measure locations, site specific savings, implementing methods, and costs of the opportunities. An adoption rate of 50% is assumed for the implementation of measures identified in trained measures to establish a reasonable upper bound of implementation.

2.2.1 Participant interviews

The evaluation team interviewed training providers and the customer points of contact at projects. A census was attempted for each population group. Incentives were offered to the customer points of contact to increase the interview uptake. The purpose of the interview follows:

- **Training providers** were interviewed to complete a battery of questions to support indirect savings calculations and to provide contact information for their customer points of contact.
- **The customer points of contact** were interviewed to confirm the scope of the training (number of staff members trained and the area of the buildings they serve) and to inventory the energy efficiency actions that were implemented by the trained staff. In some cases, the project contact could confirm that the training occurred, but did not have specific knowledge of implementation.

Table 3-3 summarizes the disposition of the interviews for both interview pools. Interviews occurred over the period of January 2024 through May 2024. Program Staff provided contact information and introductory emails to the training providers. Two training providers that served 16 of the 22 projects provided contact information for their points of contact at each project and, in some cases, provided an email introduction. The evaluation team conducted web research to identify additional contacts when the original contact proved nonresponsive. The length of time between the start of these projects (as early as 2017) and the interview attempts (starting in January 2024) were barriers to successful completion. In many cases the point of contact of record had left the firm and subsequent staff did not have knowledge of the project. In some cases, the point of contact could confirm that the training occurred, but did not have knowledge of implementation or could not recall details of implementation.

DNV made considerable efforts, shown in the contact attempts below, to reach quality points of contact within trainee organizations who were familiar with the training activities and actions taken following the training. While support from

NYSERDA program staff was instrumental in completing interviews, the process of identifying and confirming the correct contacts with the trainee organization is time-consuming and highly varied, which can present difficulty in producing evaluable, consistent results across the participant group. After introductions from training providers and/or NYSERDA program staff, DNV often had to navigate through multiple different contacts to reach the appropriate contacts who were familiar with the training program.

Table 3-3. Interview disposition

Population	Training providers	Customer points of contact
Population size	8	22
Targeted completes	Census	Census
Successful completes	6	14
Percent of total project savings from completes	77.8%	71.4%
POC confirmed that the training occurred	NA	14
POC confirmed installed measures	NA	6
Average outreach attempts per contact	4.9	9.1
Reasons for incompletes:		
Contact no longer worked at site	1	1
No contact in the record	0	3
Contact refused	0	0
Nonresponsive	1	4