Evaluation and Evaluation Report Response

Program:

- Multifamily New Construction

Program Year:

- 2019-2020

Contents:

- Evaluation Report
- PSE Evaluation Report Response

This document contains the final 2019-2020 Multifamily New Construction Program Evaluation Report, prepared by DNV GL, PSE's independent evaluation contractor. In accordance with WUTC conditions, all PSE energy efficiency programs are evaluated by an independent, third party evaluator.[1] Evaluations are planned, conducted and reported in a transparent manner, affording opportunities for Commission and stakeholder review through the Conservation Resource Advisory Group (CRAG) and reported to the UTC.[2] Evaluations are conducted using best-practice approaches and techniques.[3]

PSE program managers and evaluation staff prepare an Evaluation Report Response (ERR) upon completion of an evaluation of their program. The ERR addresses and documents pertinent adjustments in program metrics or processes subsequent to the evaluation.

Please not that this is an evaluation of the program as it operated during the 2018-2019 program years.

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Recommendations

1. While project documentation was very good overall, there are still opportunities for improvement. We recommend that builders delay removal of the labels of the windows' U-value ratings until verification photos of newly installed windows are taken. CLEAResult is aware of this issue and is already working to improve this process.

[1] (6)(c.) Approved Strategies for Selecting and Evaluating Energy Conservation Savings, Proposed Conditions for the 2016-2017 PSE Electric Conservation.

[2] PSE 2016-2017 Biennial Plan, Exhibit 8: Evaluation, Measurement & Verification (EM&V) Framework, Revised August 6, 2015

[3] Ibid.

DNV GL – ENERGY

Evaluation of the 2019-2020 Multifamily New Construction Program

Final 2019 Impact Evaluation Results and 2019-2020 Process Evaluation Findings

Puget Sound Energy

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Primary Contact:
Geoff Barker, Senior Consultant, Energy Insights
DNV GL Energy
Geoff.Barker@dnvgl.com

Project Sponsor
Jon Taffel, Head of Section, Energy Insights
DNV GL Energy
Jonathan.Taffel@dnvgl.com

PSE Contract Manager
Jim Perich-Anderson, Senior Market Analyst, Energy Efficiency Development and Evaluation
Puget Sound Energy
Jim.Perich-Anderson@pse.com

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1 EXECUTIVE SUMMARY

This report summarizes the results of the impact and process evaluation of Puget Sound Energy's (PSE) 2019 Multifamily New Construction program.

1.1 Introduction

1.1.1 Program Description

The PSE Multifamily New Construction (MFNC) program provides rebates and incentives to builders who are constructing new multifamily buildings. The program allows builders to save up to 100% of their cost beyond current energy codes, while incorporating state-of-the-art, energy-efficient equipment.

PSE's MFNC program is implemented by CLEAResult, which redesigned the program in 2018. Program incentives were originally calculated using a points-based system (good, better, and best), but changed under the new design to a two-tiered incentive structure beginning in 2019—a standard incentive and a 50% bonus multiplier for affordable housing projects—based on savings per square foot. The new program design was created to make the incentive structure easier for program participants to understand and to better align the program with PSE's program offerings. Beginning in 2020, the program also offers early design assistance (EDA), which gives builders early feedback on how to maximize PSE's incentives for their projects.

1.1.2 Study Background and Research Objectives

PSE's MFNC program is a mature program that has been previously evaluated with relatively consistent results across evaluations, and it operates in a relatively static new construction market with a limited number of potential multifamily builders. Furthermore, the program accounted for only 6% of the electric savings and 13% of the gas savings among all PSE residential programs in 2019. For these reasons, DNV GL opted to conduct a low rigor evaluation of the program. The evaluation is comprised of an impact evaluation that includes electric and gas gross savings estimates and a process evaluation that includes an assessment of participant satisfaction with the program, program influence on builders, barriers to participation, missed savings opportunities, and next-generation savings opportunities.

We present the key research questions for the impact and process evaluation of the program below. Research questions 1 and 2 primarily inform the impact evaluation, and questions 3 through 7 primarily inform the process evaluation.

1. What percent of savings claimed can be verified?
2. What are the evaluated electric and gas savings?
3. What is the level of satisfaction that participants have with the program and program process?
4. To what extent did the program influence decision-makers to install more efficient measures than they would have without the program?
5. What are the barriers that are preventing more builder participation in the program?
6. Are there any missed savings opportunities that are not being captured by the program?

7. Are there any next-generation savings opportunities that the program could take advantage of in the future?

1.2 Impact Evaluation Approach

To calculate the percent of verifiable claimed savings, the evaluation team:

- Conducted a comprehensive review of program tracking data and project files; and
- Conducted interviews with program participating decision-makers to inquire about the installation of program measures.

After determining the percent of claimed savings that could be verified, we calculated the evaluation realization rate. The evaluation realization rate is based on the ratio of the deemed savings for verified, eligible, and installed measures to the reported deemed savings for the program. We randomly sampled a number of participant projects sufficient to achieve 90% confidence that our results fall within 10% of the true realization rate result for the program. Additionally, we reviewed CLEAResult's savings calculation workbook, reviewed the references for the Regional Technical Forum's (RTF) non-modeled savings, and performed virtual data collection to compare the deemed savings assumptions, such as the number of occupants, to the installed measure characteristics for this program.

1.3 Impact Evaluation Results

1.3.1 Verification Results

Based on the DNV GL's verification efforts, we have every indication that all claimed measures were installed and are still operational. We performed a program-wide project file inventory to verify that essential project documentation was provided for every project. For all sites in the primary and backup sample, we performed an in-depth file review for all the measures claimed at the tracking level and all sub-measures found under the Whole Building Design measure category. This second stage review included the examination of equipment specification sheets, installed measure photos, and other available documentation. The detailed file review determined that the projects were well documented by CLEAResult. Specification (spec) sheets for installed measures matched what was depicted in photos with few exceptions where photos were not provided, or spec sheets did not match the installed photo for a given measure. In those cases, the evaluation team requested the missing information from CLEAResult, and after reviewing the data the evaluation team was satisfied that the measure claims were valid.

The evaluation team conducted interviews with 16 decision-makers who were responsible for 19 MFNC program projects. To further verify claimed measures during the decision-maker interviews, the site contacts were asked if each individual measure was still installed and operating. In every instance, the decision-maker confirmed this was the case. Because the evaluation team was able to verify all projects in the sample and thoroughly review project documentation, we determined that claimed savings estimates were valid and accurate, and that the overall realization rate was 100%. This realization rate was the same for every point in the sample. Because 100% of measures in the sample

were confirmed, the evaluation team did not apply an adjustment to claimed savings, yielding a 100% realization.

1.3.2 Detailed Savings Results and Analysis

A deeper dive into measure-level savings revealed that most electric savings come from lighting (74%) and most gas savings come from water saving showerheads, closely followed by condensing gas water heaters. Several measures offered through the program were not claimed in any projects, most notably drain water heat recovery and building shell insulation. Drain water heat recovery is an emerging technology and may have had low uptake because builders or trade allies were unfamiliar with the technology. Building shell insulation is not a new technology, but often requires building design modifications to reach higher than standard levels. Another measure that was included as a MFNC measure offering, but not installed at any sites, was energy efficient refrigerators, which is a missed opportunity. All measures related to saving gas heating fuel are absent in claimed measure level savings including smart thermostats, in-unit gas furnace with air conditioning (AC), in-unit high efficiency condensing furnace, and energy recovery ventilators (where building heat is gas), indicating a possible low incidence of gas heat in participating buildings. PSE program staff can investigate this possibility further.

A key program risk going forward is that because the Washington state energy code continues to increase building energy efficiency, the program must pursue deeper energy retrofits and more emerging technologies to maintain eligible savings claims. New construction represents a window of opportunity for shell measures, which will last the lifetime of the building and are hard to retrofit after the building is constructed. Program staff and some interview responses from decision-makers indicated a desire to move the MFNC program toward Passive House standards (focused on building shell measures), which we endorse. This will require earlier project identification so the program can influence the project during the design phase.

An additional risk of the MFNC program relates to its heavy utilization of lighting measures. As mentioned earlier, lighting and lighting control savings represent 74% of the total electric savings for the program. Parking garage lighting, exterior lighting, and other non-residential lighting measures combined represent close to 60% of the total electric savings. The availability and affordability of LED lighting options across all market sectors improved exponentially over the past decade. The baseline code for lighting power allowance (LPA), however, is much more static. While it is beneficial for the program participants to claim lighting savings based on baseline code LPA, moving forward the program should consider and account for standard practices in lighting installations. If the Northwest follows the path forged by other regions, the RTF may soon change the lighting baselines.

The final result focuses on non-modeled measure savings that were based on deemed savings from the RTF. We reviewed the assumptions underlying those savings and compared them to MFNC program participant data to understand if the RTF deemed savings values accurately represent savings from the MFNC program. The RTF savings values that the MFNC program used a lower occupancy assumption for aerators than it did for drain waste heat recovery and heat pump water heater measures. The evaluation yielded a verified occupancy assumption that was close to the RTF aerator assumption, but was lower than the RTF drain waste and heat pump water heater assumption. Thus, substituting verified assumptions specific to the MFNC program participants had little or no effect on showerheads, aerators (kitchen and bath), and thermostatic shower valves. For the remaining two

measures investigated, drain waste heat recovery and heat pump water heater measures, the MFNC-specific assumptions resulted in lower savings since the RTF assumption of people per residence was significantly higher than that computed using program-collected data. For more detail, see Table 8 in Section 4.4.3.

1.4 Process Evaluation Approach

Data collection activities that support the process evaluation included the following:

- Program staff interview
- Program implementer interview
- Decision-maker interviews

Each of these research activities informed the key research questions on participant satisfaction with the program, program influence on builders, barriers to program participation, missed savings opportunities, and next-generation savings opportunities that the program could offer in the future.

As part of these research activities, we also explored the nature of the interactions and communications between program staff, program implementers, and decision-makers as well as the marketing and outreach efforts associated with the program. The program staff and program implementer interviews took place in June of 2020 and the decision-maker interviews took place in July, August, and September of 2020. Evaluators completed interviews with 16 decision-makers who were responsible for 19 MFNC program projects out of a population of 44 projects completed as part of the 2019 program.

1.5 Process Evaluation Results

1.5.1 Recent and Planned Program Changes

Beginning in 2019, the MFNC program's incentive structure changed from a point-based system to a two-tiered system based on kWh or therm savings per square foot with a standard incentive and a 50% bonus multiplier for affordable housing projects. The additional incentives for affordable housing projects are part of a broader effort by PSE to expand the MFNC program to reach more underserved low and moderate income customers.

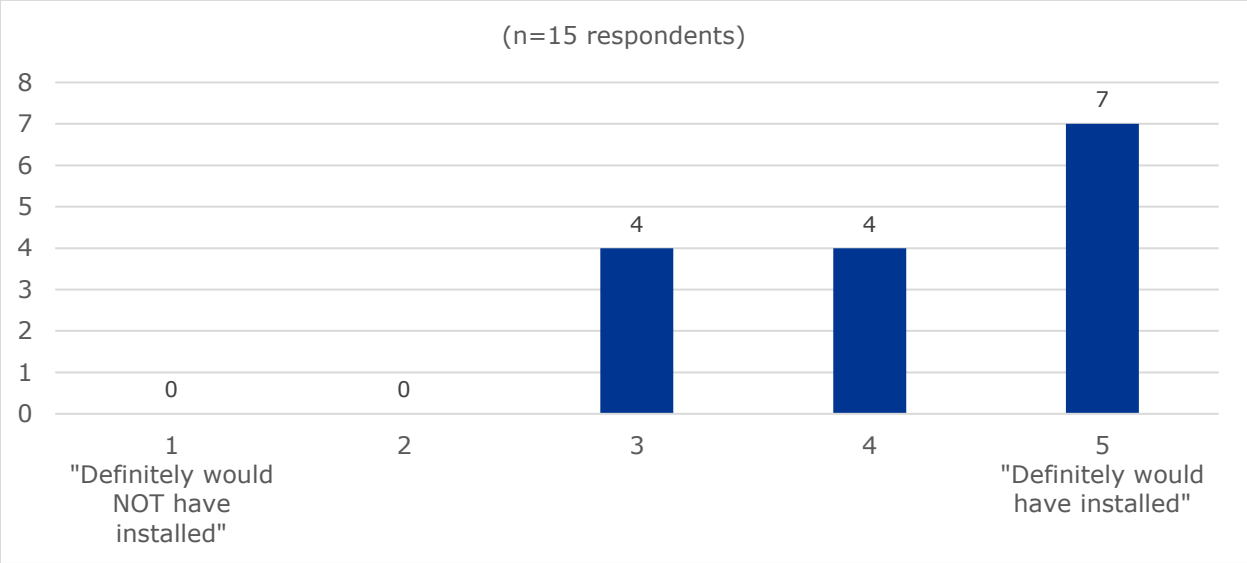
In 2020, the program added early design assistance (EDA), which provides builders early feedback on how to maximize PSE's incentives for their projects. EDA offers an interactive workshop that includes a discussion of program offerings and resources, efficiency best practices, and the development of an action plan designed to reduce construction costs and improve building efficiency.

Going into 2021 and beyond, PSE program staff and its implementers recognize the need for the program to adapt to changing code in Washington state. New building codes were originally slated to go into effect in July of 2020, but their implementation was delayed until February of 2021 due to the COVID-19 pandemic. PSE program staff are also considering offering program support for high-performance buildings, such as passive design buildings, to achieve deeper savings in the future.

1.5.2 Program Influence

During decision-maker interviews, evaluators asked respondents to rate the likelihood that they would have installed the same program-qualifying measures if no program incentives were available on a scale of 1 to 5, where 1 means they "definitely would not have installed" the measures and 5 means they "definitely would have installed" the measures.[4] Figure 1 shows the distribution of responses among the 15 respondents who answered the question. Nearly half of respondents (7) said that they "definitely would have installed" program-qualifying measures without program incentives, suggesting that the program had no influence on their decision to install these measures. Across the 15 respondents the average rating given was 4.2, indicating that most respondents likely would have installed program-qualifying measures without program support.

Figure 1. Likelihood of Installing Same Program-Qualifying Measures without Program Incentives



Respondents cited incentives as the primary reason for participating in the program, but half of respondents also said that the incentives did not impact measure selection. This presents a risk to the MFNC program going forward. As baselines increase through code updates and market evolution, savings through incentives will become harder to claim and, without other added value from the program, participation could decline. Going forward, PSE could develop new, innovative measures that customers would not typically install without program intervention.

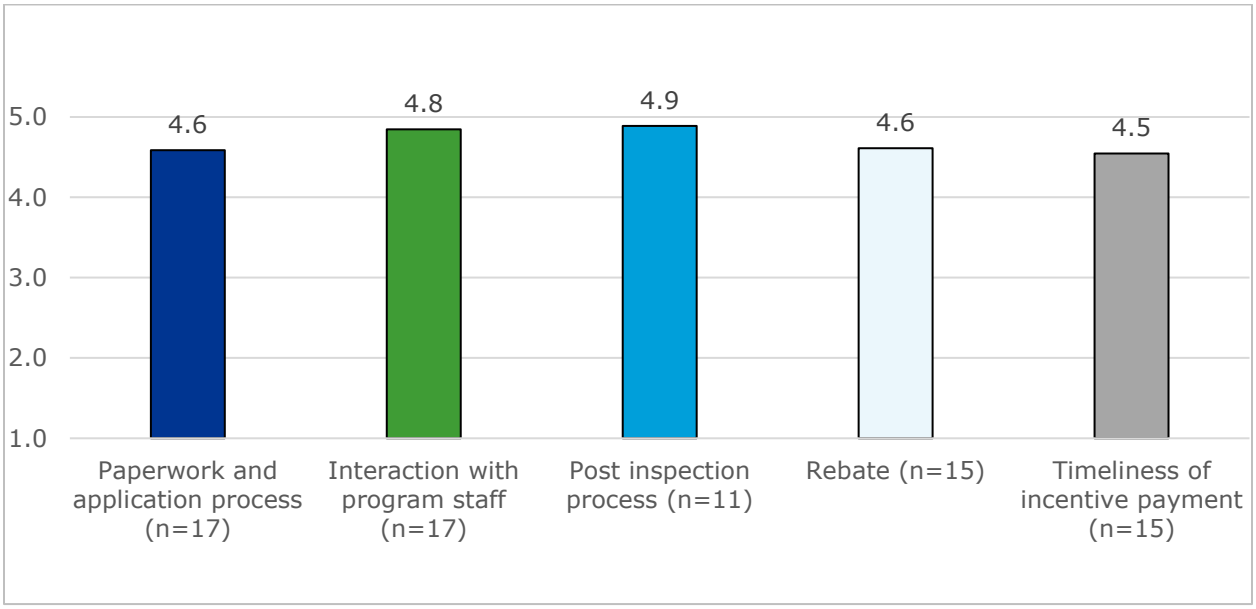
1.5.3 Satisfaction with the Program

Satisfaction with the MFNC program among participants was high. Evaluators asked decision-makers about satisfaction with various program aspects using a 5 point scale, where 5 means "very satisfied" and 1 means "very dissatisfied." In Figure 2, we present participant satisfaction with five aspects of the program. Participants gave the post inspection process and interaction with program staff the

[4] Please see the MFNC Decision-Maker Survey in Appendix B for further details on the questions asked during decision-maker interviews.

highest satisfaction ratings, on average. For the five program aspects listed below, no respondents gave a rating less than 3.

Figure 2. Satisfaction with the Program



1.5.4 Barriers to Participation

Evaluators asked decision-makers to consider a set of possible barriers to program participation and state whether they actually experienced any of the barriers. Some of the barriers considered included the following:

- Added cost to install the recommended measures
- Higher upfront investment (cash flow before the rebate comes in)
- Higher cost for design services to interact with the program
- Time commitment to interact with program (e.g., could have slowed down project)
- Onerous program requirements
- Poor prior program experience
- Construction issues

Half of the 14 respondents who answered the question did not experience any barriers during their participation in the program. This may be, in part, due to repeat participation as customers become more familiar with the program. The only barriers actually experienced by more than one respondent was the higher cost for design services (4 mentions) and higher upfront investment (3 mentions). The fact that half of the respondents did not experience any barriers and there were few mentions of other barriers actually experienced suggests that the program is working well and is being implemented effectively.

Interviewers also asked respondents for suggestions to increase program participation. Their suggestions included the following:

- More marketing and outreach (5 mentions)
- Having program staff involved earlier in projects (4 mentions)
- Providing a clear demonstration of cost savings (2 mentions)
- Offering program incentives for cutting-edge technology (1 mention)

Along with increasing marketing and outreach, respondents mentioned that having program staff involved earlier in projects would ultimately benefit the program and help increase program participation.

1.5.5 Next-Generation Program Opportunities

We asked respondents whether they would be interested in a service offering of design support for high-performance buildings, such as passive design buildings. Among the 15 respondents who answered the question, 12 said that they would be interested or might be interested in this service offering.

Respondents were also asked whether there are any energy-efficient technologies or services that the program is not currently offering that they should be supporting. Half of the 16 respondents believed that there should be additional measures or services offered. When asked what measures or services the program should offer, respondents mentioned the following:

- Solar PV (3 mentions)
- High-efficiency window (e.g., triple pane) or shell improvement measures (2 mentions)
- EV charging stations (1 mention)

As the state of Washington pursues deep-decarbonization pathways, PSE may wish to consider the MFNC program as an opportunity to electrify space and water heating end-uses in new construction. Furthermore, the interplay between codes and energy efficiency programs is constantly evolving and making it ever-more difficult to find energy efficiency savings above code. The MFNC program has the potential to operate in synergy with improving codes and standards.

1.6 Findings and Recommendations

We present our key findings and recommendations below.

1.6.1 Findings

1. The overall level of documentation found in the CLEAResult project folders was very good. Aside from a few minor inconsistencies, which were mostly resolved after follow-up documentation requests were addressed, the project documentation allowed for a straightforward and complete verification effort.

2. Participants expressed a high level of satisfaction with the program and many are repeat participants. Based on responses from decision-makers, they had positive experiences with the program and program staff.

3. While decision-makers experienced high levels of satisfaction, several also mentioned that they became involved with the MFNC program relatively late after the design phase was

underway or completed. This may have ultimately led to missed savings opportunities for the MFNC program. Identifying practical ways to engage projects earlier in the process is an important, but difficult challenge that all new construction programs face. Examples of possible savings opportunities available with earlier intervention include shell measures, such as increased insulation.

4. Code will be changing in February 2021. CLEAResult is planning for this change by revising the point system used to calculate savings. The point system mirrors the system used in the state energy code and allows the program to remove points, corresponding to energy savings, already required by code. CLEAResult plans to re-run its previous analysis using the new measures and point credits given in the Efficiency Package Credits table in the new code. We reviewed CLEAResult's methodology for calculating savings and believe that its updated point system will produce reasonable results.

5. When it is cost-effective, the program could offer deeper energy saving measures. PSE MFNC program staff are already pursuing this by considering incentives for high-performance buildings, such as passive design buildings that focus on building shell improvements, and we support this effort. Participants said that in many cases they would have installed program measures without program support and that many of the program measures they installed are already industry standard practice. Interviews indicated that there is interest in incentives and/or design support for high-performance buildings. The Washington state energy code, due to take effect in February 2021, will increase the energy efficiency baseline necessitating deeper energy efficiency for program participants. The interview responses paired with the code changes indicate that the time is right for increased program design assistance and incentives for new energy efficiency technologies, while some older energy efficiency measures may need to be retired.

1.6.2 Recommendations

1. While project documentation was very good overall, there are still opportunities for improvement. We recommend that builders delay removal of the labels of the windows' U-value ratings until verification photos of newly installed windows are taken. CLEAResult is aware of this issue and is already working to improve this process.

2. Several decision-makers mentioned that they did not become involved in the MFNC program until after the design phase was underway or complete, resulting in lost savings opportunities for building shell measures, such as increased levels of insulation. This underscores the importance of PSE's early design assistance (EDA), which was added to the program in 2020. PSE should aggressively promote EDA going forward and recruit participants as early as possible. This would provide the opportunity to achieve deeper savings per project and greater savings overall.

3. A more stringent code will go into effect in February 2021, and CLEAResult is adapting the program design to align with this code accordingly. We suggest the MFNC program expand its offerings to include measures listed in the energy efficiency section of the new code, including high-performance service water heating and dedicated outdoor air system measures. This

would also be in keeping with participant interests. While participants expressed satisfaction with the program, they also indicated that they would have interest in participating in a more cutting-edge program that offers more emerging technologies. This will require earlier project identification so the program can influence the project during the design phase.

4. CLEAResult is planning to update their prototypes to accommodate new code changes. To evaluate cost-effectiveness and support for deeper-savings measures, it may be useful for CLEAResult to additionally develop a set of prototypical simulation models that incorporate measure combinations for deeper savings. These models would not only identify which combinations are cost-effective, but CLEAResult could use these models to demonstrate the payback of these deeper-saving measure combinations to potential participants.
5. Electrification is expected to accelerate in Washington state. The MFNC program saw uptake of in-unit ductless heat pump and heat pump water heater measures, and we expect even more uptake of these measures going forward. CLEAResult should lower the heat pump water heater deemed energy savings value by substituting assumptions from program data into Regional Technical Forum equations. For buildings with centralized water heater systems, a heat pump water heater system measure could be developed for inclusion in the program.

2 INTRODUCTION

2.1 Program Overview

The PSE Multifamily New Construction (MFNC) program provides rebates and incentives to builders who are constructing new multifamily buildings. The program allows builders to save up to 100% of their cost beyond current energy codes, while incorporating state-of-the-art, energy-efficient equipment. In the new construction marketplace, high-efficiency measures need to be specified and installed during design and construction. Without active engagement from builders interested in going beyond code or program intervention, it could be years before energy efficient changes to the buildings take place.

PSE's MFNC program is implemented by CLEAResult, which redesigned the program in 2018. Program incentives were originally calculated using a points-based system (good, better, and best), but changed to a two-tiered incentive structure beginning in 2019—a standard incentive and a 50% bonus multiplier for affordable housing projects—based on savings per square foot. Beginning in 2020, the program also offers early design assistance (EDA), which gives builders early feedback on how to maximize PSE's incentives for their projects. EDA offers an interactive workshop that includes a discussion of program offerings and resources, efficiency best practices, and the development of an action plan designed to reduce construction costs and improve building efficiency.

One of the key challenges of the MFNC program relates to optimizing its alignment with state code. As Washington's building code is regularly and systematically updated to require various formerly incentivized measures, the MFNC program removes these measures and must rely on remaining and new measures to reach savings goals. In addition, the complexity of the state's points-based code creates a complicated baseline that the program is measured against. By simplifying program design, and providing early-development support, the program has positioned itself to respond as effectively as possible to this challenge.

2.2 Research Objectives

There are seven key research questions that are part of this evaluation. Table 1 shows the key research questions and which research activities and data sources served as inputs to help answer each question. Research questions 1 and 2 primarily inform the impact evaluation, while questions 3 through 7 primarily inform the process evaluation. We describe the data sources and research activities in more detail in Section 3 below.

Table 1. Key Research Questions and Associated Research Activities and Data Sources, 2019

Research question	Data source				
	Decision-Maker Interviews	Program Staff Interviews	Program Implementer Interviews	Project Files	Program Tracking Data
1. What percent of savings claimed can be verified?	■		■	■	■
2. What are the evaluated electric and gas savings?	■			■	■
3. What is the level of satisfaction that participants have with the program and program process?	■				
4. To what extent did the program influence decision-makers to install more efficient measures than they would have without the program?	■				
5. What are the barriers that are preventing more builder participation in the program?	■	■	■		
6. Are there any missed savings opportunities that are not being captured by the program?	■	■	■		
7. Are there any next-generation savings opportunities that the program could take advantage of in the future?	■	■	■		

2.3 Impact Evaluation Overview

PSE's MFNC program is a mature program that has been previously evaluated with relatively consistent results across evaluations, and it operates in a relatively static new construction market with a limited number of potential multifamily builders. Furthermore, the program accounted for only 6% of the electric savings and 13% of the gas savings among all programs in PSE residential program in 2019. For these reasons, the evaluation team opted to conduct a low rigor evaluation of the program. In general, a low rigor evaluation of a program using deemed measure savings would consist of 1) verification of measure eligibility and 2) verification of measure count. As a further enhancement to this evaluation, we reviewed the non-modeled deemed savings calculations and assessed some of the input assumptions in comparison to program-specific data.

The key research questions that the impact evaluation addresses are:

- What percent of savings claimed can be verified to be eligible, installed and operating as intended?
- What are the evaluated electric and gas savings?

To address the first question, we reviewed program tracking data, project files, and inquired about the installation of program measures during interviews with decision-makers who participated in the program (see Section 4.2 for further details on verification methods). After determining the percent of claimed savings that could be verified, we calculated the evaluation realization rate. The evaluation realization rate is the ratio of the deemed savings for verified, eligible, and installed measures to the previously reported (claimed) deemed savings for the program. The evaluated electric and gas savings is the product of the realization rate and the claimed savings for each fuel.

Equation 1. Realization Rate

$$RR = \frac{S_v}{S_r}$$

Where:

RR = Realization Rate

S_v = Verified, Eligible, and Installed Deemed Savings

S_r = Previously Reported Deemed Savings

Equation 2. Energy Savings

$$S_{v(f)} = RR \times S_{r(f)}$$

Where:

S_v = Verified, Eligible, and Installed Deemed Savings for fuel *f*

RR = Realization Rate

S_r = Previously Reported Deemed Savings for fuel *f*

We sampled 21 participant projects to achieve 90% confidence that our result falls within 10% of the true realization rate result for the program. See Appendix A for further details on the sample design. In addition, we reviewed CLEAResult's savings calculation workbook, reviewed the references for the Regional Technical Forum's (RT) non-modeled savings, and performed virtual data collection to compare the deemed savings assumptions, such as the number of occupants, to the installed measure characteristics for this program.

2.4 Process Evaluation Overview

Data collection activities that support the process evaluation include the program staff interview, program implementer interview, and decision-maker interviews with program participants. Each of these research activities inform the following key research questions:

- What is the level of satisfaction that participants have with the program and program process?
- To what extent did the program influence decision-makers to install more efficient measures than they would have without the program?
- What are the barriers that are preventing more builder participation in the program?
- Are there any missed savings opportunities that are not being captured by the program?
- Are there any next-generation savings opportunities that the program could take advantage of in the future?

As part of these research activities, we also explored the nature of the interactions and communications between program staff, program implementers, and decisions makers as well as the marketing and outreach efforts associated with the program. The program staff and program implementer interviews took place in June of 2020 and the decision-maker interviews took place in July, August, and September of 2020.

2.5 Report Overview

We have organized the remainder of this report as follows:

- Section 3 describes the evaluation's data sources.
- Section 4 details the results of the impact evaluation.
- Section 5 provides the results of the process evaluation.
- Section 6 includes the evaluation's key findings and recommendations.
- Appendix A details the sample design used for decision-maker interviews and file review.
- Appendix B provides the interview guides used for the program staff, implementer, and decision-maker interviews.
- Appendix C presents additional considerations for potential program improvements.

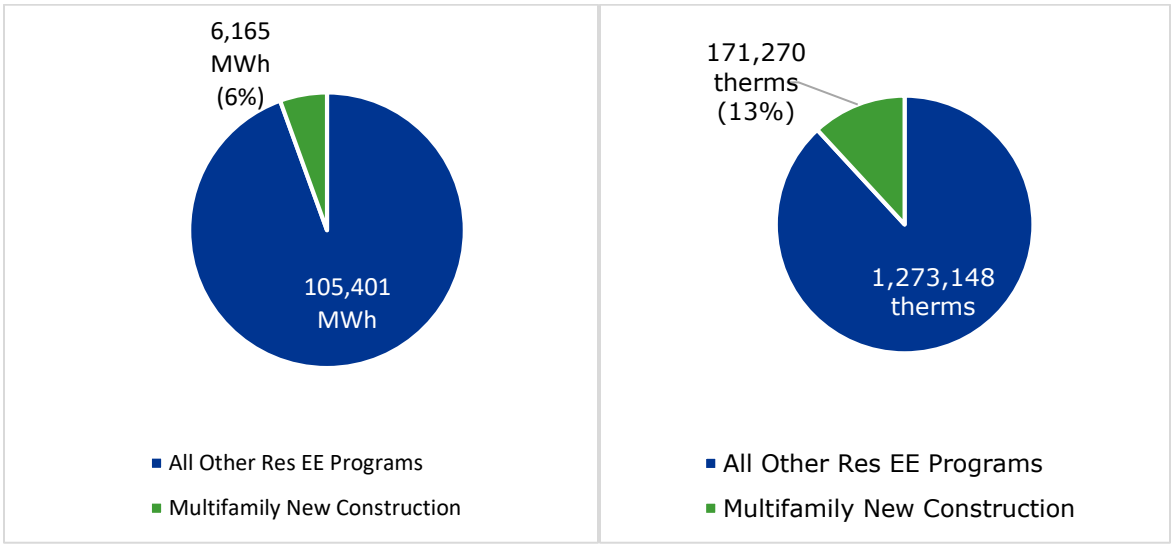
3 DATA SOURCES

In this section, we provide an overview of the data sources used for this evaluation.

3.1 Program Tracking Data

PSE provided the evaluation team tracking data for all of its 2019 residential programs. In the tracking dataset, there were 50 rows of data for the MFNC program, which represented 44 different PSE project numbers and 41 different sites. The tracking data showed MFNC claimed savings comprised 6% of residential electric savings in the portfolio of residential programs and 13% of the residential gas savings (see Figure 3). Pertinent fields included in the data are project number, project site address, measure name, and both electric and gas savings totals. Most sites installed more than one measure for the given project according to the project files. However, the tracking data did not always contain separate rows for each installed measure or list the individual measures installed.

Figure 3. MFNC Savings Compared to Residential Portfolio Claimed Electric Savings (MWh) and Gas Savings (therms)



The measure name "whole building design – custom" accounted for both the majority of claimed electric and gas savings (87% and 89%, respectively) and majority of the rows in the tracking data (37 out of 50 rows), as shown in Figure 4 and Figure 5 below. Each instance of whole building design – custom in the tracking data represents any number of installed measures including, but not limited to, condensing water heaters, kitchen and bathroom aerators, showerheads, and lighting. The list of individual measures installed under the whole building design – custom category and their savings were provided in the project files received from PSE. It was not clear why certain measures were broken out at the tracking level while others were not.

Figure 4. Tracking-Level Electric Savings (kWh)

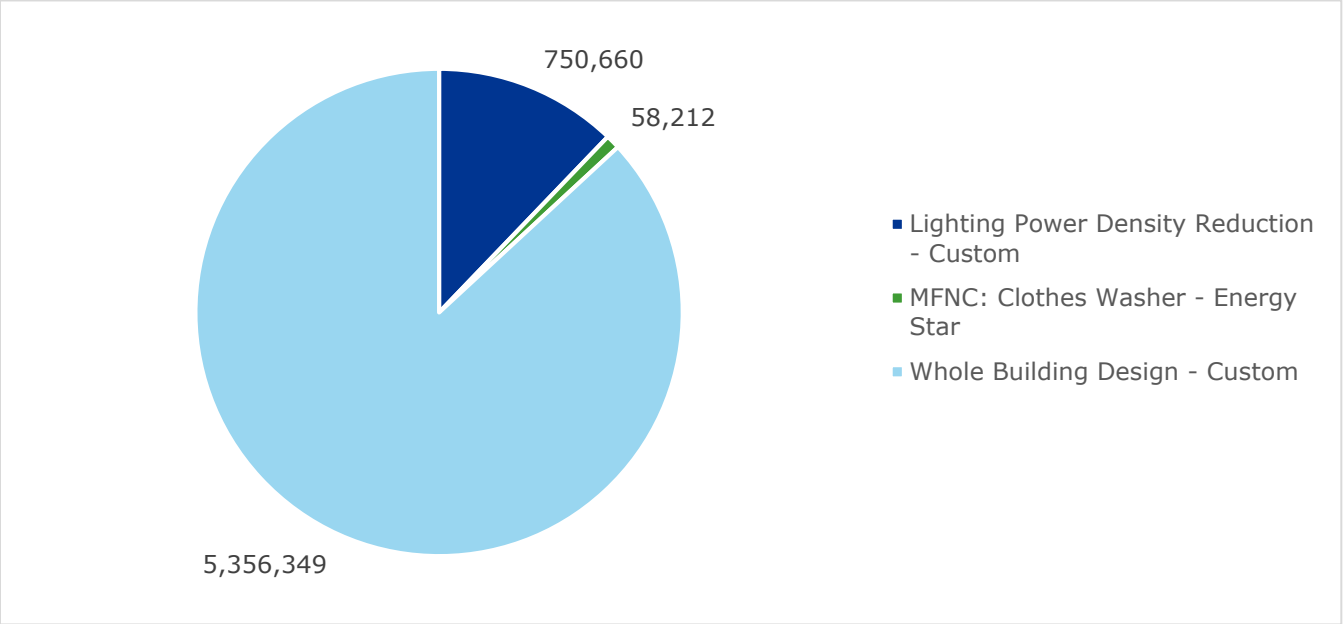
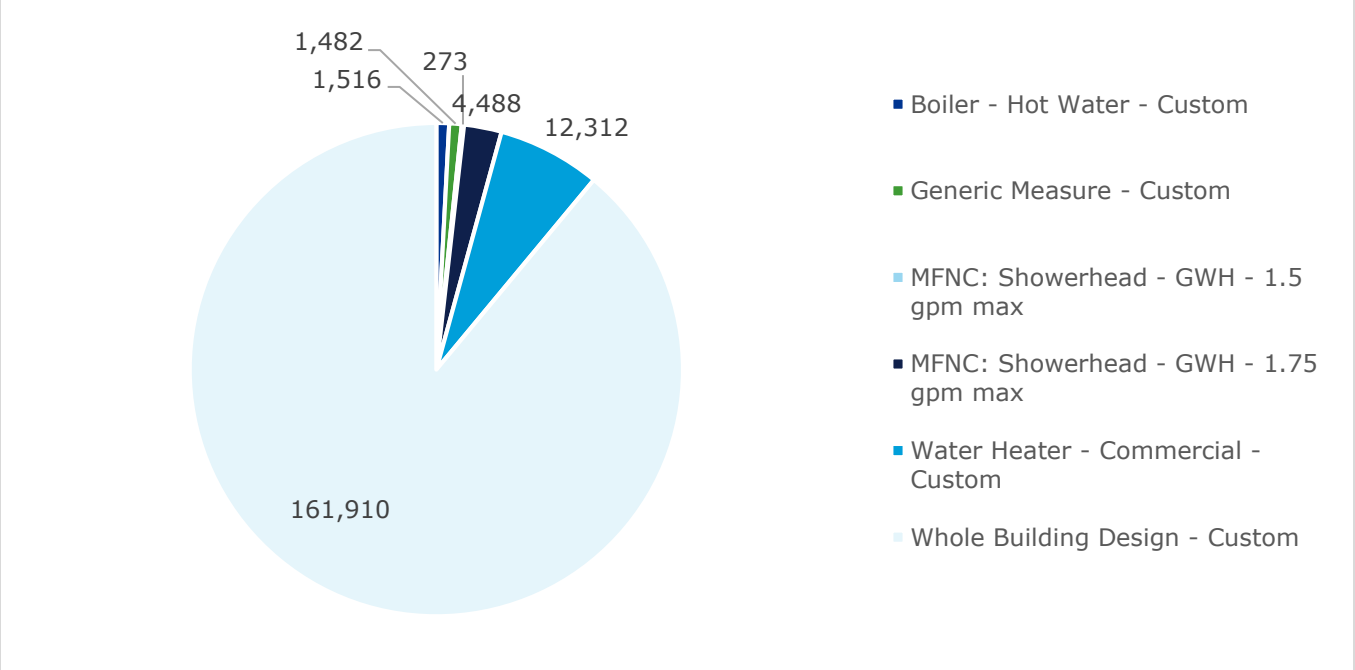


Figure 5. Tracking-Level Gas Savings (therms)



More information on the evaluation team's findings pertaining to the whole building design measures can be found in Section 4.3.

3.2 Project Files

We received 2019 MFNC program project files from PSE, which included the savings calculation workbooks, application forms, specification sheets, photos, and verification notes from CLEAResult. Of the 44 projects included in the 2019 program population, there were 41 distinct project sites, with 3 project sites containing multiple project numbers. Each project site had its own folder containing these standardized forms. The evaluation team completed the file review in multiple stages. The first stage included a review of all project folders to determine any missing documentation. This initial review stage also sought to determine which sites qualified as affordable housing for incentive purposes. We determined that 28 out of 41 project site folders were missing the grant application forms, but after a follow up data request to PSE, all 28 of the missing forms were provided to DNV GL.

The second stage review process was more robust, and sought to thoroughly validate the installation and claimed measure level performance found in the tracking data. More information on the in-depth file review and measure verification process can be found in Section 4.2.

3.3 Program Staff and Implementer Interview

Prior to conducting interviews with program staff and implementers, DNV GL evaluators conducted a thorough review of the program implementation manuals. Evaluators used these manuals to inform interview guides as they gave evaluators a more complete understanding the program and interviewees' experience with program. The program staff interview took place in June of 2020 and included the MFNC program manager as well as three additional staff members from PSE. Shortly after completing the program staff interview, evaluators spoke with the program implementation team at CLEAResult, including the manager responsible for implementing the program and two additional staff members from CLEAResult. The primary goals of the program staff and implementer interviews were to understand any recent and planned program changes, characterize the market actors and their interactions with program staff and implementers, and to understand the marketing and outreach efforts of the program. Evaluators also asked PSE program staff and implementers to characterize the quality control processes they use to ensure installation of program measures. For a complete list of questions asked during the program staff and implementer interviews, see Appendix B.

3.4 Decision-Maker Interviews

Following the program staff and implementer interviews, two DNV GL evaluators conducted interviews with a sample of decision-makers who participated in the program in 2019. Decision-maker interviews were conducted from late July to early September of 2020 and helped determine the level of satisfaction among program participants, influence of the program on installation of energy efficient measures, barriers to program participation, and level of interest in next generation savings opportunities for the program to inform the process evaluation. The interviews also included a set of questions to verify that program measures were installed and operational to help inform the impact evaluation.

Table 2 shows the 2019 multifamily new construction population of projects, targeted sample of projects, and actual number of projects that were included and discussed in decision-maker interviews. Projects were stratified as either market rate or affordable. As shown, we attempted to

complete interviews for 14 market rate projects and 7 affordable projects and actually completed 13 and 6, respectively, for a total of 19 projects.

Table 2. Summary of Multifamily New Construction Project Population, Targeted Sample of Projects, and Actual Number of Projects Included in Decision-Maker Interviews, 2019

Project Type	Project Population	Targeted Project Sample	Completed Interviews
Market Rate	37	14	13
Affordable	7	7	6
Total	**44**	**21**	**19**

Table 3 shows the number of decision-makers (individuals representing building companies) who took part in the program in 2019, targeted sample of decision-makers, and actual number of completed interviews. Evaluators completed a total of 16 interviews representing 19 projects. We provide further details on the sample design and stratification in Appendix A.

Table 3. Summary of Multifamily New Construction Decision-Maker Population, Targeted Sample, and Actual Number of Completed Interviews with Decision-Makers, 2019

Project Type	Decision-Maker Population	Targeted Decision-Maker Sample	Completed Interviews
Market Rate	28	13	11
Affordable	6	6	5
Total	**34**	**19**	**16**

4 IMPACT EVALUATION RESULTS

4.1 Overview

Below we provide a detailed description of the impact evaluation verification methods, gross savings realization rate, measure-level savings, lighting savings claims analysis, and a description of our review of deemed assumptions for non-modeled measures.

4.2 Verification Methods

The team utilized a multi-pronged approach for completing measure verifications. Our initial verification efforts focused on tracking data and project file reviews. Our follow up verification efforts involved speaking with a sampled group of program participants or submitting data requests to the program implementer. The team conducted follow up verification research to validate measure installations and to obtain additional information on the measures installed via photographs, physical observations, or through data requests when needed. As detailed in Section 3.2, we performed a program-wide project file inventory to verify that essential project documentation was provided for every project. The process for the in-depth file review effort was more involved. Table 4 below details the three different verification steps performed, including tracking data review, project file review, and an in-depth file review.

Table 4. Measure Verification Task Summary

Verification Method	Projects Reviewed*	Verification Tasks Performed
Tracking Data Review	44	▪ Review of overall claimed kWh and therm savings ▪ Review savings by measure ▪ Review of details provided per project ▪ Review of measure counts and site counts.
Project File Inventory	44	▪ Inventory of documents for each project ▪ Request any critical missing files ▪ Review of requested data received
In-Depth Project File Review	25	▪ Invoice & measure cost review ▪ Review post-install photos ▪ Specification sheet review ▪ Lighting power density (LPD) workbook review ▪ Infiltration report review ▪ Requests to either CLEAResult ▪ Requests to site contacts ▪ Review of requested data received
Total Projects	**44**	

*The MFNC program completed a total of 44 projects in 2019.

Considering the ongoing pandemic, we designed the data collection efforts to maximize verification and performance assessments while minimizing customer burden. Knowing the decision-maker interviews would be targeting the sample of at least 21 of the 44 projects (to target a confidence and precision of 90/10), the impact verification effort sought to leverage the decision-maker interview site contacts to support the in-depth file review effort. When interviewed, the decision-maker contacts were asked whether all claimed measures were still installed and operational. To help prepare for these decision-maker interviews, the team performed in-depth project file reviews on all primary sample points selected for decision-maker interviews as well as a select number of backup sample points, which resulted in in-depth file reviews for 25 of the 44 projects. The in-depth file review findings helped the interviewers responsible for decision-maker interviews understand the full scope of measures installed at each site. By following this streamlined approach to remote verification, we minimized the number of respondents contacted and limited the need to request respondents to physically inspect installed measures.

The in-depth file review task involved a detailed examination of each claimed measure's details by DNV GL engineers. The "whole building design – custom," measure 10055, was the only measure listed for 23 of the 25 projects included in the in-depth file review effort. However, those 23 whole building design projects consisted of 221 different measures.

For each measure, the in-depth project file review task included the following verification steps:

- Confirm that invoices or measure cost summary details match the claim types and quantities
- Confirm that installed measure post-inspection photos and/or equipment nameplates match measure descriptions
- Confirm that specification sheets present for aerators, water heaters, and lighting measures met the efficiency or performance ratings of claimed measures
- Confirm that summary calculations showing baseline versus installed kW, assumed hours of operation, areas served, and site layout review for lighting LPD measures match claimed savings
- Confirm that infiltration report showing compliance for infiltration reduction measures match claimed savings
- Requests to either CLEAResult or the decision-maker for any missing documents, photos, or inquiries about inconsistencies
- Review of the requested data received

We developed a program measure tracking tool to document the in-depth review findings and help prepare the list of individual measures completed at each site for the decision-maker interviewer to confirm. The file review effort flagged any sites with missing or inconsistent measure claims based on the details found in the documentation. Depending on the measure and the nature of the missing or inconsistent data, we followed up with either the program implementer or the program participant during the decision-maker interview.

The detailed file review determined that the projects were well documented by CLEAResult. Specification sheets for installed measures matched what was depicted in photos with a few exceptions where photos were not provided, or specification sheets did not match the installed photo for a given measure. The evaluation team reviewed each flagged measure and bucketed the issues into one of two categories:

- Measure documentation that likely could not be provided by the decision-maker, or
- Documentation that the decision-maker could confirm visually or via a nameplate photo

For the measure specification/documentation needs flagged, we sent a data request to CLEAResult who quickly provided the requested measure data documentation to the evaluation team. Upon reviewing the data, we were satisfied that the measure claims were valid. The one measure to consistently lack complete documentation was the high-performance windows measure. The in-depth file review found the installed photos of the high-performance windows usually did not include photos that showed the manufacturer's rating sticker, which provides verification that the rated U-value and solar heat gain coefficient values of the installed windows met the measure requirements. The evaluation team brought this up in a call with CLEAResult staff, who acknowledged being aware of the issue. CLEAResult staff indicated they have taken steps to ensure installed photos are captured before the window ratings stickers get removed whenever possible, but sometimes the timing is out of their control. Staff provided invoices for the high-performance windows, which indicated the window models matched the claimed window types, so overall, we are not concerned about the validity of those measure claims.

During the decision-maker interviews, the respondents were asked if each individual measure was still installed and operating. In every instance (16 interviews covering 19 projects), the decision-maker confirmed all measures were installed and operational. Confirmation was provided either over the phone or via a follow up email to the evaluation team, if the contact needed to physically check prior to confirming. For a handful of measures flagged in the file review, DNV GL engineers asked the decision-maker if they could provide a nameplate photo of the installed equipment and received photos for all requested measures. In these cases, the photos provided the detail needed to fully verify the measure specifications.

4.3 Realization Rate

Based on verification findings, we have every indication that all claimed measures were installed and are still operational. Because the evaluation team verified all program measure installation and specifications, the overall realization rate was 100%. This means that the evaluated electric and gas savings are equal to the claimed electric and gas savings.

Because this realization rate was the same for every point in the sample, there is not any variation in the estimate of gross savings, so there is no uncertainty in the estimates, meaning that the achieved relative precision on the gross savings estimates is 0.0% for both the market rate and affordable groups. Because 100% of measures in the sample were confirmed, the evaluation team did not apply an adjustment to claimed savings, yielding a 100% realization. More information on the sample design and results extrapolation can be found in Appendix A.

4.4 Detailed Savings Results and Analysis

The results of the impact evaluation described in this section consist of a deeper dive into measure level savings to understand the technologies and end-uses being incented through the program in the first section. Finding that lighting savings made up 74% of the total claimed savings justified a section devoted to claimed lighting savings alone. The final section focuses on non-modeled measure savings that were based on deemed savings from the Regional Technical Forum (RTF). We reviewed the

assumptions underlying those savings and compared them to MFNC program participant data to understand if the RTF deemed savings values accurately represent savings from the MFNC program.

4.4.1 Measure-Level Savings

As a first step in analyzing measure level savings, we disaggregated the site-level claimed savings into the measure-level savings reported in the site level savings workbooks. Some of the measure-level savings spreadsheets used a "code compliance reduction" factor to reduce the measure level savings below RTF savings values, which is accounted for and shown on the measure-level savings figures. The "code compliance reduction" factor was developed by CLEAResult in order to account for the fact that some energy efficiency measures incented through the program are already required by Washington State Energy code.

Figure 6 shows the program-level electric savings broken out by measure for the top nine measures in terms of gross savings. All the measures are compliance adjusted except interior garage lighting, exterior lighting, and whole building custom measures.[5] The average compliance reduction across all electric savings measures is 37%. Three of the four highest saving measures are lighting, and together these lighting measures comprise 74% of the program electric savings. After lighting, the highest saving measure is in-unit ductless heat pump.

[5] The savings from these measures are calculated using custom program methods, and this is likely why the compliance adjustment is not applied.

Figure 6. Measure-Level Electric Savings (kWh) for Highest Saving Measures

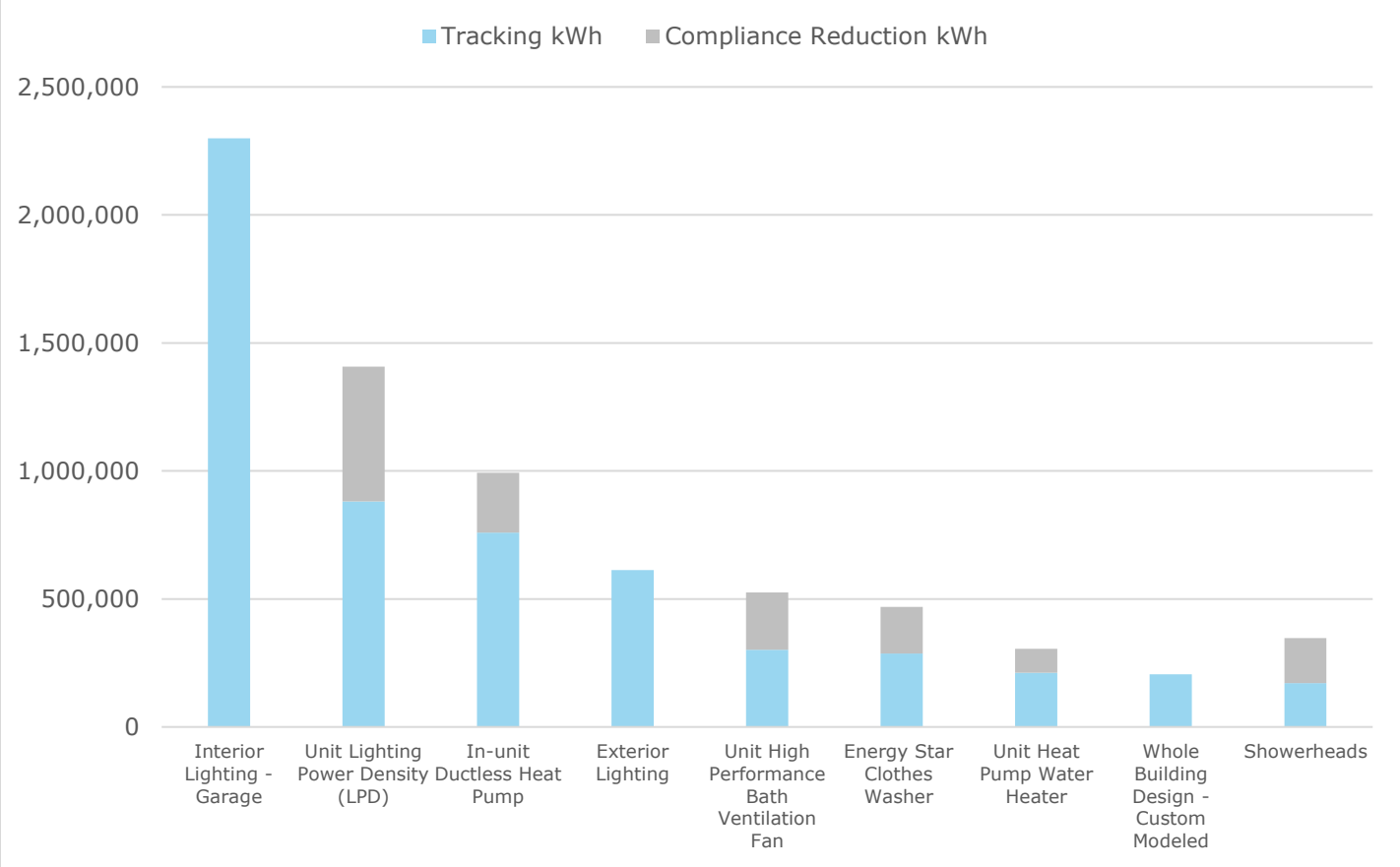


Figure 7 shows electric savings for the measures with the lowest combined savings, and includes appliances, windows, air sealing, and domestic hot water measures. Electric saving measures that were part of the 2019 MFNC measure offerings, but not installed at any sites include energy efficiency refrigerators and drain water heat recovery for buildings with electrically heated hot water and building shell insulation for buildings with electric heat or AC. The program can investigate why buildings did not include these measures and whether it is an opportunity for additional savings, and PSE should consider promoting these measures more in discussions with participants.

Figure 7. Measure-Level Electric Savings (kWh) for Lowest Saving Measures

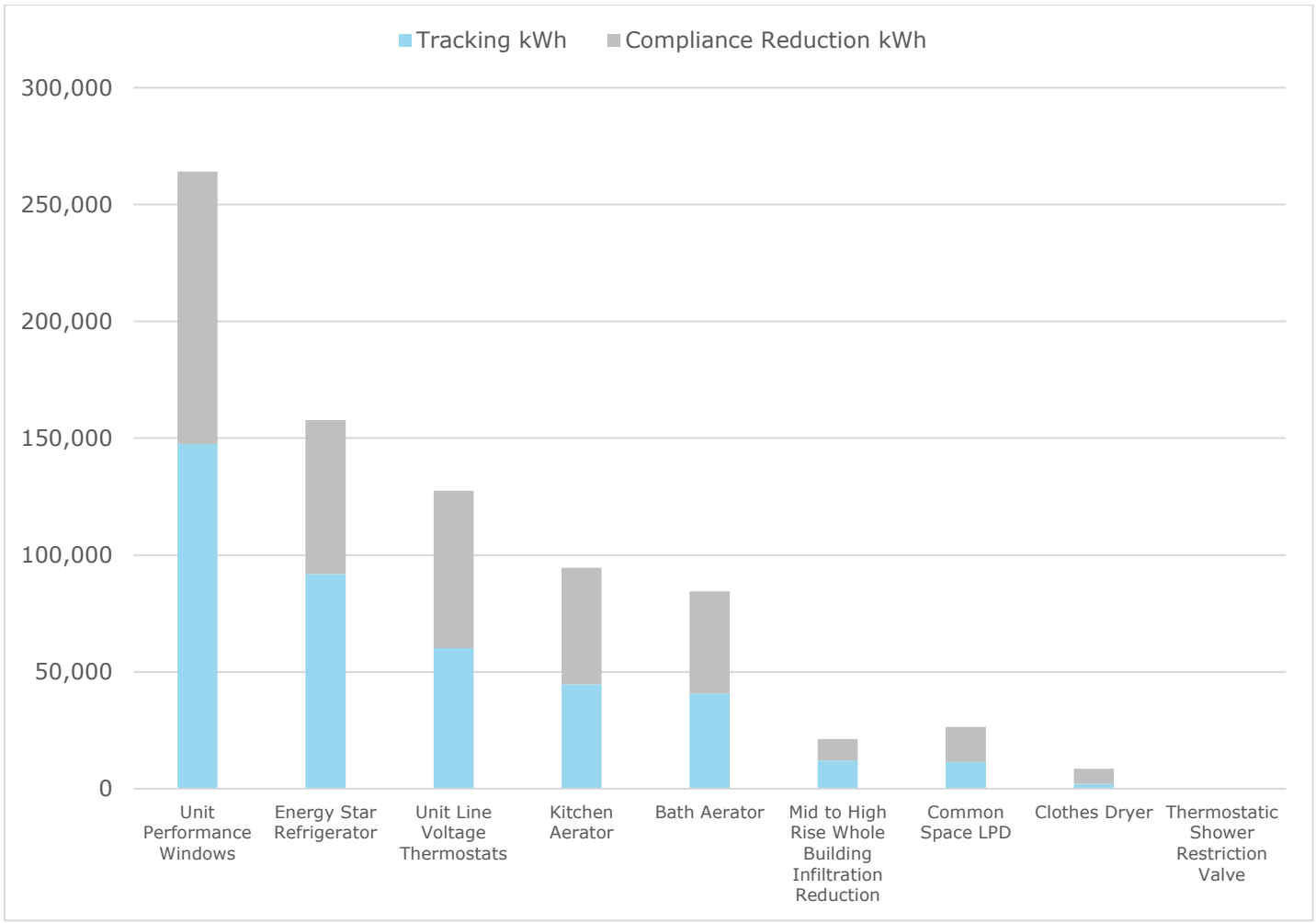
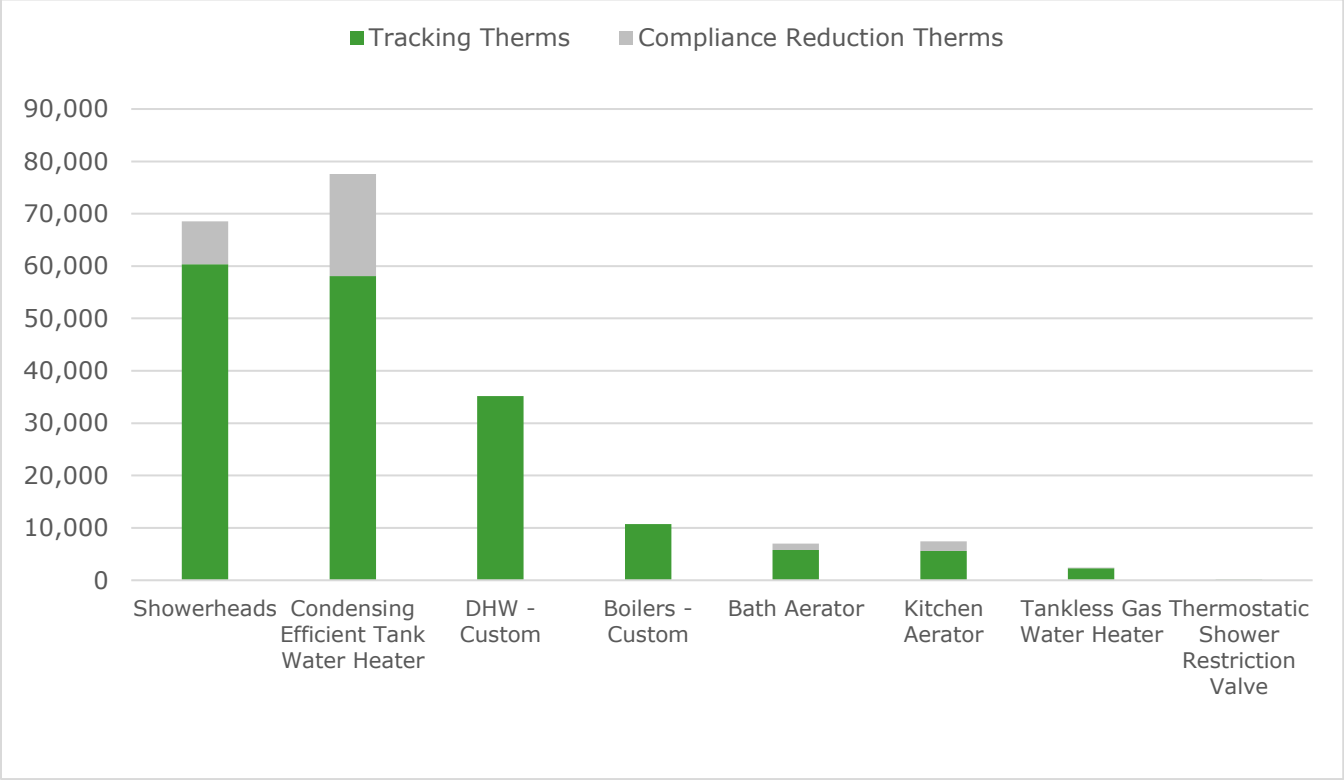


Figure 8 shows the program level gas savings broken out by measure. The average compliance reduction across all gas measures is 15%. Again, the custom measures do not have a compliance reduction. The top gas savings measures are shower heads and condensing efficient tank water heaters. Although installation of gas water heating measures was high, no gas-saving drain water heat recovery measures were installed. All measures related to saving gas heating fuel are absent, including smart thermostats, in-unit gas furnace with AC, in-unit high efficiency condensing furnace, energy recovery ventilator (where building heat is gas), and building shell insulation (again for buildings with gas heat). Additional research may be valuable to determine potential applicability of these measures among the participant population and PSE's new construction stock in general. Such research would investigate whether sites had gas accounts, whether measures, such as smart thermostats, are compatible with installed heating systems (central boiler systems vs in-unit HVAC). Findings from this effort could be used to better understand how to develop measures that are well suited to multifamily trends in new construction.

Figure 8. Measure-Level Gas Savings (therms)

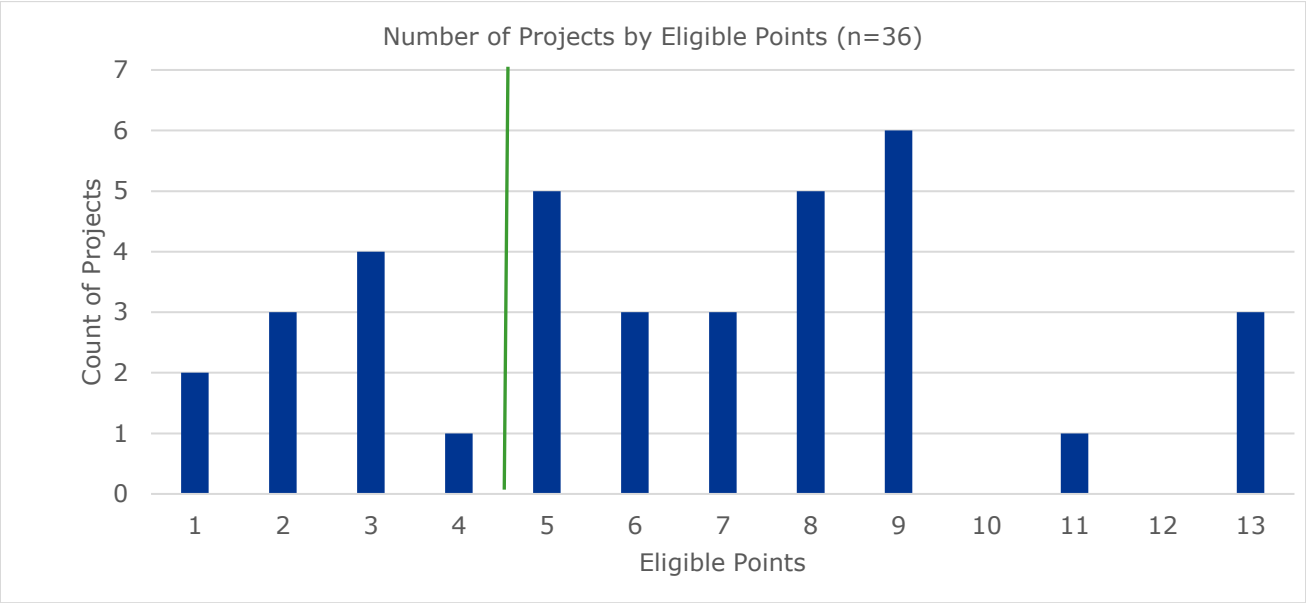


The Washington State Energy Code uses a points system to require energy efficiency measures beyond what is prescriptively required by code for residential buildings. CLEAResult mirrored this system and assigns points based on the energy savings of the installed energy efficient measures.[6] Projects with more points save more energy. Figure 9 shows the distribution of projects by number of eligible points, so projects on the left of the figure save less energy and those on the right save more on a per-square-foot basis. The total project points are reduced by the 2.5 points required by code to get the number of eligible incentive points for the MFNC program.

The above discussion is important because it highlights a key program risk going forward. The new 2018 code goes beyond the 2015 code and will require points not only for residential buildings, but also for commercial buildings. The vertical line on the graph shows the evaluated projects that would not have had enough points to participate if the new rules of six required (commercial) compliance points were in effect. Ten projects, or almost one-third of the total participating projects, would not achieve enough points to participate. Going forward, we recommend the program encourage deeper energy savings to maintain overall program savings.

[6] Based on modelling the 2015 residential code compliance point measures, CLEAResult assigned a value of 0.6 kBtu/ft^2.

Figure 9. Points System and Compliance Reduction



The 2018 Washington State Commercial Energy Code going into effect February 2021 includes a requirement of six compliance points for every commercial new construction project. The code includes a table of "Efficiency Package Credits" for 10 measures with varying point credit per measure. The table includes two tiers of reduced lighting power worth one or three points, indicating that going forward, a compliance reduction should be applied to all lighting measures in the MFNC program including those with custom workbooks. The table also includes a hot water measure specific to multifamily buildings, high performance service water heating (HPSWH), which is worth eight points. We recommend adding this measure to the program going forward since hot water is one of the largest building loads.

The code shows emphasis on building shell measures by valuing enhanced envelope performance at six points (currently ~2.5 in PSE's MFNC program) and infiltration reduction at two points (currently the highest tier infiltration reduction in the MFNC program is credited 1.5 points.) Program staff and some interview responses indicated a desire to move the MFNC program toward Passive House standards (focused on building shell measures), which we fully endorse. New construction represents a window of opportunity for shell measures which will last the lifetime of the building and are hard to retrofit after the building is constructed. Tighter building envelopes will require mechanical ventilation that could be provided through a dedicated outdoor air system (DOAS), one of the efficiency package credit measures in the 2018 commercial code, worth four points.

We recommend that the MFNC program expand their offerings to include HPSWH and DOAS measures and to place more emphasis on shell measures. This will require earlier project identification so the program can influence the project during the design phase.

4.4.2 Lighting Savings Claims Analysis

An additional risk of the MFNC program relates to its heavy utilization of lighting measures. As mentioned earlier, lighting and lighting control savings represent 74% of the total electric savings for the program. The parking garage lighting, exterior lighting, and other non-residential lighting measures combine to represent close to 60% of the total electric savings. These measures are somewhat unique in that they are not subject to same compliance reduction formula that reduced the average electric savings for the whole building design measures by 37%. That compliance reduction formula *is* applied to the in-unit lighting measures included in the whole building design tracking measure.

The program implementer informed the evaluation team that the parking garage lighting and exterior lighting measures were added as an offering after the original set of MFNC measure offerings were established. Because these measures are found in multifamily common areas, they are not subject to residential energy code, but rather the commercial energy code. The commercial baseline lighting power allowance (LPA) for these measures is determined by the applicable energy code cycle the project was subject to at the time of permitting. For most projects that was the 2015 code cycle. However, for several projects, their permitting date subjected them to the 2012 cycle. The next applicable code cycle is the 2018 code, which was adopted on February 1, 2021.

The availability and affordability of LED lighting options across all market sectors improved exponentially over the past decade. The baseline LPA by code, however, is much more static. The baseline LPA for indoor parking garage areas was at 0.190 watts per ft^2 in the 2012 cycle, 0.160 watts per ft^2 in the 2015 code cycle, and is set to go to 0.140 watts per ft^2 in the upcoming 2018 cycle. To address this disparity, states like Massachusetts have sponsored code compliance and baseline studies to determine the industry standard practice for new construction lighting and lighting retrofits. The current method used in Massachusetts for calculating the baseline LPA in commercial new construction is to apply a baseline LPA adjustment factor to the code allowable LPA for the specified area type.

The LPA adjustment factor applied to projects subject to the 2012 code is 0.670, and the factor applied to projects permitted under the 2015 code is currently 0.700 but is set to be updated with the publication of the next code compliance report, expected in early 2021. This code compliance adjustment method would mean the 2012 code baseline allowable wattage for an indoor parking garage of 0.190 watts per ft^2 would be adjusted to 0.127 watts per ft^2. To demonstrate this impact, the pre-lighting controls indoor parking garage savings found in one of the MFNC program projects[7] would see a 45% reduction in claimed savings, as illustrated in Table 5.

[7] 2019 MFNC project number P-832319.

Table 5. Example Baseline Lighting Power Allowance Adjustment

Applicable Baseline	Space Type*	Allowed W/ft²	Gross Interior Area in ft²	Baseline Watts Allowed (W/ft² x area)	Proposed Watts	Annual Hours	Baseline kWh	Proposed kWh (Pre-Controls)	Total kWh Savings
2012 WSEC	Parking Garage – Garage Areas	0.190	106,472	20,230	5,451	8,760	177,212	47,751	129,461
2012 WSEC with 0.67 LPA Adjustment Factor	Parking Garage – Garage Areas	0.127	106,472	13,554	5,451	8,760	118,732	47,751	70,981

While this LPA adjustment factor demonstration is leveraging findings from Massachusetts, the LED market is undergoing rapid growth and becoming increasingly more affordable everywhere. In most of the lighting workbooks for which the 2015 code was applicable, there is a minimum 20% savings eligibility requirement for lighting projects to receive a grant. In most of the workbooks the evaluation team reviewed, the savings achieved for the exterior lighting and indoor parking garage lighting projects exceed 50% of the code allowance usage. While it is certainly beneficial for the program participants to claim lighting savings purely based on baseline code LPA, moving forward some effort to consider and account for standard practice seems warranted.

4.4.3 Review of Deemed Assumptions for Non-Modeled Measures

As part of the participant survey, we collected information about the apartments to verify the measure-level savings assumptions in the RTF savings calculations that are the basis of the MFNC program non-modeled measure savings. We were seeking data on the number of bedrooms, number of showers, and number of bathroom sinks. Given the ongoing pandemic, we collected as much information as possible from the internet and then asked interviewees to confirm the information we gathered to minimize survey respondent requests. Because we ultimately wanted to know the number of occupants in each apartment, but thought it was unlikely that many respondents could provide this information, we pulled occupancy information by number of bedrooms for residential units in the Seattle area from the 2019 American Housing Survey[8] and calculated the average number of occupants for the residential unit types as shown in Table 6. The summary information in Table 7 was compiled from 21 participating sites with a total of 3,265 apartment units. We computed the number of people per unit based on the number of bedrooms per unit from the decision-maker surveys and the average occupancy of residential units in the Seattle area from the 2019 American Housing Survey.

[8] https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html?s_areas=42660&s_year=2019&s_tablename=TABLE8A&s_bygroup1=5&s_bygroup2=1&s_filtergroup1=1&s_filtergroup2=1

Table 6. 2019 American Housing Survey Average Occupancy of Residential Units in the Seattle Area

Number of Bedrooms	Average Occupancy
Studio	1.26
One Bedroom	1.40
Two Bedroom	1.96
Three Bedroom	2.50
Four Bedrooms or more	3.25

Table 7. Summarized Apartment Information Collected from Program Participants

Averages based on survey data	
Bedrooms per unit	1.68
Showers per unit	1.48
Bathroom sinks per unit	1.71
Number of people per unit	1.81
People per showerhead	1.32
people per bath aerator	1.24

We reviewed the RTF savings workbooks for all the deemed measures and found six measures where we could check input assumptions against the data gathered for the MFNC program. Table 8 shows the RTF assumptions compared to data collected in this evaluation for the relevant measure parameters. The table also shows the effect on the deemed savings, if the MFNC data were substituted for the RTF assumption in each case. There was little or no effect on all the savings, except with the drain waste heat recovery and heat pump water heater measures where the RTF assumption of people per residence was significantly higher than that computed using program-collected data. Notably, the RTF assumptions for the number of people per residence used in the showerhead and aerator calculations was very close to the number we found.

Table 8. Deemed Measure Parameter Comparison of RTF Assumptions and MFNC Data

Measure	Parameter	RTF assumption	MFNC data	Effect on Savings
Showerhead	Frequency (events/year/showerhead)	332	329	no effect
Kitchen Aerators	Number of People per Faucet	1.81	1.81	no effect
Bathroom Aerators	Number of People per Faucet	1.38	1.24	slightly lower
Drain Waste Heat Recovery	Persons Per Residence	2.59	1.81	lower
	Showers Per Person Per Day	0.6	0.68	slightly higher
Heat Pump Water Heater	People Per Single Family House	2.57	1.81	lower
Thermostatic Shower Restriction Valve	Showers per year, per showerhead	333	329	no effect

5 PROCESS EVALUATION RESULTS

This section summarizes findings for the process evaluation, and includes results from the decision-maker interviews as well as information learned from the program staff and implementer interviews.

5.1 Overview

As described in Section 2.4 above, the key research questions for the process evaluation address the following topics:

- Level of participant satisfaction with the program
- Program influence on decision-makers
- Barriers to program participation
- Savings opportunities that could be captured by the program but currently are not being captured
- Next-generation savings opportunities for the program in future program years

The evaluation team also asked PSE program staff and implementers about recent and planned program changes (Section 5.2), how decision-makers learned about the program (Section 5.3), and what marketing and outreach efforts are associated with the program (Section 5.9).

5.2 Recent and Planned Program Changes

As discussed in Section 2.3 above, the program implementer, CLEAResult, redesigned the Multifamily New Construction program in 2018. In 2018, program incentives were calculated using a points-based system with incentive levels of "good, better, or best." Beginning in 2019, the program's incentive structure changed to a two-tiered system based on kWh or therm savings per square foot with a standard incentive and a 50% bonus multiplier for affordable housing projects. The additional incentives for affordable housing projects are part of a broader effort by PSE to expand the MFNC program to reach more underserved low and moderate income customers.

In 2020, the program added early design assistance (EDA), which provides builders early feedback on how to maximize PSE's incentives for their projects. EDA offers an interactive workshop that includes a discussion of program offerings and resources, efficiency best practices, and the development of an action plan designed to reduce construction costs and improve building efficiency. PSE program staff are also interested in having more MFNC projects completed beyond King County and have worked on broadening outreach with developers outside of the county.

Going into 2021 and beyond, PSE program staff and its implementers recognize the need for the program to adapt to changing code in the state of Washington. New building codes were originally slated to go into effect in July of 2020, but their implementation was delayed until February of 2021 due to COVID-19 pandemic. PSE program staff also may consider offering program support for high-performance buildings, such as passive design buildings, to achieve deeper savings in the future.

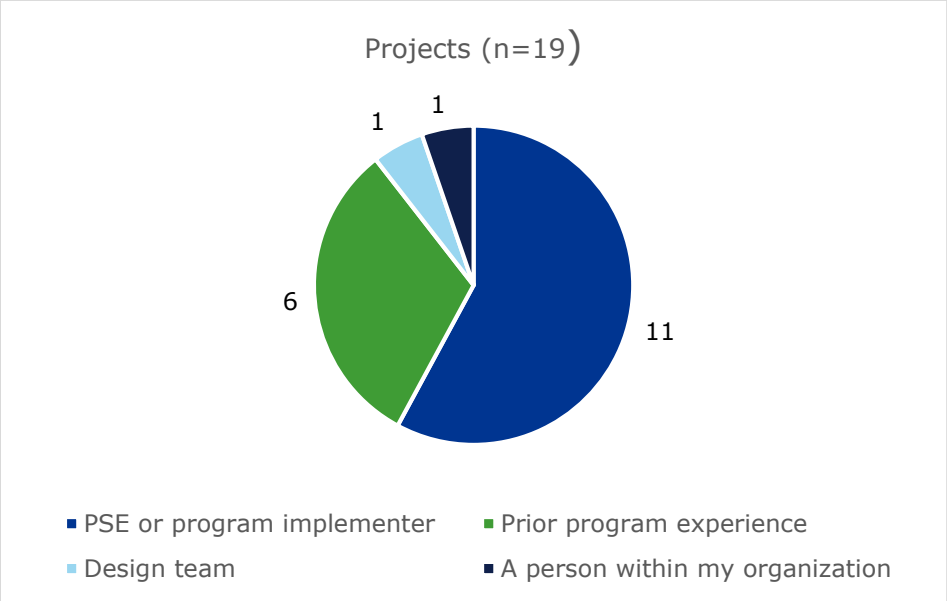
5.3 Program Awareness

As part of the decision-maker interviews, [9] evaluators asked respondents how they heard about the MFNC program. The 16 decision-makers sampled for the interviews were responsible for 19 of the 44 projects in the program (43% of the project population). For further details on sample selection and design, please see Appendix A.

Figure 10 provides a breakdown of the sources of program awareness among decision-makers. We present program awareness at the project level because the sources of project awareness varied from project to project for some participants. For example, some respondents reported learning about the program originally from PSE but were aware of the program due to prior participation in previous projects. A majority of respondents learned about the program from PSE or the program implementer, and roughly one third of respondents reported being aware of the program due to prior participation in the program.

These findings illustrate that the program implementer has developed successful recruitment strategies for program participation and that barriers to participation are low enough and program benefits are high enough to generate continued interest when there are future project opportunities. We would caution PSE and the program implementers to not rely too heavily on repeat participation or relaxing marketing and outreach efforts. The program may not remain top-of-mind even for repeat participants (especially if there is a considerable time gap between projects), so periodic reminders are still important.

Figure 10. Source of Program Awareness



[9] Please see the MFNC Decision-Maker Survey in Appendix B for further details on the questions asked during decision-maker interviews.

When asked about the primary reason for participating in the program, the vast majority of respondents (13) said the program incentives were the primary reason for their companies' participation. Two respondents mentioned that the lower cost of building operation was the primary reason for participation, and one mentioned that the program complemented their existing design goals for building efficiency and that was the primary reason for their participation.

After being asked about the primary reason for their participation, respondents were asked to provide additional reasons for their participation. As shown in Table 9, "lower cost of operation" was cited among half of respondents as a secondary reason for program participation and a quarter of respondents said that participating in the program complemented their organizations' existing design goals.

Table 9. Additional Reasons for Program Participation

Reasons for Program Participation*	Respondents (n=16)
Lower cost of operation	8
Complemented existing design goals	4
Rebates	3
Energy efficiency	2
Internal guidelines or maintenance policy	1
Recommendation from a consultant/contractor	1
Other	4
Total	**23**

*Respondents were given the opportunity to provide more than one reason for program participation.

There is uncertainty ahead for the MFNC program if cost-effective incentive opportunities decline and efficiencies are codified. As incentives become less cost-effective, we recommend additional research to better understand the potential value the program could offer to builders and their residents. More research on the MFNC market in the Seattle area, including research on non-participants, could provide valuable insights on the potential for program growth. This research could ultimately help shape the direction and evolution of the program.

5.4 Project Involvement

The earlier that participants become engaged with the program, the greater the potential program impact on decision-making and energy savings, particularly when the program provides a design assistance service. Decision-makers were asked in which phase of the design and construction process they first became actively involved with the program. Table 10 shows the timing of participants' initial involvement in the program. As shown, more than one-third of respondents (5) did not get actively involved with the program until after design development was complete and half (7) did not get involved until the design development was under way. Once projects reach the design development phase, the opportunity becomes increasingly more limited to influence the project. The early design

assistance offered by the program starting in 2020 should provide an opportunity to involve decision-makers earlier in the project and maximize savings.

Table 10. Timing of Initial Participant Involvement in Program

Timing of Initial Program Involvement*	Projects (n=17)	Respondents (n=14)
1-Project Conception	1	1
2-Project Development Phase	3	2
3- Schematic (drawings electrical or mechanical)	3	3
4- Design Phase	1	1
5-Design Development	3	2
6-Construction Documents	4	4
7- During Construction	2	1

*Two respondents were not able to recall the timing of their involvement in the program.

5.5 Program Influence

Evaluators asked decision-makers how the program influenced the measures they installed. Respondents were read a list and asked for to choose one or more possible ways (if any) in which the program influenced the installation of project measures. Possible program influences included the following:

- Program suggested or introduced the measures
- Program provided design assistance to verify energy savings
- Program incentive made the measures an easier sell
- Program incentive helped measures meet investment criteria
- Prior program project had success with the measures
- Program had no influence on the measures

As shown in Table 11, just under half of respondents (7) said the rebate had no influence on the measures they installed. This suggests that these participants would have installed the program measures even without program incentives. An equal number of respondents (7) said the program incentives made their installation an easier sell for their organization, while a quarter of respondents (4) said that the program helped meet investment criteria or that a prior program project had success with the measures.

Table 11. Program Influence on Measures

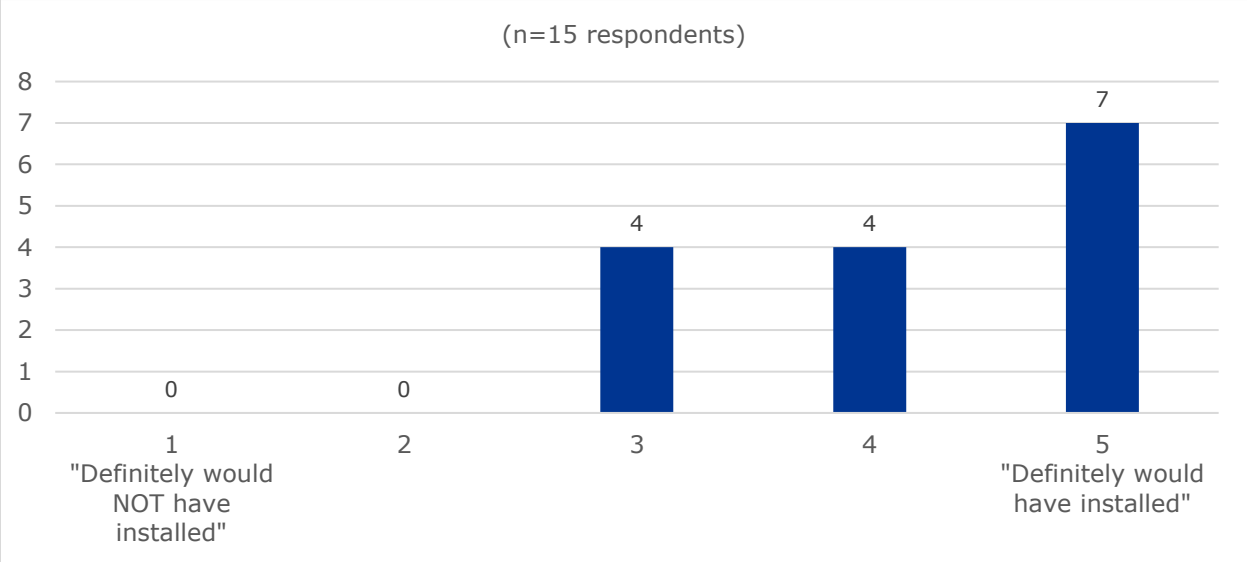
Program Influence*	Respondents (n=16)
Program had no influence on the measures	7
Program incentive made the measures an easier sell	7
Program incentive helped the measures meet investment criteria	4

Prior program project had success with the measures	4
Program provided design assistance to verify energy savings	1

*Respondents were given the opportunity to cite more than one program influence.

Evaluators also asked decision-makers to rate the likelihood that they would have installed the same program-qualifying measures if no program incentives were available on a scale of 1 to 5, where 1 means "definitely would not have installed" the measures and 5 means "definitely would have installed" the measures. Figure 11 shows the distribution of responses among the 15 respondents who answered the question. As shown, nearly half of respondents (7) said that they "definitely would have installed" program-qualifying measures without program incentives, suggesting that the program had no influence on their decision to install these measures. Across the 15 respondents the average rating given was 4.2, suggesting that most respondents likely would have installed program-qualifying measures without program support.

Figure 11. Likelihood of Installing Same Program-Qualifying Measures without Program Incentives



Interviewers asked decision-makers about the level of difficulty required for their projects to exceed code by 5% or better (as required by the program). Respondents were asked to use a 5 point scale where 1 means "not difficult at all" and 5 means "very difficult." Figure 12 shows the distribution of responses among 15 respondents covering 18 projects (one respondent was not able to provide a rating). As shown, most respondents rated the level of difficulty of meeting code as either a 1 or a 2, meaning that it was not at all or not very difficult for their projects to exceed code by 5% or better. The average rating across the 18 projects was 1.8. This suggests that participants would choose to exceed code even without program support.

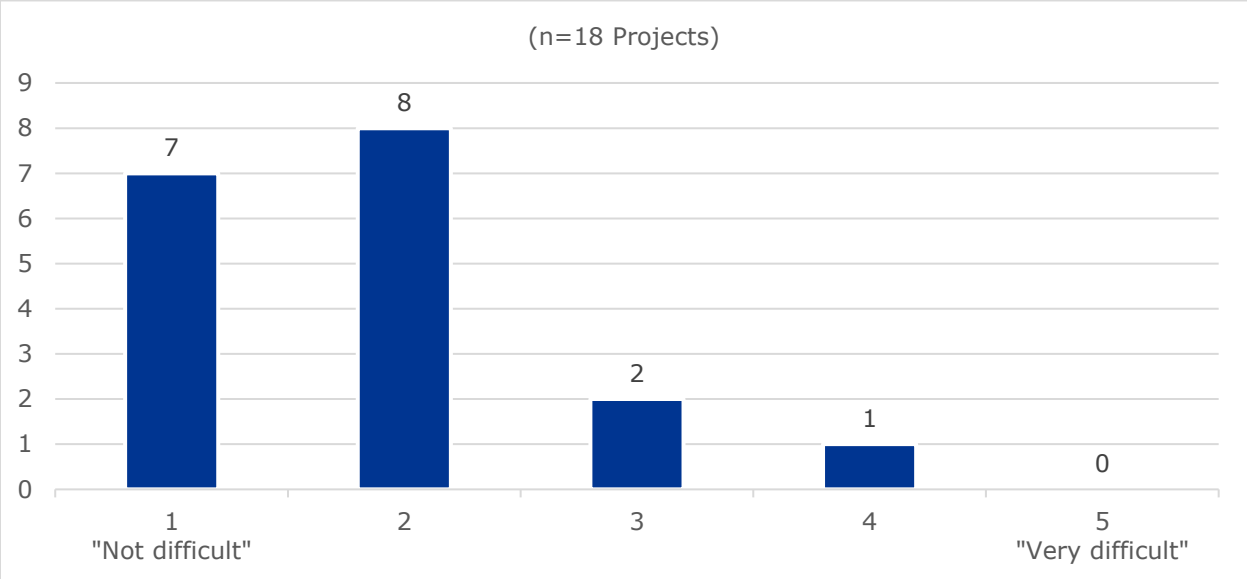
Some respondents offered additional feedback regarding the program's requirement to exceed code:

"It was easy process to achieve better than code, but it changed right after that. It is increasingly more difficult now."

"We knew the target, we have done it before, and we planned for it."

"It's easy. LEED Gold is our standard process."

Figure 12. Level of Difficulty Exceeding Code



The survey sought to identify the external factors that influenced the decisions to implement measures better than building code requires beyond program influence. Respondents were asked to consider the following drivers:

- Previous experience or prior success with this measure(s)
- Met financial criteria without incentive
- Non-energy benefits (such as improved occupant comfort and aesthetic enhancements)
- Payback/return on the investment (ROI)
- Reduced cost of operation (lifecycle cost)
- Recommendation from a consultant (lighting, refrigeration, mechanical)
- Standard practice in their industry
- Corporate policy or guidelines
- Compliance with their organization's normal maintenance or equipment policies
- Compliance with rules or codes set by regulatory agencies
- Other reasons

Among all external factors we prompted respondents to consider, the following three factors were cited by at least half of the 16 respondents:

- Reduced cost of operation (lifecycle cost) (11 mentions)

- Compliance with rules or codes set by regulatory agencies[10] (8 mentions)
- Previous experience or prior success with this measure(s) (8 mentions)

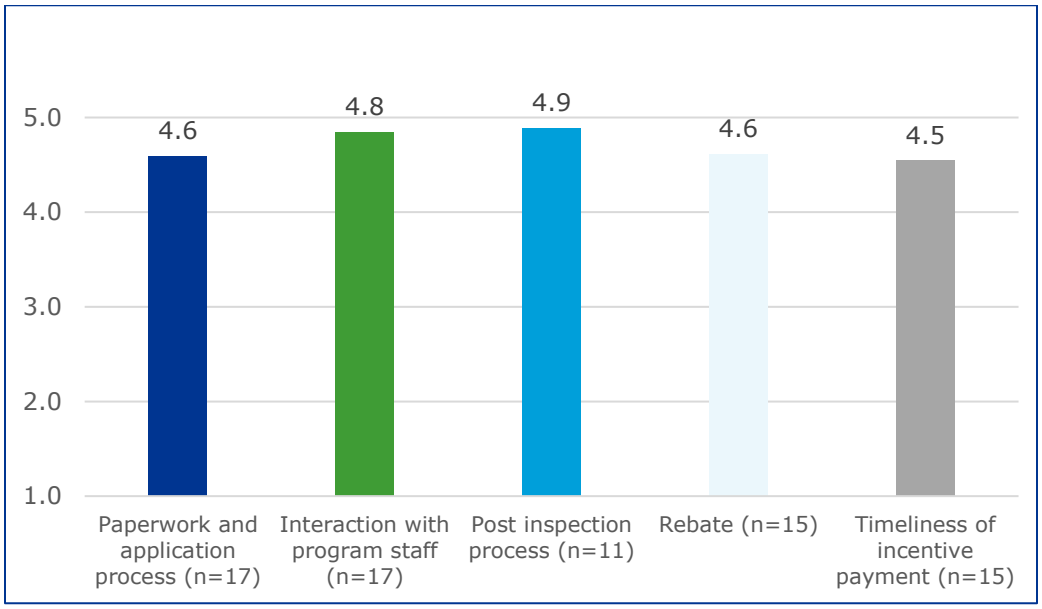
All other drivers were cited by four or few respondents.

5.6 Satisfaction with Program

Evaluators asked decision-makers about satisfaction with various program aspects using a 5-point scale, where 5 means "very satisfied" and 1 means "very dissatisfied." There were seven different aspects we covered, ranging from learning about the program all the way through program payment.

In Figure 13, we present participant satisfaction with five aspects of the program.[11] Based on ratings from respondents, satisfaction with different aspects of the program experience among decision-makers is very high. Participants give the post inspection process and interaction with program staff the highest satisfaction ratings, on average. We should note that in the five program aspects listed below, no respondents gave a rating less than 3 for any aspect.

Figure 13. Satisfaction with the Program



Interviewers asked respondents two open-ended questions on what aspects of the program went well and what aspects of the program needed improvement. We binned the responses into common categories across the respondents and present these results in Table 12. Based on decision-maker

[10] Respondents often cited the Evergreen Sustainable Design Standards which are a set of requirements for WA state funding necessary to qualify for affordable housing projects. For further details, see http://www.commerce.wa.gov/wp-content/uploads/2018/03/hfu-esds-v3.0.1.pdf .

[11] We do not include satisfaction with the program's lunch and learn presentation as too few respondents participated, and there were not enough respondents who received technical assistance or advice from program staff to include here.

responses, it is clear that participants had positive interactions with program staff as 9 respondents mentioned that program staff was helpful.

Table 12. Aspects of the Program that Worked Well

Aspects that Worked Well*	Respondents (n=13)
PSE staff was helpful	9
Ease of program	5
Amount of rebate	2
Early staff involvement	2

*Respondents were able to cite multiple aspects of the program that worked well.

While not all participants had suggestions for program improvements, 12 provided some thoughts on how the program improved. We binned responses into common categories and list respondents' suggestions for program improvements in Table 13. The most commonly mentioned program improvement was earlier engagement by program staff with participants (5 mentions). This provides further evidence that EDA could lead to a more improved program experience. Developing better collaboration between multiple utilities that offer new construction programs was another suggestion. Two respondents participated in the PSE and Seattle City Light new construction program and recommended standardization of program requirements and more collaboration between the utilities. To this point, one respondent recommended "A standard model requirement that is acceptable for both programs such as the models used for LEED or Living Buildings," and "a process that identifies the complements and differences" to help them prepare for meeting both program requirements. The collaborative process could benefit PSE by resulting in additional project opportunities.

Some additional suggestions we captured throughout the interview process include the following:

- PSE program staff having a direct role in the payment delivery process or an ability to track the incentive payment
- Fewer staff changes, and when these occur the customer doesn't have the burden of getting the new PSE staff up to speed
- Better cross coordination between PSE departments (e.g., coordination between PSE program staff involved with energy efficiency programs and PSE staff involved with electric vehicle charging stations or solar PV)

Table 13. Participant Suggestions for Program Improvements

Suggestions for program improvements*	Respondents (n=12)
Earlier engagement	5
Better communication of measure verification requirements	2
Collaboration with other utilities	2

*Some respondents cited more than one suggestion for program improvement.

While the MFNC program appears to have high customer satisfaction due to ease of participation, it also shows signs that participating market actors are engaging in the program too late for it to have a significant impact on the measure selection. It is likely that the existing program design may not require sufficient project savings for long-term program viability. Participants cited incentives as the primary reason for participating in the program (as mentioned above in Section 5.5), but half of respondents also said that the incentives did not impact measure selection. This reveals a program risk going forward—as baselines increase through code updates and markets evolve, savings through incentives will become harder to claim and without other added value, participation is could drop.

Early Design Assistance should help get decision-makers involved earlier and have a larger impact on measure selection. Furthermore, PSE could utilize this new program feature to conduct embedded participant surveys at the earliest phase of program engagement. Results from the surveys would help to monitor and refine the overall program design going forward. There will certainly be a market for MFNC construction in coming years and understanding the potential added value that PSE can provide through their MFNC will provide feedback for ongoing program design support.

5.7 Barriers to Program Participation

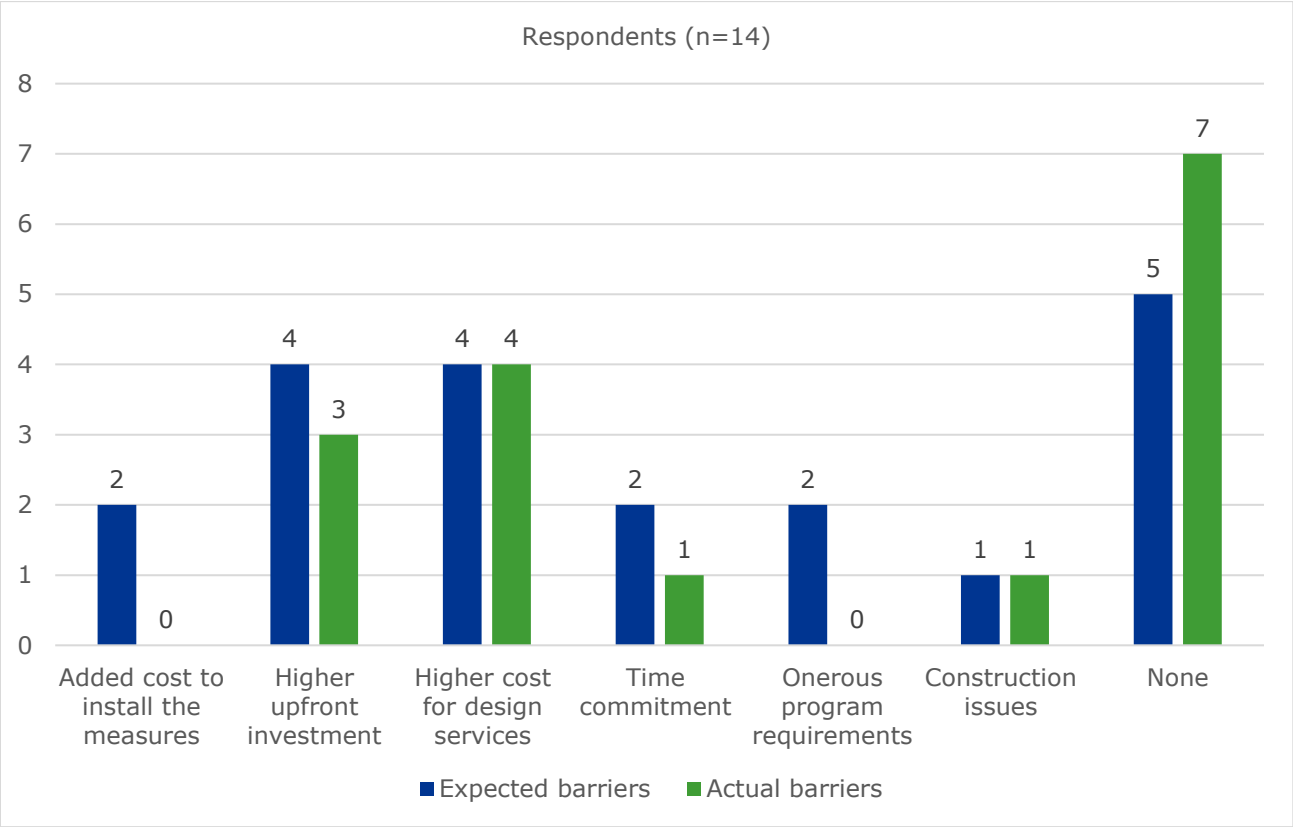
Respondents were asked a multi-response, two-part question on whether there were preconceived (*expected*) barriers to program participation, such as an expectation that participating would result in higher cost to install the measures, and if those expectations were *actual* barriers they experienced in their participation in PSE's program. Respondents were asked to consider the following possible barriers:

- Added cost to install the recommended measures
- Higher upfront investment – cash flow before the rebate comes in
- Higher cost for design services to interact with the program
- Time commitment to interact with program (e.g., could have slowed down project)
- Convincing other project decision-makers
- Insufficient savings/payback not favorable
- Lack of interest
- Long duration
- Onerous program requirements
- Poor prior program experience
- Construction issues
- Tax benefits and financial arrangements for low-income multifamily housing
- Eligibility limitations

We present the expected program barriers versus actual barriers experienced by respondents during their program participation in Figure 14. As shown, half of the 14 respondents who answered the question did not experience any barriers during their participation in the program. This may be, in part, due to repeat participation as customers become more familiar with the program. The only barriers actually experienced by more than one respondent was higher cost for design services (4 mentions) and higher upfront investment (3 mentions). The fact that half of the respondents did not

experience any barriers and there were few mentions of other barriers actually experienced is evidence that the program is working well and is being implemented effectively.

Figure 14. Expected Versus Actual Barriers Experienced during Program Participation



Interviewers also asked respondents for suggestions to increasing program participation. Their suggestions were as follows:

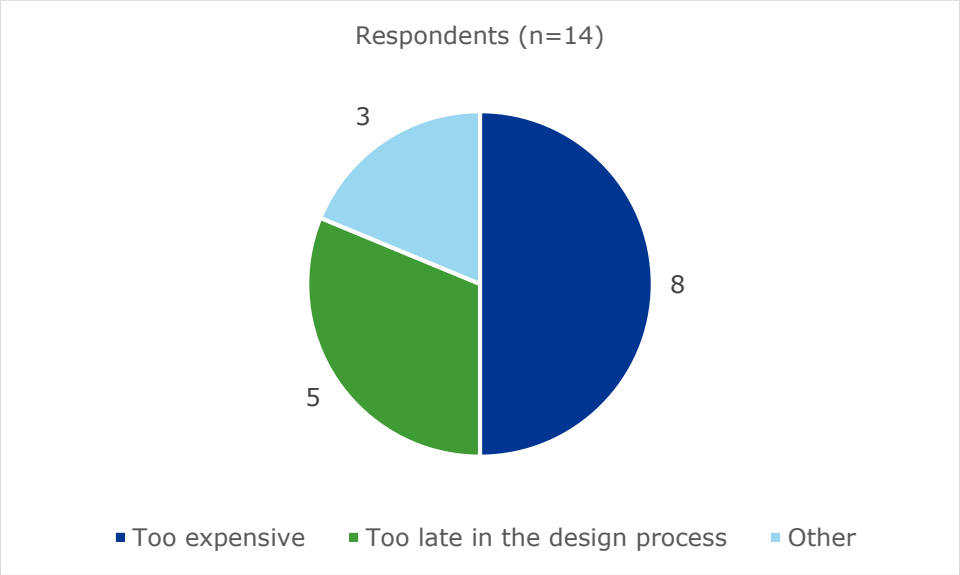
- More marketing and outreach (5 mentions)
- Having program staff involved earlier in projects (4 mentions)
- Providing a clear demonstration of cost savings (2 mentions)
- Offering program incentives for cutting-edge technology (1 mention)

Along with increasing marketing and outreach, respondents again mentioned that having program staff involved earlier in projects would ultimately benefit the program and help increase program participation.

5.8 Missed Savings Opportunities

Respondents were asked why they did not design projects with greater energy savings given that program incentives were available for additional measures to help offset costs. Figure 15 lists the reasons why respondents opted to not to install additional program-qualifying measures. Of the 14 participants who responded to the question, more than half (8) cited cost as the primary reason for not installing additional measures. Notably, more than one third of respondents (5) said that it was too late in the design process to install additional program qualifying measures, underscoring the importance of early involvement from program staff in the design process.

Figure 15. Reasons for Not Installing Additional Program-Qualifying Measures



Respondents were asked whether there are any energy-efficient technologies or services that the program is not currently offering that they should be supporting. Half of the 16 respondents believed that there should be additional measures or services offered. When asked what measures or services the program should offer, respondents mentioned the following:

- Solar PV (3 mentions)
- Super high-efficiency window (e.g., triple pane) or shell improvement measures (2 mentions)
- Electric vehicle (EV) charging stations (1 mention)

Adding high-efficiency shell improvement measures to the program and coordinating within PSE to explore additional measures that go beyond energy efficiency, such as incentives for solar panels and EV charging stations could make the MFNC more attractive with larger packages of incentives.

5.9 Marketing and Outreach

In speaking with program implementers at CLEAResult, we were able to probe for details on the types of marketing and outreach they do to promote the MFNC program. After taking over the program in 2018, the implementers discovered that there was little awareness of the program among builders in the community. Because of this, the implementation team was engaged in doing proactive outreach,

including calls to prospective participants, lunch-and- learn presentations, and other events to raise the level of awareness of the program. Based on this experience, the implementation team learned that this type of proactive recruitment was effective at increasing program awareness and, ultimately, program participation. The team also noted that passive recruitment efforts, such as waiting for inquiries through the program's website, were not effective.

The implementation team also has been trying to expand program awareness and participation outside of King County where most of PSE's MFNC program projects are built. They coordinated with PSE's team of community outreach managers who are responsible for outreach throughout PSE territory, including communities outside of King County. This effort has led to opportunities or potential opportunities in Whatcom County near the Canadian border and in Olympia in Thurston County.

In response to the COVID-19 pandemic, the implementation team has had to adjust their education and outreach strategies by conducting virtual lunch and learn presentations and attending virtual industry events, such as the Passive House Northwest Conference, as well as smaller virtual events.

As detailed in the program implementation manual, the implementation team has performance metrics and goals to track its marketing and outreach efforts. In addition to hosting virtual lunch-and-learn presentations and attending industry events, the team attempts to have at least one call a week with a new lead. In general, the implementation team has been successful at growing the program, but also must contend with the negative impacts from the pandemic, which include occasional disruptions in the new construction supply chain and a potential slowdown in the new construction market.

5.10 Next-Generation Program Opportunities

We asked respondents whether they would be interested in a service offering of design support for high-performance buildings, such as passive design buildings. Among the 15 respondents who answered the question 12 said that they would be interested or might be interested in this service offering. Some respondents elaborated on their interest in this service offering and shared these thoughts:

> *"We looked at this early in the design phase (passive housing is very common in Scotland). I think the program needs to go in this direction."*
>
> *"This is a good idea, and the fact that there is an incentive built in would help."*
>
> *"We wouldn't want to add another layer of analysis. If PSE establishes the goal, we can figure out how best to do that."*
>
> *"The state is going to follow building codes like California, and our mindset is that we're ready for energy efficiency."*

Given this level of interest and the opportunity for deeper savings, the program might consider offering incentives and support for high-performance buildings in the future. As the state of Washington pursues ambitious carbon reduction goals, PSE may also wish to consider the MFNC program as an opportunity to electrify space and water heating end-uses in new construction. Furthermore, the interplay between codes and energy efficiency programs is constantly evolving and

making it ever-more difficult to find energy efficiency savings above code. The MFNC program has the potential to operate in synergy with improving codes and standards.

6 FINDINGS AND RECOMMENDATIONS

We present our findings and recommendations below.

6.1 Findings

1. The overall level of documentation found in the CLEAResult project folders was very good. Aside from a few minor inconsistencies, which were mostly resolved after follow-up documentation requests were addressed, the project documentation allowed for a straightforward and complete verification effort.

2. Participants expressed a high level of satisfaction with the program and many are repeat participants. Based on responses from decision-makers, they had positive experiences with the program and program staff.

3. While decision-makers experienced high levels of satisfaction, several also mentioned that they became involved with the MFNC program relatively late after the design phase was underway or completed. This may have ultimately led to missed savings opportunities for the MFNC program. Identifying practical ways to engage projects earlier in the process is an important, but difficult challenge that all new construction programs face. Examples of possible savings opportunities available with earlier intervention include shell measures, such as increased insulation.

4. Code will be changing in February 2021. CLEAResult is planning for this change by revising the point system used to calculate savings. The point system mirrors the system used in the state energy code and allows the program to remove points, corresponding to energy savings, already required by code. CLEAResult plans to re-run its previous analysis using the new measures and point credits given in the Efficiency Package Credits table in the new code. We reviewed CLEAResult's methodology for calculating savings and believe that its updated point system will produce reasonable results.

5. When it is cost-effective, the program could offer deeper energy saving measures. PSE MFNC program staff are already pursuing this by considering incentives for high-performance buildings, such as passive design buildings that focus on building shell improvements, and we support this effort. Participants said that in many cases they would have installed program measures without program support and that many of the program measures they installed are already industry standard practice. Interviews indicated that there is interest in incentives and/or design support for high-performance buildings. The Washington state energy code, due to take effect in February 2021, will increase the energy efficiency baseline necessitating deeper energy efficiency for program participants. The interview responses paired with the code changes indicate that the time is right for increased program design assistance and incentives for new energy efficiency technologies, while some older energy efficiency measures may need to be retired.

6.2 Recommendations

2. While project documentation was very good overall, there are still opportunities for improvement. We recommend that builders delay removal of the labels of the windows' U-value ratings until verification photos of newly installed windows are taken. CLEAResult is aware of this issue and is already working to improve this process.

3. Several decision-makers mentioned that they did not become involved in the MFNC program until after the design phase was underway or complete, resulting in lost savings opportunities for building shell measures, such as increased levels of insulation. This underscores the importance of PSE's early design assistance (EDA), which was added to the program in 2020. PSE should aggressively promote EDA going forward and recruit participants as early as possible. This would provide the opportunity to achieve deeper savings per project and greater savings overall.

4. A more stringent code will go into effect in February 2021, and CLEAResult is adapting the program design to align with this code accordingly. We suggest the MFNC program expand its offerings to include measures listed in the energy efficiency section of the new code, including high-performance service water heating and dedicated outdoor air system measures. This would also be in keeping with participant interests. While participants expressed satisfaction with the program, they also indicated that they would have interest in participating in a more cutting-edge program that offers more emerging technologies. This will require earlier project identification so the program can influence the project during the design phase.

5. CLEAResult is planning to update their prototypes to accommodate new code changes. To evaluate cost-effectiveness and support for deeper-savings measures, it may be useful for CLEAResult to additionally develop a set of prototypical simulation models that incorporate measure combinations for deeper savings. These models would not only identify which combinations are cost-effective, but CLEAResult could use these models to demonstrate the payback of these deeper-saving measure combinations to potential participants.

6. Electrification is expected to accelerate in Washington state. The MFNC program saw uptake of in-unit ductless heat pump and heat pump water heater measures, and we expect even more uptake of these measures going forward. CLEAResult should lower the heat pump water heater deemed energy savings value by substituting assumptions from program data into Regional Technical Forum equations. For buildings with centralized water heater systems, a heat pump water heater system measure could be developed for inclusion in the program.

7 APPENDICES

7.1 Appendix A: Sample Design and Results Extrapolation

7.1.1 Sample Design

The Puget Sound Energy (PSE) Multifamily New Construction program had 44 projects that claimed savings during 2019. Based on tracking data, 38 of the projects were market rate projects (86% of the 44 projects) and 6 of the projects (14%) were considered affordable housing projects.[12]

To calculate the gross savings of the program, the evaluation team designed the sample to achieve +/-10% relative precision at the 90% confidence level on the final estimate of gross savings. In order to achieve this relative precision, an assumed error ratio of 0.40 was used, based on previous experience evaluating similar programs and the defined level of rigor (low). Table 14 shows the 2019 MFNC project population and sample sizes for estimating gross savings stratified by affordable and market rate projects. The market rate stratum was designed to target an overall relative precision of savings of +/-10%. Due to the small population size of the affordable housing program (n=6), the evaluation team targeted a census of these projects.

Table 14. Target Precision of Sample Design for 2019 MFNC Program Gross Savings

Program	Population	Tracking Savings (Source kBtu)	Error Ratio	Sample	Expected Relative Precision
Affordable	6	2,391,214	0.4	6	0.0%
Market Rate	38	36,843,100	0.4	15	10.4%
Total	**44**	**39,234,313**	**0.4**	**21**	**9.8%**

Table 15 shows the more detailed stratification of the project population in the original sample design, including number of sample points per stratum, and inclusion probability for the 2019 MFNC program sample design. Market rate projects were further stratified into four substrata based on project savings. Projects in market rate substratum 1 had the smallest savings and market rate and substratum 4 projects had the largest savings. Affordable housing projects were also stratified by project savings, but divided into only two substrata, with sub-stratum 1 having projects with the smallest savings and sub-stratum 2 the highest savings.

[12] The tracking data reviewed by the evaluation team had 38 market rate projects and 6 affordable projects, and thus, the sample design was based on this breakdown of projects. During a call with CLEAResult on August 20, 2020 (after calls with decision-makers began), the program implementers discovered an error in the tracking data whereby one project that was originally classified as market rate should have been classified as affordable. Thus, the actual project population of projects is 37 market rate projects and 7 affordable projects. We describe this in further detail in Section 7.1.2.

Table 15. Sample Design Stratification

Program	Sub-Stratum	Maximum (Source kBtu)*	Population	Tracking Savings (Source kBtu)^	Sample	Inclusion Probability
Affordable	1	364,469	5	1,163,176	5	1.000
Affordable	2	1,228,038	1	1,228,038	1	1.000
Market Rate	1	567,993	20	6,120,221	4	0.200
Market Rate	2	1,222,563	9	7,775,580	4	0.444
Market Rate	3	1,664,526	6	8,426,393	4	0.667
Market Rate	4	7,846,512	3	14,520,905	3	1.000

*Maximum kBtu is the upper bound of kBtu claimed savings within a given substratum for an individual project within that substratum. For example, there are 5 projects in affordable, substratum 1. Among those 5 projects, the largest savings produced by an individual project was 364,469 kBtu.

^Tracking savings are the total kBtu claimed savings for a given substratum.

7.1.2 Results Extrapolation

Table 16 and Table 17 present the results of the measure verification and measure documentation review, respectively (see Section 4.2 for further details on the measure verification and measure documentation review). The tables include the revised population summary statistics as well as the targeted versus achieved sample sizes and gross savings relative precisions. During the course of the project review, one of the projects that was originally identified as a market rate project was recategorized as affordable housing project. For this reason, the affordable housing stratum, which was designed to be a census, instead had 6 of 7 projects contacted via the telephone survey in the measure verification analysis. Although this stratum was designed to be a census due to the small number of projects in the program, with six of the revised seven projects surveyed, the estimates for the measure verification are still within the level of rigor established for this evaluation.

Because all of the projects in the sample were verified and the documentation was sufficient, the overall realization rate was 100%. Because this realization rate was the same for every point in the sample, there is not any variation in the estimate of gross savings, so there is no uncertainty in the estimates, meaning that the achieved relative precision on the gross savings estimates is 0.0% for each group.

Because the verification rate of 100% is an estimate based on a population proportion, it is possible to use an alternative approach to estimate a lower confidence limit on that rate. Note that we cannot express this as a traditional relative precision with a "plus or minus" amount, since the estimate of the verification rate, 100%, is the maximum value possible. By examining the samples and calculating the probabilities of the unsampled customers having different outcomes on the verification, we can say with 90% confidence that the true verification rate is between 87% and 100% for the market rate stratum. For the affordable stratum, we know with certainty that the verification rate is either 85.7%

or 100%, because the measures of the one affordable housing project that was not included in the sample were either installed or not installed.

Table 16: Achieved Sample and Precision for Measure Verification

Program	Population	Tracking Savings (Source kBtu)	Error Ratio	Target Sample	Achieved Sample	Target Relative Precision	Achieved Relative Precision
Affordable	7	3,675,153	0.4	6	6	0.0%	0.0%
Market Rate	37	35,559,161	0.4	15	13	10.4%	0.0%
Total	**44**	**39,234,313**	**0.4**	**21**	**19**	**9.8%**	0.0%

Table 17: Achieved Sample and Precision for Measure Documentation

Program	Population	Tracking Savings (Source kBtu)	Error Ratio	Target Sample	Achieved Sample	Target Relative Precision	Achieved Relative Precision
Affordable	7	3,675,153	0.4	6	7	0.0%	0.0%
Market Rate	37	35,559,161	0.4	15	18	10.4%	0.0%
Total	**44**	**39,234,313**	**0.4**	**21**	**19**	**9.8%**	0.0%

7.2 Appendix B: Data Collection Instruments

7.3 Appendix C: Additional Considerations

We present additional considerations for program improvement below.

1. Roughly 60% of the program's electric savings comes from parking garage lighting, exterior lighting, or other common-area lighting measures not subject to the same compliance reductions that the unit-level lighting and other electric measures are subject to. All non-residential lighting measure savings estimates are based on applicable Washington state energy code lighting power allowance baselines. The more recent commercial lighting measure workbooks all state that a minimum 20% savings threshold is required for grant eligibility, yet all of that 20% savings is included when calculating the incentive. Though this is accurate from a code baseline perspective, PSE should consider using a standard practice baseline.

   PSE should consider performing a new construction lighting code compliance review and consider applying a compliance reduction factor to the non-residential Lighting Power Allowance values allowed by code. PSE could consider revising the current 20% savings grant eligibility requirement to become the new adjusted baseline for claiming non-residential lighting savings and calculating incentives moving forward, then modify the adjustment factor based on code compliance review findings. This would make commercial lighting incentives more consistent with the residential code, which includes a compliance reduction factor, leading to deeper savings. This additional consideration may ultimately be rendered moot, however, as the new code goes into effect in February 2021.

2. PSE MFNC program staff are already considering incentives for high-performance buildings, such as passive design buildings that focus on building shell improvements, and we support this effort. New construction represents a window of opportunity to install shell measures because upgrading building shells post-construction is much more difficult to accomplish. Therefore, encouraging implementation of high-efficiency building shell measures is particularly important in new construction programs. There is a growing movement of passive house builders in the Pacific Northwest, as demonstrated by their 2018 annual conference at which presenters showed that multifamily passive house structures cost only 2-5% more than structures built to code. PSE incentives could help this growing movement to expand further.

3. PSE should consider coordinating with other groups within its organization and offer incentives for EV charging stations and PV packaged together with the energy efficiency measure incentives it already offers. Practical considerations, such as program subscription limits, will need to be overcome to make this possible. If successful, such coordination would create a larger package of incentives which would be more attractive to builders and may lead to higher program participation.

Evaluation Report Response

Program: Multifamily New Construction

Program Manager: Amit Singh

Study Report Name: Evaluation of the 2019-2020 Multifamily New Construction Program

Report Date: February 25, 2021

- **Contents:**
- Evaluation Report
- PSE Evaluation Report Response

Recommendations

1. While project documentation was very good overall, there are still opportunities for improvement. We recommend that builders delay removal of the labels of the windows' U-value ratings until verification photos of newly installed windows are taken. CLEAResult is aware of this issue and is already working to improve this process.

Response

- CLEAResult will let the project contact know that window stickers should remain on until the inspection. Also, CLEAResult will pursue obtaining alternative verification of window U-values, such as a window order packing slip or invoice. CLEAResult has been using invoices as an alternate verification method for programs with other utilities since 2019.

2. Several decision-makers mentioned that they did not become involved in the MFNC program until after the design phase was underway or complete, resulting in lost savings opportunities for building shell measures, such as increased levels of insulation. This underscores the importance of PSE's early design assistance (EDA), which was added to the program in 2020. PSE should aggressively promote EDA going forward and recruit participants as early as possible. This would provide the opportunity to achieve deeper savings per project and greater savings overall.

Response

- While the program introduced EDAs during the 2018-2019 cycle, it took some time to get off the ground. During the 2020-2021 program cycle, we have seen increased uptake of EDAs, with seven completed in 2020. Moving forward, we plan to continue promoting EDA as the first and best step for projects to take. Additionally, as we continue to develop relationships with developers, we will be able to engage them earlier on in the construction planning process.

- Most of the EDA uptake so far has been from affordable housing projects. CLEAResult suggested the following strategies to increase EDA uptake from market-rate developers:
    - Increased periodic outreach to past program participants to update them on program offerings and ask about new or upcoming projects. We have seen success in EDA participation by asking contacts with an existing enrolled project what they are working on next.
    - Improved access to project data. Earlier, timely outreach to projects in schematic design via Dodge Analytics subscription information. The Dodge Analytics report provides contact information and construction stage for new construction projects.
    - Utilization of a long-term cost savings tool to illustrate the financial benefit of choosing energy efficiency measures (outside of the one-time cash incentive).
    - Pilot an offering with cities with highest new construction rates on expedited permitting if projects complete an EDA. For example, ETO worked with the Portland Housing Bureau to include EDAs as a mandatory piece of their Green Building Policy. Consider developing similar policies with cities or counties that we serve.

3. A more stringent code will go into effect in February 2021, and CLEAResult is adapting the program design to align with this code accordingly. We suggest the MFNC program expand its offerings to include measures listed in the energy efficiency section of the new code, including high-performance service water heating and dedicated outdoor air system measures. This would also be in keeping with participant interests. While participants expressed satisfaction with the program, they also indicated that they would have interest in participating in a more cutting-edge program that offers more emerging technologies. This will require earlier project identification so the program can influence the project during the design phase

Response

- The MFNC program workbook now includes a dedicated outdoor air system (DOAS) measure, and we've had one project submit for a central heat pump hot water system through the PSE Custom Grant pathway.
- While solar and EV charging don't necessarily fall under the energy efficiency umbrella, as more building start to pursue these options, it would make sense for the MFNC program to collaborate more with the PSE departments that oversee solar and EV infrastructure.

4. CLEAResult is planning to update their prototypes to accommodate new code changes. To evaluate cost-effectiveness and support for deeper-savings measures, it may be useful for CLEAResult to additionally develop a set of prototypical simulation models that incorporate measure combinations for deeper savings. These models would not only identify which

combinations are cost-effective, but CLEAResult could use these models to demonstrate the payback of these deeper-saving measure combinations to potential participants.

Response

This concept will be discussed with CLEAResult for the next program cycle (2022-2023). We agree that adding a cost-savings component to the multifamily calculator would be beneficial for projects.

5. Electrification is expected to accelerate in Washington state. The MFNC program saw uptake of in-unit ductless heat pump and heat pump water heater measures, and we expect even more uptake of these measures going forward. CLEAResult should lower the heat pump water heater deemed energy savings value by substituting assumptions from program data into Regional Technical Forum equations. For buildings with centralized water heater systems, a heat pump water heater system measure could be developed for inclusion in the program.

Response

- The MFNC workbook already applies an adjustment to the RTF assumption for number of people in the household. RTF assumption is 2.57 persons per household, and the program adjusts that to 80% (HH size of 2.07) based on 2015 RECs data.
- For the central heat pump water heater system, we will continue to incentivize that through the Custom Grant pathway, with hopes to integrate it into the MFNC workbook after we have sufficient data to establish deemed savings values.