Draft Report

Evaluation of the MPower Pilot

March 18, 2016

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Executive Summary

This report summarizes an evaluation of the MPower Pilot (the Pilot), which Research Into Action conducted in 2015 - 2016 on behalf of Energy Trust of Oregon (Energy Trust). The evaluation documents the evolution of the Pilot and assesses the effectiveness of the Pilot delivery model from stakeholder and customer perspectives. To complete the evaluation, the team conducted four data collection activities:

- Review of Pilot documents, materials, and project data,
- Interviews with 14 key Pilot stakeholders,
- Interviews with seven Pilot participants who completed a Pilot project, and
- Interviews with three partial Pilot participants who started but did not complete a Pilot project.

The team will also review the Pilot energy savings analysis performed by Energy Trust when it becomes available in second quarter of 2017. The team will summarize the results from the review in an addendum to this report upon completion of the review.

Below, we present a brief description of the Pilot. Next, we outline the key findings from the evaluation. Last, we present our overall conclusions and recommendations.

The MPower Pilot

Stakeholders developed the Pilot with the common goal of providing low-income multifamily building owners in Oregon with services to overcome existing market and program barriers to making comprehensive energy- and water-efficiency upgrades. Key perceived barriers included:

- A resource-constrained and highly regulated market, in which owners often do not have the funds for making comprehensive energy upgrades or the resources needed to manage an upgrade project while adhering to multiple regulations.
- A split-incentive issue in buildings in which tenants pay their own utility bills (tenant-metered buildings); building owners have a disincentive to pay for upgrades in tenant units since the resulting energy savings accrue to the tenants and not the owner who paid for the upgrades.
- An absence of a program in Oregon that provided a comprehensive package of services designed specifically to overcome these market barriers.

Stakeholders aimed to integrate existing services in the market into the Pilot, develop any new services that would be needed, and provide all the services in a streamlined fashion to participants through a single organization, MPower Oregon LLC (MPower Oregon). Key stakeholders involved in designing and implementing the Pilot included organizations from the

low-income multifamily housing, energy and water efficiency, finance, and community development sectors in Oregon and around the U.S. All the key stakeholders provided in-kind staff support, and several contributed funding. The Pilot's services and the key stakeholders involved in each included:

- Consultation with participants provided by MPower Oregon staff regarding the Pilot processes, participation eligibility and potential upgrades, with support from Energy Trust and the Network for Oregon Affordable Housing (NOAH).
- Walk-through assessment of the building provided by MPower Oregon staff to identify specific upgrades and estimate energy savings and costs.
- Design and verification of the upgrade project, including developing a scope of work, performing a comprehensive building assessment, and managing a project timeline, provided by MPower Oregon staff with assistance from Enterprise Community Partners (ECP) and Energy Trust and its Existing Multifamily program management contractor, Lockheed Martin, as well as Evergreen Consulting Group and Allied Technical Assistance Contractors (ATACs).
- Financing of upgrades through a combination of a 10-year unsecured loan from Craft3 and lenders, grant funds from the U.S. Department of Housing and Urban Development (HUD) and other organizations, and incentives for eligible upgrades from Energy Trust's Existing Multifamily program, all provided through NOAH, the Pilot Fund manager, to MPower Oregon.
- Coordination with participants to hire contractors to install the upgrades and construction management, provided by MPower Oregon staff, as well as quality assurance verification that the Energy Trust incentivized energy upgrades were installed as expected, provided by Energy Trust's ATACs.
- Tenant engagement surveys, activities, and materials (see Appendix C) regarding use of the installed upgrades and energy-saving behaviors, provided by MPower Staff with support from ECP upon project completion and annually throughout the Pilot's 10-year service agreement.
- Periodic measurement and verification (M&V) of energy and/or water savings , and check-ups on the installed upgrades throughout the Pilot's 10-year service agreement provided by MPower Oregon staff.
- Planned for the future, on-bill repayment of the Pilot loan provided by utilities with assistance from Craft3, Energy Trust, and MPower Oregon staff, through a service charge on the utility bills of owners, which stakeholders estimated would be lower utility pre-Pilot.[1]

[1] Stakeholders planned to provide the on-bill loan repayment service at the Pilot's launch but it was still under development at the time of this evaluation; stakeholders plan to offer it to past and future participants when it becomes available.

To be eligible for participation in the Pilot, buildings had to be rent-restricted affordable housing and able to achieve 20% or higher energy savings with a 10-year or less payback for installed upgrades, as required by a two-year HUD grant awarded to the Pilot. Comprehensive investment-gradebuilding assessments had to be performed in buildings to estimate energy savings as accurately as possible, as required by financial stakeholders and lenders for loan approval. Building owners also had to sign a 10-year service agreement granting MPower Oregon limited access to the property and utility billing data to measure and verify savings, perform check-ups on the upgrades, and provide tenant education services.

To be eligible to receive Energy Trust's Existing Multifamily program incentives through the Pilot, participating buildings' primary heat source must have been provided one of the following utilities: Portland General Electric (PGE), Pacific Power, or NW Natural. In addition, the Pilot project must have included an eligible energy or water upgrade, which included:

- common area lighting fixtures, bulbs, and controls;
- refrigerators, clothes washers and dryers, and toilets;
- heating, cooling, and ventilation (HVAC);
- domestic water heating;
- doors and windows, weatherization, and air sealing;
- energy management systems;
- irrigation and landscaping; and
- free showerheads, faucet aerators, and LED light bulbs directly installed in tenant units through Energy Trust.

Stakeholders conceived the idea for the Pilot in late 2010 and officially launched the Pilot in mid-2013. In the interim, stakeholders designed and built the Pilot model and processes, obtained Pilot funding from the two-year HUD grant and other contributing organizations, and designated the Pilot as an Energy Trust pilot initiative to leverage Energy Trust's support, services, and incentives into the Pilot model. After the Pilot's launch, stakeholders implemented the Pilot for about two and a half years until its conclusion in December 2015.

Key Findings

Participant Characteristics

- Twenty-eight buildings with a total of 2,321 units completed Pilot projects between June 2014 and December 2015. Over half of participating buildings (15) were located in the Portland Metro area and the remainder were in metropolitan areas in southwest and central Oregon. Participating buildings varied in size, with between 9 and 286 units, and with an average of 83 units. Most of the participating buildings (20) were tenant-metered,

in which tenants receive and pay their own utility bills, and the remainder (8) were master-metered, in which the owner receives and pays tenants' utility bills.

- The total project costs for all participants was about $10.3 million, with a range of over $5,000 to over $1 million per project, an average cost per building of nearly $400,000, and an average cost per unit of nearly $4,500. All participants received grant funds and Energy Trust's Existing Multifamily incentives, which, combined, covered an average of 27% of project costs, and over half (15) used the Pilot's unsecured loan, which covered an average of 27% of project costs. The remainder of project costs, an average of 46% of total project costs, were covered by participants' own contributions, which nearly all participants (25) made.
- The most common upgrades installed in the 28 Pilot projects were lighting upgrades, faucet aerators, ventilation upgrades, showerheads, heating/cooling upgrades, domestic hot water upgrades, water closets, appliances, and insulation (Table 4-5). Less common upgrades included doors, windows, weatherization, water conservation landscaping, and programmable thermostats. Projects received an average of 7.6 types of upgrades, and master-metered buildings received one more upgrade, on average, than tenant-metered buildings (8.5 vs. 7.3).

Pilot Awareness and Motivations to Participate

- All interviewed participants learned about the Pilot through outreach performed by the stakeholders. Participants were motivated to participate because the Pilot's services and financing reportedly provided them with needed resources and upgrades to improve their buildings, often through supplementing or enhancing planned rehabilitation or capital improvement projects, and reduce operations costs and maintenance needs.
- Stakeholders were motivated to participate in developing and/or implementing the Pilot because its goal of supporting energy and water efficiency upgrades in low-income multifamily buildings aligned with their respective organizations' missions.

Reasons for Not Participating and Interest in Future Participation

- Partial participants and participants reported two main challenges with participating in the Pilot. First, one partial participant's building, and one prospective participant's building that did not participate , could not meet the 20% savings requirement without upgrades that they thought were too costly at the time. Second, one partial participant, and one participant with a building that did not participate, wanted enough upgrades installed to justify waiting to participate in the Pilot until they planned a larger rehabilitation or capital improvement project in the future.
- All four of the partial participants and participants with additional buildings not receive upgrades were open to future participation in the Pilot and reportedly had sufficient information on the Pilot's requirements and benefits to know when participating would be advantageous. Two of them said they would approach MPower Oregon once they had

site rehabilitation projects planned and two others mentioned plans to work with MPower Oregon for identifying energy efficiency opportunities at some of their other buildings.

Major Changes to the Pilot

Throughout the development and implementation of the Pilot, stakeholders made major changes in an attempt to improve Pilot building assessment, financing processes, and streamline the Pilot's structure. Stakeholders also made a substantial change to the stakeholder group before launching the Pilot.

- Stakeholders had not established the on-bill repayment service with involved parties by the time the first participants were ready to participate. The participants needed a loan through the Pilot to move the project forward so stakeholders created the unsecured loan product that with a 10-year payback and no upfront costs. Since the loan was not secured by the property as collateral, lenders required accurate energy savings estimates for assurance that the savings would materialize. Stakeholders were unable to establish the on-bill repayment service during the Pilot period due to complications with reaching agreements between utilities, Energy Trust, MPower Oregon, and financial stakeholders.
- Before the Pilot's launch, MPower Oregon tested the building assessment they initially designed for the Pilot, determined it was too complex, and did not result in any buildings meeting the Pilot's energy savings and payback requirements. A working group of stakeholders revised the assessment and stakeholders performed the revised assessment in the first Pilot participants' buildings. Stakeholders determined the assessment was still too complex and time consuming, and resulted in few Pilot projects qualifying for participation. MPower Oregon then changed MPower Oregon's energy savings requirement to apply to the participant's portfolio of projects instead of individual projects to qualify more projects with the assessment. They also changed the process so that stakeholders performed a less rigorous walk-through assessment first, developed a work scope second, and then performed the comprehensive assessment to verify the work scope met the Pilot's requirements. In addition, Energy Trust designated MPower Oregon as one of its ATACs so that the latter could deliver the required energy analysis components of the assessment necessary for Energy Trust's Existing Multifamily review purposes directly to Energy Trust's program management contractor, while at the same time MPower could also simultaneously manage its subcontracted engineering firm to deliver any additional analysis specific to MPower Oregon's building assessment needs directly to MPower Oregon.
- Blue Tree Strategies served in a leadership role among the stakeholders involved in the Pilot and, before the Pilot's launch, quickly transitioned its leadership role to the newly created MPower Oregon organization. Stakeholders reported this transition occurred at an inopportune time: they were making major changes to the building assessment and financing services, and MPower Oregon staff were still learning about managing the Pilot. This situation caused substantial strain among the stakeholders and resulted in a loss of progress and momentum and, ultimately, a long delay in the Pilot's launch.

Stakeholder Goal Attainment

Interviewed stakeholders reported attempting to meet four primary Pilot goals: 1) launching the Pilot with the first participant soon after HUD grant funds were awarded in July 2012, 2) demonstrating the Pilot's services were in demand and helped overcome existing market and program barriers, 3) meeting or exceeding the Pilot's project completion goals of 34 buildings and 2,550 units, and 4) meeting or exceeding the Pilot's 20% energy savings goals for each participant's portfolio of Pilot projects.

- The first participant was not qualified until July 2013, one year after the July 2012 goal, due primarily to the complications stakeholders experienced in developing a building assessment process, creating an alternative to the on-bill repayment service, and transitioning leadership to MPower Oregon during 2012 and 2013.
- Overall, the Pilot was mostly successful at generating demand for its services and reportedly helped participants overcome market and program barriers to making comprehensive energy- and water-efficiency upgrades. For example, interviewed participants reported that without the Pilot services and funds they would not have installed upgrades, or would have installed fewer and/or less efficient upgrades. In addition, none of the interviewed partial participants indicated that the Pilot's services were unattractive.
- At the end of the Pilot period, stakeholders had completed projects in 28 buildings with 2,321 units, reaching 82% of the project completion goal for buildings and 91% for units.
- After Energy Trust performs the energy savings analysis with the 28 completed projects, the team will determine if the Pilot met its 20% energy savings goals for these projects, and will include the results in an addendum to this report.

Key Stakeholder Challenges

The team identified four key interrelated challenges that occurred during the development and/or implementation of the Pilot. Interviewed stakeholders reported that these were the challenges that most inhibited their progress in developing the Pilot and attaining their goals, caused substantial strains in their collaboration when making changes to the Pilot, and led to delays in launching the Pilot and completing projects.

- Many stakeholders indicated that, in hindsight, engaging building owners earlier and performing building stock and market needs assessments would have provided them with needed information about building characteristics, building owners' needs, and the level of interest in Pilot services. Having more information about the target market would have reportedly enabled stakeholders to more efficiently design and build the Pilot's processes with fewer changes, particularly regarding the building assessments and financing services.
- Most stakeholders reported that designing, implementing, and continually improving the Pilot's processes required much more time and resources than initially anticipated or

planned. Energy efficiency stakeholders, in particular, reported that when other stakeholders were resource-constrained, they often turned to the energy efficiency stakeholders for assistance, which became unsustainable. Some stakeholders also mentioned that dedicating much of their time and resources to the Pilot's continuous improvement shifted time and resources away from other important tasks, such as outreach to more building owners and contractors and establishing on the on-bill repayment service.

- Energy efficiency and finance stakeholders reported difficulty in integrating their existing services into the Pilot. This was due to conflicts between regulatory and organizational requirements governing the stakeholders' services, and to other stakeholders having to learn these requirements and how to best work within them.
- Stakeholders also experienced difficulty in establishing the new on-bill repayment service for the Pilot. Integrating the on-bill repayment service with utilities' billing practices and systems, Energy Trust's data protocols and systems, finance stakeholders' underwriting practices and standards, and MPower Oregon's Pilot management systems required much more time than the Pilot period allowed.
- All stakeholders indicated that, after the Pilot was launched, they were confused, to some extent, about many of the Pilot's requirements and processes, and other stakeholder organizations' regulatory and internal requirements. This confusion reportedly stemmed from the large number of stakeholders involved in the Pilot and the multiple changes that were made to Pilot processes. Confusion among stakeholders reportedly led to some miscommunication and misunderstanding with other stakeholders, and required much effort to try update the group on a continual basis.

These challenges were in large part due to the complexity involved in a program in which multiple stakeholder organizations, operating under different regulations, collaborated to package their services together in a single offering tailored to an underserved, multifaceted, and little-understood market.

Key Stakeholder Benefits

- Stakeholders reported that their involvement in the MPower Pilot was beneficial because they developed new partnerships and learned about sectors outside of their own in their collaboration with other stakeholders. Stakeholders also benefited from what each stakeholder organization contributed to developing and implementing the Pilot.
- Stakeholders expressed that they benefitted from their experience in building a Pilot model from scratch and continually improving it throughout the Pilot period. Stakeholders also reported benefitting from the group's willingness and dedication to continually improve the Pilot as they encountered challenges. Although challenges remained at the end of the Pilot, stakeholders indicated that the Pilot likely would have foundered if stakeholders had not been so willing to collaborate through making major Pilot changes and improvements.

Participant Goal Attainment

Interviewed participants reported that their primary goals for participating in the Pilot were to improve their buildings, reduce maintenance costs, save energy and water, and provide non-energy benefits for tenants.

- Participants expressed overall high satisfaction with their completed projects, and thought that the upgrades were an improvement to their buildings and would reduce future maintenance needs.
- Four of the five interviewed participants with completed projects reported seeing energy savings right away, and one of these participants noted that the energy savings at the property exceeded the forecast. One interviewed participant reported lower than expected energy savings soon after completing the project, which they estimated at 10%, due to an increase in gas usage. MPower Oregon has continued to work with the participant to increase savings and, at the time of the interview, the participant estimated savings at 15%.
- All the interviewed participants reported at least one non-energy benefit resulting from the upgrades and received positive feedback from tenants in these regards. The non-energy benefits reported by participants included increased comfort in tenant units from air conditioning upgrades, noise reduction from insulation upgrades, and enhanced security from exterior lighting upgrades.

Key Participant Challenges

- Partial participants, and participants with other buildings that did not participate in the Pilot, reported difficulties in meeting the 20% savings requirement without including upgrades that they thought were too costly at the time.
- The first Pilot participants mentioned needing to dedicate more of their own or their staff's time to their Pilot projects than anticipated. Participants noted that this was primarily due to stakeholders improving the Pilot's processes, such as the building assessments and financing services, as they performed them. They also understood in advance of their participation that their projects were some of the Pilot's first and thus would serve as early test cases for the Pilot's processes.
- Some interviewed participants reported difficulty in making decisions about whether to participate in the Pilot and what upgrades to install based on the results from the building assessment report. These participants mentioned that the report was presented as a work scope that lacked information about potential upgrades not included in the work scope and the financial benefits of participating in the Pilot compared to participating only in Energy Trust's Existing Multifamily program. They preferred a report that presented "packages" of different upgrades, demonstrating the Pilot's benefit, which they could choose from to achieve 20% savings.

- Two interviewed participants had trouble in finding a contractor to install the upgrades. One participant outside the Portland Metro area received bids from only one contractor and would have preferred more choices. Another participant could not find a preferable contractor whose costs were as low as the estimates provided in the work scope, and reportedly had to pay more than anticipated.

Key Participant Benefits

- All interviewed participants with completed Pilot projects reported benefitting from the performance of the upgrades. Participants expressed that the upgrades contributed to mostly meeting their goals for participating in the Pilot.
- Participants reported benefitting from participating the Pilot's processes, particularly the financing services. For example, participants said that the financial services enabled them to install comprehensive upgrades that they otherwise could not have afforded and, for some participants, perform capital improvements or rehabilitations of their properties sooner than planned.
- Participants with tenant-metered buildings reported leveraging the Pilot's grant and incentive funds to offset costs to making upgrades in tenant units that they otherwise would not have made.
- Those participants who were involved in the tenant education activities reported learning how to teach tenants to use the upgrades and that the materials were helpful reminders to change behaviors.
- Participants mentioned benefiting from the Pilot's one-stop-shop model and MPower Oregon's staff. Interacting primarily with one organization, MPower Oregon, through the participation process reportedly saved participants time and made participation "mostly seamless." In addition, participants reported that MPower Oregon staff worked diligently to complete their projects and address issues that arose, and were flexible in planning Pilot projects along with other construction projects planned at their properties.

The Future of MPower

- At the conclusion of the Pilot in December 2015, there were 28 buildings that had completed projects, two active projects in the pipeline, and 24 partial participants who withdrew from participating in the Pilot but expressed interest in future MPower participation. However, two major changes occurred at the Pilot's conclusion that stakeholders reported must be addressed if MPower Oregon is to continue offering its services.
- First, the Pilot's designation as a pilot initiative under Energy Trust and MPower Oregon's status as an Energy Trust Allied Technical Assistance Contractor (ATAC) ended at the conclusion of the Pilot. ATACs are energy engineering firms that are utilized by Energy Trust's Existing Multifamily program on a limited basis to perform technical energy analysis of proposed custom energy efficiency measures. MPower Oregon's status

as an ATAC was limited to the Pilot period to improve coordination and delivery of the building assessments and analysis for Pilot projects. The conclusion of the Pilot and termination of ATAC status also concludes MPower Oregon's ability to access building owners' utility usage data through Energy Trust for the purpose of conducting the Pilot building assessments.

- Second, the HUD grant agreement that provided much of the Pilot's grant funding for projects ended in December 2015. All the participants used a combination of grants and incentives, and reported the availability of these funds as one of the reasons they participated, particularly for tenant-metered building owners who used the grant funds to offset the costs of tenant unit upgrades.

- All interviewed stakeholders expressed interest in continuing to work with MPower Oregon's program in the future if it can reach a cooperative agreement with Energy Trust and obtain the necessary funding to continue. Without these, stakeholders reported that the MPower Oregon's program would likely not be viable to continue. The energy efficiency stakeholders also mentioned that continued collaboration with MPower Oregon could be beneficial if MPower Oregon can manage the program and provide most of its services without as much assistance as was needed in the Pilot period.

Conclusions and Recommendations

The evaluation team reached the following conclusions and recommendations based on key findings from the evaluation. The first three conclusions and recommendations pertain to what would need to occur for MPower Oregon's program to continue in future as a program. The last three conclusions and recommendations were made with the assumption that MPower Oregon will continue to provide services to low-income multifamily properties.

Conclusion 1: The Pilot concluded in December 2015 and stakeholders reported interest in continuing to work with MPower Oregon and providing their services through MPower Oregon's program.

Recommendation 1: Energy Trust's Multifamily program should assess the value of continuing to work with MPower Oregon and its program.

Conclusion 2: The conclusion of the Pilot ended the agreements made between MPower Oregon and Energy Trust, which energy efficiency stakeholders reported as "unsustainable" due to the time and resources required of them. The expiration of the agreements concluded Energy Trust's provision of special support and services in the Pilot.

Recommendation 2a: If Energy Trust sees value in continuing to work with MPower Oregon, these two entities should reach an agreement that re-establishes the relationship the organizations shared during the Pilot period to continue providing the support and services required to utilize Energy Trust's Existing Multifamily upgrade incentives.

Recommendation 2b: An agreement between Energy Trust and MPower Oregon should establish a formal division of labor between MPower Oregon and Energy Trust that prevents

the latter from contributing more time and resources to Pilot projects than what is typically required of them for Energy Trust's Existing Multifamily program projects.

Conclusion 3: Grant funds for pilot projects were a key component of the Pilot's financing services that participants leveraged to offset the costs of upgrades, particularly tenant unit upgrades.

Recommendation 3: Identify and partner with one or more grant-funding organizations to achieve the level of grant funding that was provided during the Pilot to participants to continue uptake in participation.

Conclusion 4: Stakeholders reported that many of the challenges they encountered in the Pilot's implementation stemmed from the complexity of the Pilot's model, in which multiple stakeholder organizations, operating under different regulations, collaborated to package their existing services together into a single offering tailored to an underserved and little-understood target market.

Recommendation 4a: Consider performing building stock and market needs assessments of the target market and using the results to inform decisions on what, if any, future improvements to make to the MPower Oregon's program to increase participation.

Recommendation 4b: Assess ways to streamline the MPower Oregon's processes and structure to enable stakeholders to more seamlessly provide their services through the program, as commensurate as possible with how the stakeholders provide their services to their customers outside the program.

Conclusion 5: Interviewed participants desired more transparency and information in the presentation of the building assessment results and work scope to facilitate more informed decisions about moving forward with their projects.

Recommendation 5a: Present a summary sheet outlining the results of the assessment as a lead–in to the presentation of the scope of work.

Recommendation 5b: To the extent feasible, consider providing options in the work scope, including different packages of measures participants could choose among.

Recommendation 5c: Consider including separate cost estimates for participating in MPower Oregon and for participating in Energy Trust's Existing Multifamily program to demonstrate any added value from participation in MPower Oregon.

Conclusion 6: Nearly half of Pilot participants did not use the Pilot's unsecured loan and all interviewed participants preferred a loan product paid back through the participant's finances instead of an on-bill repayment service.

Recommendation 6a: Continue offering the unsecured loan with no upfront costs to participants since there was a moderate level of uptake of the loan by Pilot participants.

Recommendation 6b: Consider exploring whether other debt financing products are available through lenders and assessing building owners' level of interest in using these products to determine if others products could generate more uptake in participation.

Recommendation 6c: Assess whether nonparticipant building owners are interested in an the on-bill repayment service for paying off their debt financing and what would encourage past Pilot participants to use on-bill repayment for their Pilot loan to determine if there is any demand for it.

1. Introduction and Methods

In March 2015, Energy Trust of Oregon (Energy Trust) contracted with Research Into Action, Inc. (the team) to conduct an evaluation of the MPower Pilot (the Pilot). The primary goals of the evaluation are to document and assess the evolution of the Pilot and the effectiveness of Pilot processes. The team conducted the evaluation through a review of program documentation, materials, data, and in-depth interviews with 14 key stakeholders, seven participants, and three partial participants. Interview guides for these three groups are in Appendix A. The team will conduct a review of the energy savings analysis when it becomes available in the second quarter of 2017, and will provide results from the review in an addendum to this report.

1.1. Description of the MPower Pilot and Stakeholders

1.1.1. The MPower Pilot

Stakeholders developed the Pilot with the common goal of providing low-income multifamily building owners in Oregon with services to overcome existing market and program barriers to making comprehensive energy- and water-efficiency upgrades. The low-income housing market is resource-constrained and highly regulated, and building owners often do not have the funds for making comprehensive energy upgrades or the resources needed to find and secure and manage an upgrade project while adhering to multiple regulations. Owners are also often reluctant to pay for upgrades in tenants' units if the tenants pay the utility bills (tenant-metered) since the resulting energy cost savings benefit the tenant instead of the owner (split-incentive issue). In addition, before the Pilot there was not a program in Oregon that provided a comprehensive package of services designed specifically to overcome these market barriers (Chapter 2).

Stakeholders aimed to integrate existing services in the market into the Pilot, develop any new services that would be needed, and provide all the services in a streamlined fashion to participants through a single organization, MPower Oregon LLC (MPower Oregon). These services included the following:

- Consultation with participants regarding the Pilot processes, participation eligibility, and potential upgrades.
- Walk-through assessment of the building to identify upgrades and estimate energy savings and costs.
- Design and verification of the upgrade project, including developing a scope of work (Appendix B), performing a comprehensive building assessment to verify that the work scope will meet Pilot savings and cost requirements, and managing a project timeline.
- Financing of upgrades, requiring no up-front costs to the participant, through a combination of a 10-year unsecured loan and grant funds that owners could choose to

apply to different parts of their project, and incentives for eligible upgrades from Energy Trust's Existing Multifamily program.

- Coordination with participants to hire contractors to install the upgrades, project management, and quality assurance that the correct upgrades were properly installed.
- Tenant engagement and educational activities and materials (Appendix C) regarding use of the installed upgrades and energy- and water-saving behaviors, provided upon project completion and annually throughout the Pilot's 10-year service agreement.
- Annual measurement and verification (M&V) of energy and/or water savings, and check-ups on the installed upgrades throughout the Pilot's 10-year service agreement.
- In the future, on-bill repayment of the Pilot loan through a service charge on the owner's utility bills that stakeholders estimated would be less than the dollar amount saved on utility bills as a result of the installed upgrades, resulting in a net reduction in monthly utility bills.[2]

To have been eligible for participation in the Pilot, multifamily buildings must have been rent-restricted affordable housing, in which tenant family income does not exceed 80% of the area median income. In addition, Pilot participation required a minimum of 20% average energy savings across the participant's portfolio of projects and each project must also have passed a cost-effectiveness test for a 10-year or less payback. Pilot participation also required building owners to sign a 10-year service agreement with MPower Oregon to allow the latter access to property and utility billing data to track and verify savings, perform quarterly and annual check-ups on the upgrades, and provide tenant education services.

Pilot participants could receive Energy Trust's Existing Multifamily program incentives if they met two criteria. First, participants must have included eligible upgrades in their Pilot project. Eligible upgrades included lighting fixtures, bulbs, and controls; refrigerators, and clothes washers and dryers; toilets; heating, cooling, and ventilation (HVAC); domestic water heating; doors and windows; weatherization and air sealing; energy management systems; irrigation and landscaping; and, free direct-install devices such as high-performance showerheads, faucet aerators, and LED light bulbs.

Second, participating buildings' primary heat source must have been provided by one of the following utilities: Portland General Electric (PGE), Pacific Power, and NW Natural. Combined, these utilities cover the largest population centers in central and western Oregon where low-income multifamily housing is available. Buildings that receive their primary heat source from another Oregon utility could still participate in the Pilot but would be ineligible to receive Energy Trust's incentives.

Stakeholders conceived the idea for the Pilot in late 2010 and officially launched the Pilot in mid-2013. In the interim, stakeholders collaborated to develop Pilot processes, make changes to

[2] Stakeholders planned to provide the on-bill loan repayment service at the Pilot's launch but it still under development at the time of this evaluation; stakeholders plan to continue to pursue offering it to past and future participants.

the Pilot model, and acquire funding for the Pilot (Chapter 3). Energy Trust also designated the Pilot as a pilot initiative under its role as the project manager for the Oregon Energy Efficiency and Sustainable Technology (EEAST) Act of 2009, which established the on-bill repayment service in Oregon. The pilot initiative designation established a legally binding relationship between Energy Trust and MPower Oregon and the roles each would perform in Pilot implementation.

After the Pilot's launch, stakeholders implemented the Pilot for about two and a half years until its conclusion in December 2015 (Chapter 4). During this time, stakeholders aimed to complete Pilot projects in 34 low-income buildings in Oregon, with up to 2,550 units, and to achieve 20% energy savings per participant, which stakeholders estimated at 9,000,000 kWh and 250,000 therms. At the end of the Pilot, stakeholders completed Pilot projects in 28 buildings with 2,321 units.

1.1.2. MPower Stakeholders and Their Roles

Multiple stakeholders from the low-income multifamily housing, energy and water efficiency, finance, and community development sectors in Oregon and around the U.S. collaborated to design and implement the Pilot. As shown in Table 1-1 most of the MPower stakeholders contributed to the Pilot's development, including Blue Tree Strategies (BTS) as the initial leadership organization, and to the Pilot's outreach to contractors and low-income multifamily building owners. Throughout the development of the Pilot, involved stakeholders provided in-kind staff support and some provided the funding needed for planning and creating the Pilot's processes, documents, and other materials.

Since the Pilot's launch, several of the key stakeholders provided the Pilot's services to participants through MPower Oregon (Table 1-1). MPower Oregon staff administered and managed the Pilot, including leading or assisting with most of the Pilot's processes. Energy Trust and/or Lockheed Martin and Evergreen Consulting Group (Energy Trust's Multifamily Program Management Contractor and its subcontractor lighting project specialist), provided assistance by coordinating Energy Trust's Existing Multifamily program services and incentives for participants, which were being leveraged for the Pilot, including Energy Trust's energy savings analysis. These organizations also took the lead in providing quality assurance tests and, initially, performing the building assessments; after the first few Pilot projects, MPower Oregon staff performed the building assessments. Enterprise Community Partners (ECP) provided assistance with work scope development and the Pilot's tenant education services. Walsh Construction initially performed installation of the upgrades in participating buildings, unless the building owners chose another contractor. After the first few projects, Walsh Construction focused on installing upgrades in larger projects and other contractors installed the upgrades in most of the projects.

Table 1-1: Key MPower Pilot Stakeholder Organizations and Their Roles

	PILOT DEVELOPMENT	OUTREACH	PILOT MANAGEMENT	PROJECT CONSULTATION	GRANT & INCENTIVE FUNDING	LOAN FINANCING	BUILDING ASSESSMENTS	WORK SCOPE	INSTALLATION	QUALITY ASSURANCE	TENANT EDUCATION	M&V
Blue Tree Strategies (BTS)	X	X										
Craft3	X					X						
Energy Trust of Oregon	X	X	X	X	X			X		X		X
Evergreen Consulting Group							X*	X	X	X		
Lockheed Martin							X*	X	X	X		
Enhabit (formerly Clean Energy Works Oregon)	X				X							
Emerald Cities Collaborative (ECC)	X	X										
Enterprise Community Partners (ECP)	X	X			X		X	X			X	
Foundations					X							
Green For All (GFA)	X	X										
MPower Oregon LLC	X	X	X	X			X	X			X	X
Network for Oregon Affordable Housing (NOAH)	X	X	X	X	X	X						
Oregon Dept. of Energy (ODOE)					X							
Portland Bureau of Planning & Sustainability (PBPS)	X	X										
Portland Housing Bureau (PHB)	X	X										
U.S. Dept. of Housing & Urban Development (HUD)					X							
Walsh Construction & other installation contractors	X	X							X			

* Initially performed this service but shifted responsibility to MPower Oregon staff after the first several projects.

Several organizations and foundations provided the Pilot's funding and financing through the Network for Oregon Affordable Housing (NOAH), the Pilot's fund manager (Table 1-1). The U.S. Department of Housing and Urban Development (HUD) provided grant funds through its Energy Innovation Fund, and the Oregon Department of Energy (ODOE) provided grant funds through the Energy Efficiency and Sustainable Technology Act of 2009. Enhabit (formerly Clean Energy Works Oregon), the MacArthur Foundation, and the Kresge Foundation also provided additional grant funding. Energy Trust and ECP (efficiency stakeholders) provided incentives and direct-install devices. NOAH and Craft3 provided the funding and services for the unsecured loan, while Energy Trust has been working with Craft3, MPower Oregon, and the investor-owned utilities to establish the on-bill loan repayment service. Stakeholders initially planned to offer the on-bill repayment service at the Pilot's launch but, due to complications in establishing the service with involved parties, stakeholders were unable to establish the service and plan to offer it in the future.

1.2. This Evaluation

1.2.1. Research Questions and Objectives

The specific research objectives of this evaluation are to:

- Document the history and evolution of the MPower Pilot, and
- Assess the effectiveness of the MPower Pilot delivery model from stakeholder and customer perspectives.

The key research questions are:

- From the perspective of participants, what motivated them to participate in the Pilot? What challenges did they encounter and what benefits have they realized through participating in the Pilot? How satisfied were they with the Pilot overall, and with various aspects of the Pilot? What suggestions do they have for improving the Pilot? Does participation provide sufficient information and benefits to make future upgrades (for the same or other properties)?
- From the perspective of stakeholders, what major changes occurred to the Pilot? What were the major challenges or barriers in moving the Pilot forward and how were they addressed? Has the Pilot met its goals?

1.2.2. Methods

Between June 2015 and February 2016, the evaluation team reviewed MPower Pilot literature and materials as a part of documenting the evolution and development of the MPower Pilot. These materials included a report on the history of the Pilot, business briefs, project process and pipeline diagrams, project tracking data, and the MPower website. Between June and August

2015, the team conducted in-depth interviews with MPower stakeholders, participants, and partial participants – that is, building owners who started to participate but withdrew (Table 1-2).

In July and November 2015, and February 2016, the team conducted interviews with fourteen MPower stakeholders to document their perspectives on the evolution of the Pilot, their motivations and roles in developing the Pilot, and the challenges and benefits of the Pilot. The team interviewed at least one stakeholder at each of the major organizations involved in the different stages of development and/or implementation of the Pilot: Blue Tree Strategies (BTS), Craft3, Energy Trust, ECP, Evergreen Consulting Group, GFA, Lockheed Martin, MPower Oregon, and NOAH. These organizations represent a variety of sectors, including low-income housing, financing, energy and water efficiency, and community development.

In July 2015, the team interviewed seven participants to gain insights into their experiences with the Pilot processes, as well as their motivations for and satisfaction with participating in the Pilot. Five of these participants had completed projects and two participants had projects in-progress at the time of the interviews. In addition, four of these participants owned tenant-metered buildings, in which the tenants receive and pay their own utility bills, and three interviewed participants owned master-metered buildings, in which the owner receives and pays the utility bills.

In October and November 2015, the team conducted interviews with three partial participants to learn more about why they did not participate in the Pilot. These partial participants received some consultation about participating in the MPower Pilot but did not go forward with their proposed projects.

Table 1-2: MPower Pilot Evaluation In-Depth Interviews

	TARGET COMPLETES	ACTUAL COMPLETES
Stakeholders	8-10	14
Participants	6-8	7
Partial Participants	2-3	3

1.3. Report Organization

The team organized the remainder of the report as follows:

- Chapter 2 provides an overview of the major barriers that low-income multifamily building owners and programs need to overcome to achieve comprehensive energy savings, and the strategies included in the MPower Pilot to overcome these barriers.
- Chapter 3 documents the development of the Pilot from its conception until its launch.
- Chapter 4 presents stakeholder and participant perspectives on the Pilot participation processes and goals.
- Chapter 5 summarizes stakeholder and participant goals, challenges, and benefits.

- Chapter 6 outlines the conclusions and recommendations.

2. Pilot Strategies to Overcome Barriers in Low-Income Multifamily Housing Market and Programs

The low-income multifamily housing market, and energy- and water-efficiency programs targeting this market, are faced with multiple barriers to achieving comprehensive energy and water savings upgrades. The MPower Pilot combined four approaches designed to overcome these barriers.

2.1. Market and Program Barriers

2.1.1. Low-Income Multifamily Housing Market Barriers

Low-income multifamily buildings are a hard-to-reach market due to three important market barriers. First, low-income housing is a highly regulated market. The regulations enforced by local, state, and/or federal agencies and other funding organizations restrict how building owners can alter their buildings, spend funds, and manage finances. These regulations also often involve additional processes and requirements, such as submitting the required paperwork for making changes to a building or its finances, which requires staff time and resources.

Second, low-income multifamily buildings are often resource constrained, particularly during the 15 to 18 year period between the recapitalization of their property(ies).[3] Most low-income multifamily buildings have limited capital and budgets, staff and building operators, and sources of funding, making it difficult for owners to afford building improvements or to cover high up-front costs to make improvements. In many cases, the capital used to construct and maintain a property equals or exceeds the property's appraised value and property owners are often required to get consent of existing lenders to obtain more debt. In this context, building owners often do not have much leverage to use their property(ies) as collateral for obtaining additional loans and, depending on the level of debt, may not get the consent of existing lenders to take on more debt to make property improvements. Thus, property owners have to prioritize using their limited resources to keep the building in operation, leaving few, if any, resources available for identifying rebate programs for which they are eligible and making upgrades to a building.

Third, owners of tenant-metered low-income multifamily buildings face a split-incentive barrier to making energy efficiency improvements in tenants' units. In tenant-metered buildings, in which tenants pay their own energy costs, energy efficiency improvements in tenants' units reduce the energy costs for the tenant, not the owner, while the owner is responsible for covering

[3] Low-income multifamily properties often recapitalize their property every 15-18 years, at which time many properties will make improvements to continue to be eligible for tax credits.

the costs of these improvements, not the tenant. Since tenants do not own their unit, most are reluctant to invest in energy efficiency improvements.

2.1.2. Low Income Multifamily Housing Energy & Water Efficiency Program Barriers

Comprehensive energy- and water-efficiency programs targeting low-income multifamily buildings face at least three major barriers that may limit their success.

2.1.2.1. Constraints from Funding Sources

First, funding sources for some of these programs have rules governing which types of low-income buildings can qualify to participate in a program. Funding organizations typically require the highest possible return on their investment and, thus, may require a program to enforce participation criteria that limit the number of buildings in a given area that are eligible (for example, buildings with the highest energy savings potential, buildings with the greatest need for upgrades, buildings with low levels of debt and positive cash flow, etc.).

2.1.2.2. Stakeholder Collaboration

Second, designing and implementing a successful program that provides comprehensive energy- and water-efficiency upgrade services to low-income multifamily buildings involves the collaboration of multiple stakeholder organizations from different sectors with competing interests and regulatory constraints. These stakeholder organizations include those working in energy and water efficiency, construction, low-income housing, financing and grant funding, community development, and program design and implementation sectors. Pooling resources and expertise from these diverse stakeholders towards achieving goals aligned with the program and stakeholder organizations' missions is an ambitious undertaking that requires a high level of collaboration, negotiation, leadership, and organization.

2.1.2.3. Achieving Comprehensiveness

A third major barrier is that it is unclear how to successfully achieve comprehensiveness in energy efficiency upgrade projects in low-income multifamily buildings. Stakeholders in a program must define "comprehensiveness," determine what methods to use to assess and measure comprehensiveness in a cost-effective and timely manner, and identify who should perform the assessments, design the work scope, and measure and verify energy savings. Deciding how to achieve comprehensiveness is a balancing act that requires continuous improvement to meet the needs of the target market and the program's goals while being cost-effective.

Many comprehensive multifamily energy efficiency programs use a minimum savings approach, in which buildings must meet or exceed a set minimum percent energy savings target – typically 20%. In most buildings, reaching 20% energy savings requires upgrades to multiple building systems that, taken together, result in a "comprehensive" upgrade project. However, a few

programs define comprehensiveness through using a whole-building approach to identify and install cost-effective upgrades that result in some level of energy savings without setting a minimum savings requirement. So long as the whole building is assessed and most eligible, cost-effective upgrades are installed, the project is defined as "comprehensive."

Most comprehensive multifamily programs employ a building assessment to identify potential upgrades and estimate energy savings. Choosing which type of assessment to perform, the processes for performing it, and who performs it can have major implications for participation eligibility, cost-effectiveness, and timeliness.

For example, American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Level 3 audits (investor-grade audit) require a rigorous and thorough examination of the whole building and often lead to more comprehensive, customized work scopes that are easier to develop without repeated visits to the building. However, these assessments typically require advanced building science skills, and tend to cost more and take longer to perform than ASHRAE Level 1 or 2 audits. This can be problematic for a program if many buildings fail the eligibility requirements after a comprehensive assessment (which raises the average program cost to serve eligible buildings), or if there is a shortage of auditors with the skills needed to perform these types of audits, which will likely require the program to support advanced training.

Conversely, less rigorous and less thorough walk-through assessments, like ASHRAE Level 1 audits, typically do not require advanced building science skills, and tend to cost less and take less time to perform. If walk-through audits are used, buildings that do not meet eligibility requirements after the audit pass on lower costs to eligible buildings and programs may not have to offer support for advanced training for auditors. However, these assessments may also result in more uncertainty in developing a work scope that will achieve an energy savings target, possibly leading to repeated visits to the building and multiple revisions to the work scope. Walk-through audits also tend to be less effective at identifying the potential for upgrades beyond prescriptive measures, and may result in excluding more custom measures or whole-system upgrades that could result in higher energy savings.

Programs can also employ different actors to perform assessments, design work scopes, install upgrades, and measure and verify energy savings. For example, some programs like New York State Energy & Research Development Authority's Multifamily Performance Program, New Jersey Public Service Electric and Gas's Residential Multifamily Housing Program, and Energy Upgrade California's multifamily programs employ trade allies in the local market to perform most or all of these activities. Using trained trade allies can reduce the number of required program staff and staff responsibilities, and can foster market transformation, but also requires more intensive trade ally outreach, coordination, and training. Other programs, like Elevate Energy in Illinois and Energy Outreach Colorado, rely on program staff and stakeholders to perform most or all of these activities, which can require less intensive coordination and outreach but also increases program staff and responsibilities, and does little to advance market transformation.

2.2. MPower Strategies to Overcome Market and Program Barriers

Before the MPower Pilot launched, few programs existed in Oregon that provided services and/or incentives for making energy-efficiency upgrades in multifamily buildings, particularly in low-income multifamily buildings. Energy Trust's Existing Multifamily program provides cash incentives for equipment upgrades and remodels in existing multifamily buildings, performs assessments, and provides and installs free energy saving devices in tenant units including light-emitting diodes (LEDs), faucet aerators, showerheads, and leave-behind advanced power strips. (Energy Trust also provides services to multifamily new construction or major renovation projects through the New Buildings program, such as incentives and technical assistance for the design, installation, and completion of energy-efficient systems.) . Energy Trust's Existing Multifamily program is available to low-income multifamily building owners and has specific outreach and staff dedicated to the low-income sector, but the program as a whole is not designed to overcome specific barriers in the below-market-rate sector. For example, Energy Trust does not offer project financing (other than incentives) and the incentives and services are the same for low-income and market-rate buildings.

The MPower Pilot contained four strategies designed to overcome barriers in low-income multifamily housing markets and in programs designed to make comprehensive energy- and water-efficiency upgrades. First, stakeholder organizations from multiple key market sectors brought their unique perspectives and expertise to collaborate, design, and support the MPower Pilot. These sectors included energy and water efficiency, low-income housing, financial, community development, and program design and implementation.

Second, the MPower Pilot aimed to provide a one-stop shop for services from a variety of sectors, including energy and water efficiency, low-income housing, financial, and community development. Resources, expertise, and services provided by MPower stakeholders were directed through MPower Oregon to participants. This integrated, holistic delivery approach was intended to keep program costs low, enhance coordination among the diverse stakeholders, reduce the burdens faced by low-income multifamily building owners with limited resources and time to make energy efficiency improvements at their buildings.

Third, the MPower Pilot offered a funding and financing package that provided building owners with options that are difficult to find in the market and with some flexibility in choosing which funding sources to use for their project(s). Instead of more traditional secured loans that are available on the market, the Pilot offered an unsecured loan with 10-year financing terms that did not require up-front costs or the property as collateral. If and when the on-bill loan repayment service is established with utilities, participants will have the choice to pay back any Pilot loans through their utility bills instead of through the more traditional method of paying the loan directly through the lender. In tenant-metered buildings, this service was also initially envisioned to provide the option for including the charge on tenant's utility bills, so long as the charge does not exceed the amount saved through the energy upgrades, which would could assist owners to overcome the split incentive issue,. The on-bill repayment service could also be appealing to building owners since lenders and others often view it as a service charge instead of as a debt.

In addition, the Pilot received grant funding through various organizations, such as HUD, Enhabit, and the Kresge Foundation, and received upgrade incentives through Energy Trust's Existing Multifamily program to help offset the overall costs to the participant. Participants had the option to choose, to some extent, whether to receive upgrade incentives through MPower or directly through Energy Trust, which aspects of the project to apply the grant funds, and how much of the project costs would be covered through the Pilot loan and their own contribution.

These financing services and funds were designed to help low-income multifamily building owners overcome resource constraints, market barriers, and the split-incentive issue while adhering to regulations governing how their conventional funding streams must be managed and spent. The Pilot funds also did not include any additional limitations on what types of low-income buildings could participate as long as buildings could meet the Pilot's savings and payback requirements.

Fourth, MPower Pilot stakeholders and services had an explicit focus on achieving comprehensiveness in low-income multifamily building upgrade projects through the Pilot's eligibility requirements and services. As part of the funding agreement from HUD and other organizations, Pilot participation required 20% energy savings across the participant's portfolio of participating buildings and a 10-year payback for each project. Combined, the Pilot's services – consultation, building assessment, work scope, financing, construction, M&V, and education services – provided a whole-building approach to achieving these requirements.

3. Pilot Development and Evolution

The evaluation team documented the development and evolution of the Pilot through a review of program materials and in-depth interviews with key stakeholders who participated in the development process. This chapter focuses on assessing the development of the Pilot up until the Pilot's launch, including the reasons stakeholders got involved and the activities stakeholders performed to design and build the Pilot.

3.1. Motivations for Developing the Pilot

MPower stakeholders reported their primary motivation for developing the Pilot was that the Pilot's goals aligned with their respective organizations' missions. For example, low-income housing stakeholders, whose mission is to support the low-income housing sector, viewed the Pilot as a way of improving their housing assets in the state of Oregon through installing new upgrades and making building operations more cost-effective. For them, the Pilot seemed an effective way to address an expressed concern among owner-operators and Housing Authorities about rising utility costs, reportedly one of their highest expenses, and the limitations for maintaining their buildings in a capital-constrained environment.

Stakeholders from funding and financing organizations reported interest in testing the on-bill loan repayment service as a way of overcoming financial barriers to making energy and water upgrades in the low-income housing sector. The on-bill component of the Pilot that aimed to allow participants to pay back project costs through their energy savings on their utility bill was of particular interest to financial stakeholders.

Efficiency stakeholders, whose mission is to achieve energy and water savings, perceived the low-income multifamily market as an underserved market for efficiency upgrades. They reported that greater energy and water savings could be achieved in this sector through an initiative like the MPower Pilot that combines Energy Trust's Existing Multifamily program incentives and technical assistance with a financing package and long-term support services to help building owners make comprehensive upgrades and maintain savings over time.

Representatives of two national-based organizations that had looked at different approaches from around the country reported getting involved in the Pilot because they believed it to be a promising model to grow green jobs and foster an inclusive green economy in the region. These stakeholders also reported being interested in developing a model for low-income housing energy and water upgrades that could be scaled-up and replicated around the country to establish a larger market for the Pilot's services.

3.2. Pilot Development Process

The stakeholders who initially conceived the Pilot, from BTS and Portland Housing Bureau (PHB), had previously been involved in developing the Enhabit (formerly Clean Energy Works Oregon) model for financing and making comprehensive energy and water upgrades in the

single-family residential sector. They reported seeing an opportunity to develop a similar model for Oregon's low-income multifamily sector.

These stakeholders recruited and received initial buy-in from other key regional and national stakeholder organizations from the low-income housing, energy and water efficiency, finance, and community development sectors. These first stakeholders included BTS, PHB, ECP, Portland Bureau of Planning and Sustainability (PBPS), Enhabit, Energy Trust, Green For All (GFA), and Craft3.

Drawing on its experience in developing the Enhabit program, BTS created a methodology to guide the other stakeholders through the Pilot development process in four phases: Discovery, Design, Build, and Launch/Scale. In addition, a representative for GFA advocated for stakeholders to follow a set of "collective impact" best practices from an article in the *Stanford Social Innovation Review* by John Kania and Mark Kramer. The authors argue that collective impact occurs through the "commitments of a group of key actors from different sectors to a common agenda for solving a specific social problem." The best practices that actors should use for successful collective impact are shared measurement systems, mutually reinforcing activities, continuous communication, and a backbone support organization. Below, we describe the activities that occurred in each of the first three phases - Discovery, Design, and Build - and, in Chapter 4, we discuss activities in Launch/Scale phase.

3.2.1. The Discovery Phase

During the Discovery Phase, between the fourth quarter of 2010 and third quarter of 2011, the initial stakeholders began collaboration to identify key barriers to making energy-efficiency upgrades in the low-income multifamily housing sector (see Chapter 2) and establish the conceptual framework for the Pilot to address those barriers. BTS assumed the leadership role, becoming the group's "backbone support organization." BTS, along with GFA, ECP, PHB, Craft3, and Energy Trust contributed funding and/or in-kind staff support for the Pilot's development during the Discovery Phase.

Early in the Discovery Phase, BTS, with support from ECP and GFA, developed a concept paper to communicate the Pilot's proposed features and benefits, and worked with Energy Trust to develop a working financial model. ECP validated the efficacy of the conceptual Pilot model and BTS used these materials to recruit additional regional stakeholders, including Walsh Construction, NOAH, and others from the affordable housing sector.

Upon obtaining validation of the Pilot's conceptual model and the involvement of additional regional stakeholders, BTS and GFA received funding from the Rockefeller Foundation and used these funds to host a national Financing Affordable Multifamily Efficiency (FAME) forum to recruit key national stakeholders. The FAME forum was successful at obtaining buy-in from key national stakeholders, such as National Housing Trust and Lawrence Berkeley National Laboratory, achieving further validation of the model from national experts, and providing pathways for funding opportunities from HUD and national foundations.

At this time, stakeholders at PBPS developed marketing materials, including the 'MPower' name and logos, and BTS worked with other stakeholders to develop M&V strategies, which were

presented at the FAME forum. At the end of the Discovery Phase, BTS and ECP performed a program landscape analysis to compare the Pilot's model to other similar models around the country in an effort to establish more credibility for the Pilot.

3.2.2. The Design Phase

After designing and validating the Pilot's conceptual model in the Discovery Phase, stakeholders began the Design Phase, which occurred between the third quarter of 2011 and the second quarter of 2012. In this phase, MPower stakeholders designed the various components of the Pilot, obtained major sources of funding and other resources for building and launching the Pilot, and created Pilot operating plans, agreements, and budgets. Toward the end of the Design Phase, in the first quarter of 2012, stakeholders hosted a convention of Oregon low-income multifamily building owners to identify early potential projects and obtain feedback on the Pilot's processes. At the end of the Design Phase, in the second quarter of 2012, stakeholders established the MPower Pilot as a "pilot" program.

The stakeholder group was mostly complete by the end of the Design Phase, and BTS remained in a leadership role, with some assistance from GFA for organization and outreach. Craft3, NOAH, BTS, ECP, Enhabit, Energy Trust, and GFA provided the majority of funds and/or in-kind support for the Design Phase.

3.2.2.1. Obtaining Pilot Funding and Designing the Pilot Project Financing Services

During the Design Phase, a working group of stakeholders that included Craft3, BTS, NOAH, and Energy Trust (finance working group) collaborated to secure funding sources and design the financing services that participants could use to pay for energy and water upgrades. According to interviewed stakeholders involved in this process, securing the funding sources was a key step that sent a signal to other stakeholders that the Pilot would be built and launched.

NOAH, with support from BTS, took the lead on securing the HUD agreement for the $3 million Energy Innovation Fund grant. HUD awarded the grant funds later in the Design Phase, in July 2012, under a two-year agreement set to expire in July 2014. Stakeholders reported the HUD grant was the key piece of funding that ultimately made the Pilot possible and set some of the criteria for participation, such as the 20% energy savings threshold and 10-year payback period.

Craft3 secured a grant and low-interest loan funds through Bank of America that, combined with funds from NOAH, would be used for a Pilot loan. GFA and BTS secured grant funding from the Kresge Foundation and received interest from the MacArthur Foundation, which would become a grant provider after the Pilot's launch. In addition, NOAH and BTS worked with Enhabit's board of directors to get a grant from Enhabit, which stakeholders reported was especially helpful in funding the development process until the HUD grant funds arrived at the beginning of the Build Phase in the third quarter of 2012.

While the finance working group secured Pilot funding during the Design Phase, the group also began developing the Pilot's financing services that were conceived and validated during the Discovery Phase. These included a loan secured by projected energy savings and a 10-year

service agreement to pay back the loan through on-bill repayment and the on-bill repayment service, as well as grants and incentives for energy- and water-efficiency upgrades. Energy Trust committed to providing incentives for MPower participants through its Existing Multifamily program and took the lead with BTS in creating the project finance tool that estimates whether potential Pilot projects qualify for these incentives, and creating a framework for integrating these incentives into the Pilot financing model.

BTS performed an analysis for determining energy efficiency tariffs for tenant-metered buildings for the on-bill repayment service. BTS determined that these building types presented additional complexities compared to master-metered buildings since the tenants paid their own utility bills, which led MPower stakeholders to focus on master-metered buildings first and return to tenant-metered buildings later in the Pilot period.

After performing the on-bill repayment service analysis, BTS met with PGE, Pacific Power, and NW Natural to discuss plans for the implementing the on-bill repayment service and worked with Craft3 and NOAH to review the on-bill repayment model. When HUD and loan funds were secured, Craft3 developed the underwriting and credit approval processes, and letter of commitment for debt financing for the Pilot loan and on-bill repayment service.

By the end of the Design Phase, with major funds secured and financing processes developed, stakeholders planned a Pilot financing structure in which incentives for energy upgrades would come from Energy Trust, and grant funds and loans would come from funders, through NOAH to MPower Oregon to the participant. Utilities and Craft3 would implement the on-bill repayment service through MPower Oregon and under Energy Trust's management. Stakeholders then presented the Pilot's financing services to building owners at the convention of low-income multifamily building owners in Oregon to obtain feedback.

3.2.2.2. Designing Pilot Building Assessment, Construction, Quality Assurance, M&V, and Tenant Engagement Processes

During the Design Phase, stakeholders created several working groups to design many of the Pilot's energy efficiency processes, such as the building assessments, installation and construction, quality assurance, M&V, and tenant engagement activities. Stakeholders reported borrowing heavily from Energy Trust's and ECP's experiences and protocols to design these processes.

BTS collaborated with Walsh Construction, Energy Trust, and ECP (audit working group) to develop the framework for the building assessment process, including estimating energy and water savings, and determining qualifying upgrades based on the savings and payback requirements under the HUD agreement. The audit working group aimed to adapt ECP's Green Communities Energy and Water Audit Protocol, an investment-grade building audit tool tested around the U.S., to produce reliable audit results in multifamily buildings in Oregon and within the Pilot's requirements. Stakeholders reported that investment-grade building audits were important because it reduced loan payback risks in case energy savings did not materialize, which were important for the building owners and lenders. The group planned to leverage Energy Trust's Existing Multifamily program's energy analysis studies to inform the building assessments.

A small working group of key stakeholders that included BTS, Walsh Construction, and Emerald Cities Portland (construction working group) developed the protocols for how construction work would occur for Pilot projects and a construction agreement for MPower participants. The construction working group also collaborated with GFA to develop a "High Roads" strategy that included Community Workforce Agreement and a subcontractor list focused on promoting "workforce development and participation in the Pilot by historically disadvantaged communities." The group decided that Walsh Construction would perform the construction in Pilot buildings, using subcontractors from the "High Roads" list, unless participants preferred another contractor. If participants preferred another contractor, stakeholders planned to assist them in finding one or in issuing a request for proposal, and to work with the chosen contractor to meet the Pilot's installation and construction requirements.

The audit and construction working groups collaborated to design the work scoping process, or how the building assessment results would be used to develop a work scope that met the Pilot's energy savings and payback requirements. The stakeholders decided that Energy Trust and its Program Management Contractors, ECP, Walsh Construction (or the project's general contractor, if different) and staff from MPower Oregon (the Pilot's managing organization to be formed during the Build Phase) would collaborate with participants to translate the audit results into a work scope that met Pilot requirements and participant preferences (Appendix B).

The audit and construction working groups also collaborated to design the post-construction quality assurance and long-term M&V processes. To assure quality installation and performance of installed upgrades after construction is completed, the group planned to use ECP's Quality Assurance and Verification Guidelines. Energy Trust and its Program Management Contractors adapted these Guidelines to work similarly to the quality assurance processes used for Energy Trust's Existing Multifamily program participants.

To measure and verify long-term savings at participant buildings for 10 years after construction is completed, the group adopted and revised ECP's Green Communities Operations and Maintenance requirements. The requirements recommended when to collect energy usage data, how to analyze the data, and how to share the data among multiple stakeholders, such as between the utilities, Energy Trust, MPower Oregon, and NOAH.

ECP, with assistance from PBPS and other stakeholders, designed MPower Pilot tenant engagement activities and materials using ECP's Green Asset Management Toolkit. The Toolkit contained guidelines and materials for increasing tenants' knowledge about how to use the installed upgrades and practice energy and water saving behaviors. ECP and involved stakeholders obtained feedback from building owners to tailor the Toolkit's activities and materials Pilot participants (Appendix C). Stakeholders planned for ECP and/or MPower Oregon representatives to work with participant building owners to organize the tenant engagement activities and display the materials at strategic locations within the participating building.

At the end of the Design Phase, the audit working group recruited eight low-income multifamily building owners at the Oregon convention of building owners hosted by MPower stakeholders to test the assessment process at their buildings. The assessments resulted in none of the buildings meeting the Pilot's savings and payback criteria, so the audit working group created an audit

redesign team and brought in an engineering firm to help revise and improve the assessment process.

3.2.2.3. Developing the Pilot's Plans, Budget, Service Agreement, and Goals

In the later stages of the Design Phase, after major Pilot funding sources were secured and many of the Pilot's components were designed, key stakeholders developed plans and a budget for building and launching the Pilot. NOAH and BTS identified key business partners and drafted operating agreements for them. A working group consisting of BTS, Energy Trust, ECP, and NOAH, with "all hands on deck" support from other stakeholders, created a business plan, an implementation plan, and an operating budget.

Also late in the Design Phase, stakeholders drafted the Pilot's 10-year service agreement. This agreement established a legally binding relationship between MPower Oregon, the Pilot's managing organization, and Pilot participants for a 10-year period. The agreement granted MPower Oregon provisional access to participants' buildings to check on installed upgrades and provide tenant education services, and access to the building's utility records to measure and verify energy savings.

3.2.2.4. Designating the "Pilot" Status and Establishing Pilot Goals

Toward the end of the Design Phase, Energy Trust led a working group of stakeholders through the process of establishing MPower as an Energy Trust pilot initiative. The impetus for this was twofold. First, the HUD grant was for a two-year period (with the possibility of an extension), which required stakeholders to establish a two-year Pilot timeline and goals. Under these conditions, stakeholders reported that it made sense to "pilot" the initiative for the two-year HUD grant period, perform an evaluation of its performance, and then regroup stakeholders to determine next steps.

Second, the EEAST Act of 2009 established on-bill repayment service for making energy efficiency upgrades in single-family homes and commercial buildings, and called for pilot projects to test on-bill repayment in other market sectors. EEAST delegated Energy Trust as the EEAST Sustainable Energy Project Manager, a role that included initiating the on-bill repayment pilot initiatives in its service territory. MPower stakeholders agreed that establishing the MPower Pilot as an on-bill repayment pilot project for the multifamily building sector through Energy Trust, under the 2009 EEAST Act, would be necessary to implement the Pilot's on-bill repayment service with utilities and lenders.

To designate the MPower Pilot as a pilot initiative under EEAST, Energy Trust and MPower Oregon LLC, the Pilot's managing organization created early in the Build Phase, developed and signed a business brief, a memorandum of understanding (MOU), and an evaluation plan. The "pilot" designation established a legally binding relationship between Energy Trust and MPower Oregon for up to 36 months, with the possibility of making amendments to the MOU should the parties agree on change in their relationship, and established the roles each organization would perform in the Pilot's implementation.

In addition, stakeholders established goals for the number of Pilot projects and resulting energy savings, which was important for securing the HUD grant and other funding, and for designating the Pilot as a "pilot initiative" through Energy Trust. Given the Pilot's savings and payback requirements, and estimated two-year timeframe, stakeholders aimed to complete Pilot projects in 34 buildings with up to 2,550 units, with 20% energy savings per participant, or about 9,000,000 kWh and 250,000 therms.

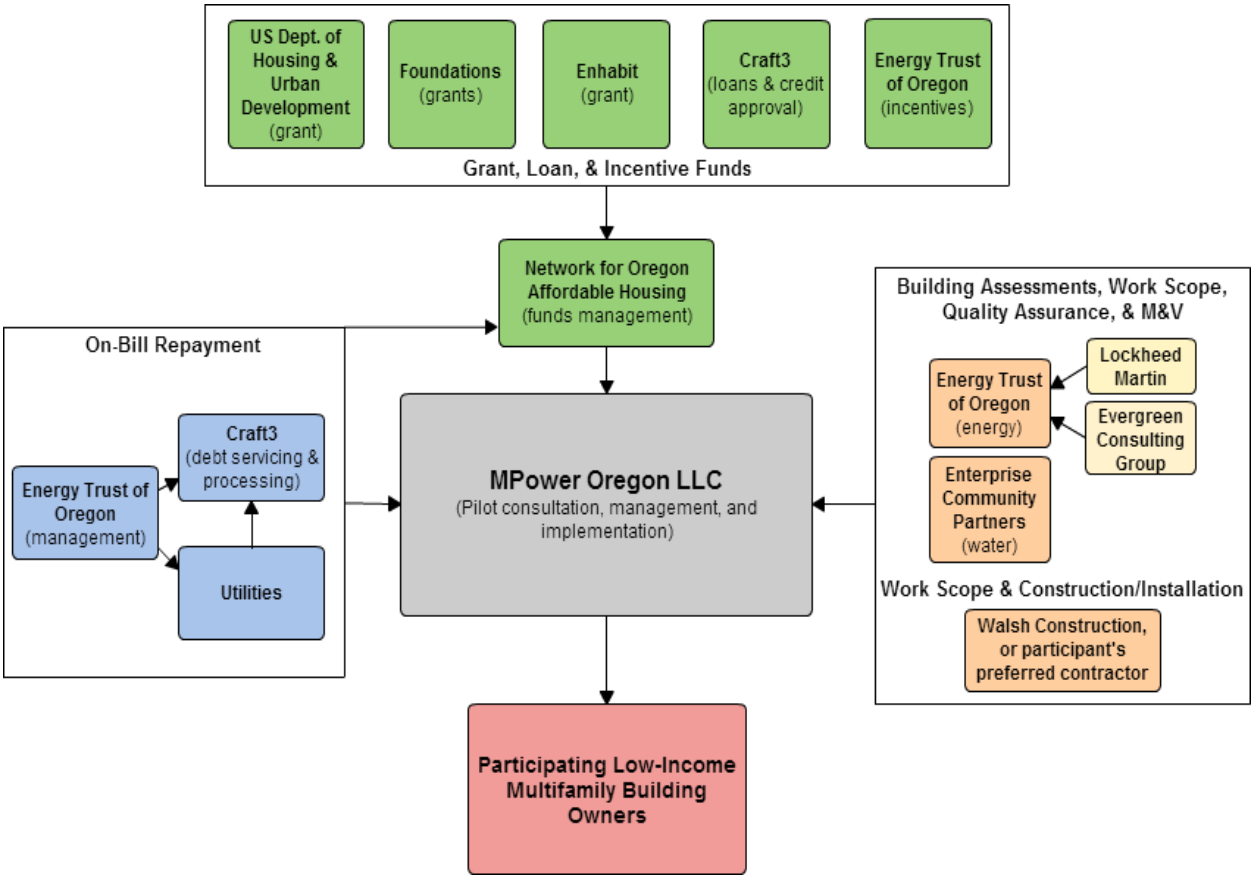
3.2.2.5. The Designed MPower Pilot Model

At the end of the Design Phase, stakeholders had designed what they referred to as a "one-stop shop" Pilot model in which the services flowed through the Pilot's managing organization, which would become MPower Oregon LLC, to Pilot participants (Figure 3-1).

- Funding and financial organizations would contribute their funds in the form of grants, loans, or incentives to the MPower Fund managed by NOAH and distributed through MPower Oregon to participants.
- Craft3, NOAH, and MPower Oregon would manage the credit approval and underwriting for participant financing, while Craft3 and Energy Trust would work with utilities to set up the on-bill repayment service.
- ECP, NOAH, Lockheed Martin, Evergreen Consulting Group, and MPower Oregon staff would recruit potential participants and perform outreach activities.
- Walsh Construction, ECP, and Energy Trust, with assistance from Lockheed Martin and Evergreen Consulting Group, would provide the construction and energy- and water-efficiency services for retrofitting participants' buildings.
- ECP and MPower Oregon staff also would work with building owners to provide educational trainings and activities to building operators and tenants after their projects were completed.

However, stakeholders soon had to make changes to the designed model during the Build and Launch Phases due to complications with some of the Pilot's processes (Section 3.2.3).

Figure 3-1: MPower Pilot Model as Designed by Stakeholders



3.2.3. The Build and Launch Phases

Stakeholders began the Build Phase in the third quarter of 2012, and began the Launch Phase at the end of the second quarter of 2013 with the first Pilot participants. Stakeholders reported that both phases were in an ongoing "iterative process" as they continued to "rebuild and improve" the Pilot after the launch in response to participant concerns and challenges with implementation of various processes (see Chapter 4).

In the Build Phase, before the Pilot was launched, stakeholders translated the various components of the Pilot that they planned in the Design Phase into a working Pilot model. This included continuing the redesign of building assessment process, continuing the creation of the on-bill loan repayment service, creating a project pipeline and recruiting the first participants, drafting Pilot documents, coordinating sources of funding, establishing shared information systems among stakeholders, and finalizing construction, work scope, quality assurance, and M&V processes. In addition, GFA hosted another national convention to present the Pilot's model and lessons learned to interested parties, receive feedback for Pilot improvements, and create a strategy for replicating the model in other regions of the U.S. NOAH provided most of the funding for the Build Phase, and these and other stakeholders contributed in-kind staff support.

3.2.3.1. Creating the Pilot's Central Organization and Transitioning Pilot Leadership

Early in the Pilot's Build Phase, NOAH established MPower Oregon LLC as the central, managing organization of the Pilot. MPower Oregon hired a managing director and support staff, and, in anticipation of the Pilot's launch, other stakeholder organizations began hiring or allocating additional staff needed to support each organization's role(s) in the Pilot. MPower Oregon staff signed off on the agreements and plans created in the Design Phase for launching the Pilot and establishing relationships between stakeholder organizations (Section 3.2.2).

In addition, BTS transitioned its Pilot leadership role as the "backbone support organization" to MPower Oregon and, soon after, exited the Pilot's stakeholder group. A few stakeholders mentioned that since BTS had been involved in the Pilot from the beginning, contributing substantial funds and staff support, they were surprised by BTS exiting the stakeholder group as quickly as it did. They thought that the transition of leadership to MPower Oregon would have been smoother if BTS continued with the group until the first Pilot project was completed. These stakeholders noted that, at the time of BTS's exit, MPower Oregon was still very new and had much to learn about the building of the Pilot processes that was currently ongoing.

3.2.3.2. Recruiting the First Participant, Making Changes to the Pilot Model, and Delaying the Pilot's Launch

In the third quarter of 2012, the audit working group consisting of BTS, Energy Trust and its Existing Multifamily program management contractor, Walsh Construction, ECP, and an outside engineering firm revised and improved the building assessment process. Stakeholders reported that the redesigned assessment process was still an investment-grade audit but was more streamlined and tailored to the Pilot's requirements. The audit working group then tested the process on two buildings. One of the buildings passed the assessment and the building's owner agreed to participate in the Pilot.

However, by this time, in the first quarter of 2013, MPower stakeholders were still working to establish the on-bill repayment service and had not yet designed an alternative financing service for participants. Stakeholders reported that the Pilot loan secured by energy savings and the 10-year service agreement would not be feasible without the on-bill repayment service.

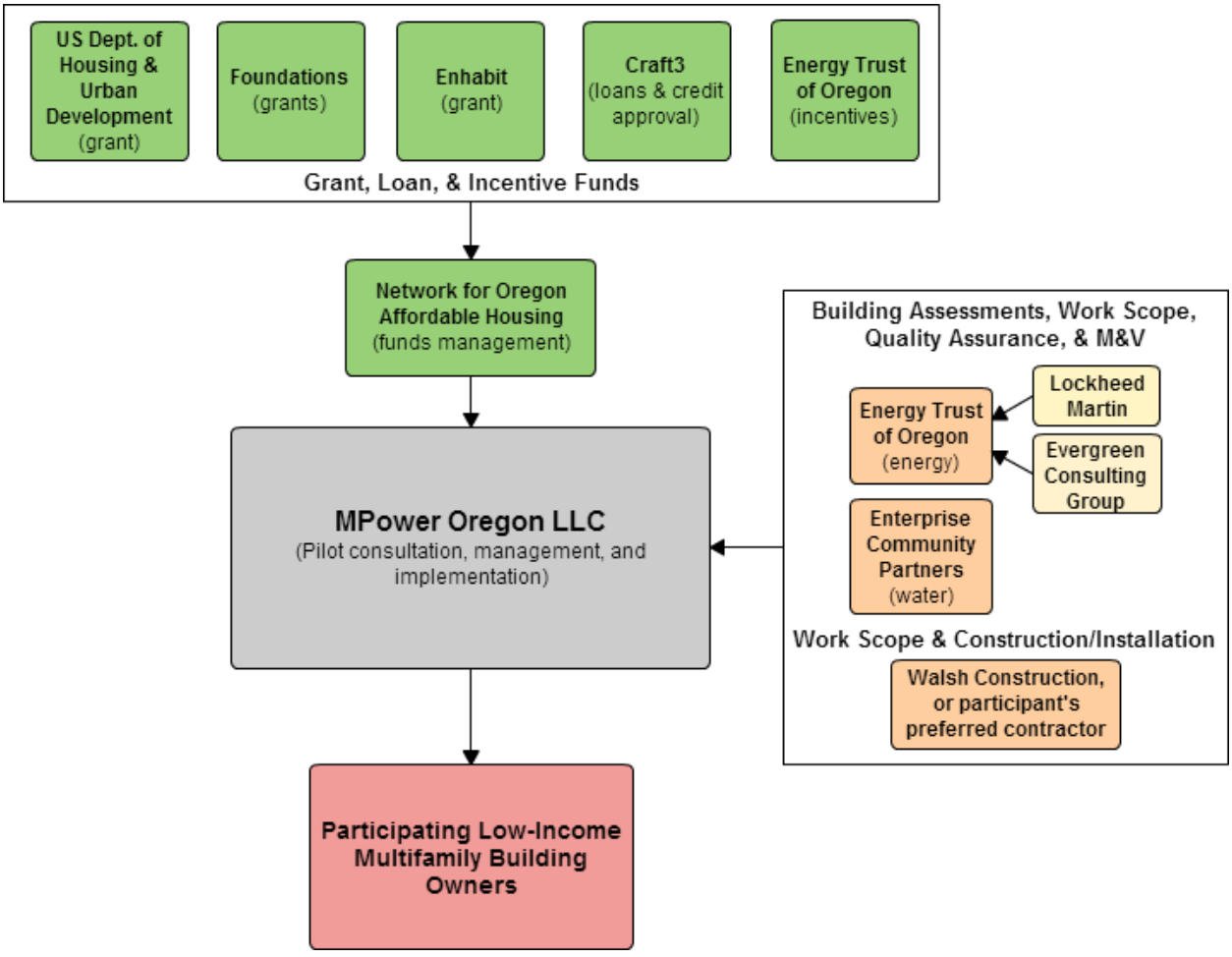
In addition, most stakeholders reported challenges to "selling" the on-bill repayment service to building owners they engaged during the Build phase. Stakeholders reported these building owners indicated that on-bill repayment was very different from the way they were used to doing business. Both tenant-metered and master-metered building owners reportedly expressed concerns about the risks of the utility bills being higher over the course of the 10-year service agreement in case the energy savings did not materialize, and would prefer a loan product to be paid back through their finances instead.

The stakeholders convened and agreed to create a loan product unsecured by energy savings or the owner's property to offer participants that would be paid back through the owner's finances. Stakeholders reported that an unsecured loan product could be integrated into the Pilot's financing package without making too many changes and was the "same economics" as the on-bill repayment service but would look more familiar to building owners. Stakeholders also

mentioned that an unsecured loan would be more appealing to building owners compared to another feasible loan product, like a loan secured by the property.

This marked the first major change to the Pilot model and contributed to a delay in the Pilot's launch (Figure 3-2). Stakeholders worked through the remainder of 2012 and the first half of 2013 to create the unsecured loan product and associated documents, and the steps participants would take to get approval for and pay back the loan. Stakeholders initially anticipated launching the Pilot substantially earlier, in the third quarter of 2012, but due to the changes, that stakeholders had to make to the Pilot's financing package, the first participant did not get approved for a loan until the third quarter of 2013, and construction did not start until the first quarter of 2014. Because of these delays, in mid-2014 stakeholders requested and received a one-year extension on the HUD grant, moving the expiration date from July 13, 2014 to July 13, 2015.

Figure 3-2: MPower Pilot Model as Built and Launched by Stakeholders



Stakeholders reported that making significant changes to the Pilot and to the stakeholder group's leadership in such a short amount of time caused a substantial amount of strain in their collaboration. Some stakeholders thought that the group began to "diverge from the Pilot's mission," "turn inward," and be "more protective of their own pieces of the Pilot." Many stakeholders also expressed that the group was already working with limited staff time and resources, and had to dedicate much more staff time to building the Pilot than initially planned or anticipated, which was "unsustainable" for their organizations. This situation reportedly created significant delays in qualifying and completing the first Pilot project, which added more pressure and stress to the process.

In addition, changes that needed to be made to some Pilot processes, such as the building assessments and financing services, involved adhering to legislative or organizational regulations. Some stakeholders reportedly perceived others working within the regulations as being too "inflexible" when negotiating the changes, and, in turn, these stakeholders perceived the others as unwilling to learn about and work under the regulations.

By the middle of 2013, the group was reportedly losing momentum and risked disbanding as a result of these challenges, so all the stakeholders attended a two-day in-house Kaizen event. At the event, everyone explained their goals, identified what resources they were willing to contribute, and gained more clarity into each other's roles and contributions. One stakeholder described this as a mini-education session with trust-building and "relationship re-building" to ensure a strong understanding of each piece of the Pilot model. At the end, the group formalized in writing an outline for moving the Pilot forward and everyone was reportedly in agreement as to their role in the Pilot. Although the Pilot risked falling apart, stakeholders reported learning valuable lessons and perceived the Kaizen event as reviving stakeholders' commitment to launching and continually improving the Pilot through collaboration.

4. Pilot Participation & Processes

The evaluation team assessed the effectiveness of the MPower Pilot delivery model, including Pilot participation and processes, after it launched in first quarter of 2013 through the end of the Pilot in December 2015. To perform the assessment, the evaluation team reviewed Pilot documentation, and analyzed in-depth interviews with stakeholders, participants, and partial participants – building owners who started to participate in the Pilot but decided to withdraw.

4.1. Pilot Participation

4.1.1. Participant Characteristics

There were 28 buildings under 11 different housing authorities with completed projects at the end of the MPower Pilot period in December 2015. The first project was completed in June 2014 and the last was completed in December 2015. The team interviewed seven participants in July 2015 about one of their participating buildings, five of which were among the first Pilot participants and were completed by the time of the interviews. All seven interviewed participants reported that their companies owned or managed multiple low-income multifamily housing properties in Oregon and that they had worked in the low-income multifamily housing sector for at least four years.

Stakeholders familiar with participants reported that the early participants in the Pilot were well-known, large, sophisticated owner-operators in the affordable housing industry, which helped lend credibility to the initiative. Reportedly, having the "big players in the industry on board and enthusiastic" reduced challenges in marketing to smaller owner-operators and helped to accelerate program uptake.

The majority of buildings that participated in the MPower Pilot were located in Portland, which is Oregon's largest low-income multifamily housing market, but several are also in other metropolitan areas in southwest and central Oregon (Table 4-1). The interviewed participants represented primarily the Portland Metro area, but two were located in other regions.

Participating buildings also varied in size, based on the number of housing units, and varied in terms of type of utility metering (Table 4-1). The average building size for participants was 83 units, and building sizes ranged between nine and 286 units, with a total of 2,321 units. Among the seven interviewed participants, building sizes ranged from nine to 154 units, with an average of 71 units and 497 total units. Buildings located in the Portland Metro area were larger, on average, than buildings outside this area.

Eight of the participating buildings were master-metered and 20 were tenant-metered. Among interviewed participants, three buildings were master-metered and four buildings were tenant-metered.

Table 4-1: MPower Pilot Participant Property Characteristics

	PARTICIPANTS (N = 28)	INTERVIEWED PARTICIPANTS (N = 7)
Location		
Portland Metro	15	5
Southwest Oregon	8	1
Central Oregon	5	1
Units	2,321	497
Average	83	71
Range	9-286	9-154
Meter Type		
Master-metered	8	3
Tenant-metered	20	4

At the end of the MPower Pilot period in December 2015, there were 28 buildings that completed projects, two active projects in the Pilot's pipeline, and 24 buildings that partially participated (partial participants) but the owners withdrew at some point before the financing and scope of work were completed. These partial participants remain in the Pilot pipeline as potential future projects. The team interviewed three of these partial participants in July 2015, two of which withdrew after the building assessment and one of which withdrew after the initial consultation.

Partial participant buildings were primarily located in the Portland Metro area and a few were located in other parts of the state (Table 4-2). These buildings had a total of 984 units, with an average of 41 units and a range of 8 to 119 units; interviewed partial participants had a total of 134 units, with an average of 45 units and a range of 32 to 70 units. Most of the partial participant buildings were tenant-metered.

Table 4-2: MPower Pilot Partial Participant Property Characteristics

	PARTIAL PARTICIPANTS (N = 24)	INTERVIEWED PARTIAL PARTICIPANTS (N = 3)
Location		
Portland Metro	18	2
Southwest Oregon	2	1
Central Oregon	2	
Eastern Oregon	2	
Units	984	134
Average	41	45
Range	8-119	32-70
Meter Type		
Master-metered	4	1

Tenant-metered	20	2

4.1.2. Sources of Awareness of and Motivations for Participating

Interviewed participants and partial participants reported learning about the Pilot through their connections with stakeholders, particularly NOAH. Three participants (early participants) mentioned that stakeholders had reached out to them while the Pilot was still in development to obtain their feedback on Pilot processes and services, while NOAH contacted others or MPower Oregon staff to see if their buildings would be good candidates for participation after the Pilot was launched.

The evaluation team asked participants and partial participants an open-ended question about what motivated them to participate in the MPower Pilot (Table 4-3). Participants reported two main motivations for participating: to supplement and enhance planned rehabilitation projects to improve their buildings and/or to reduce utility expenses and maintenances needs at their buildings. Some participants emphasized that the support and funding provided through the Pilot allowed them to include energy efficiency aspects as part of their building rehabilitation projects and allowed them to choose more durable and more efficient products than they would have been able to do otherwise. For example, one property was replacing a roof and used Pilot funds to install insulation under the roof. Another participant stated that the Pilot provided "a good opportunity to install very efficient appliances and fixtures at a point in time that we were replacing them."

The partial participants expressed similar reasons for seeking energy efficiency upgrades (Table 4-3). Two of the three reported that controlling future operating costs by reducing utility expenses was their primary motivation. The third was looking to use the Pilot as an opportunity to supplement a planned project to replace worn out equipment with efficient upgrades instead of standard efficiency replacements.

The most common motivations for participating in the Pilot that six participants selected from a close-ended list of specific motivations were *improving cash flow by reducing energy costs* and *environmental objectives* (Table 4-3). A few participants also mentioned *reducing tenant energy costs* and *contributing to tenant health benefits*. Most participants were not motivated by i*ncreasing the property's value* and *attracting new tenants*.

Table 4-3: Motivators to Participate in MPower

OPEN-ENDED ANSWERS (N=10)*		CLOSED-ENDED ANSWERS (N=6)**	
The Pilot could help finance a needed rehabilitation project	4	Improve cash flow by reducing energy costs	5
		Environmental objectives	5
Reduce future utility expenses	4	Reduce tenant energy costs	3
Both	2	Contribute to tenant health benefits	3
		Increase property's market value	1
		Attract tenants by advertising energy-efficient housing	1

* Included both interviewed participants and partial participants.

** Excluded partial participants and one participant; respondents could choose more than one answer.

4.1.3. Reasons for Not Participating and Interest in Future Participation

The three partial participants reported different reasons for withdrawing from the Pilot. One chose not to pursue participation after the building assessment because their property was not undergoing a rehabilitation project and consequently the limited number of qualifying upgrades that could be made without a rehabilitation did not meet the Pilot's minimum 20% energy-savings requirement. Another partial participant learned after the building assessment that the building could not accommodate the installation of sub-meters to measure tenant water consumption. Since this partial participant wanted only the water upgrades through the Pilot, the building did not qualify for participation without the water sub-meters. The third interviewed partial participant reported that, after learning about the Pilot processes through consultation with MPower staff, they determined that their Housing Authority lacked staff capacity at the time to devote to participating in the Pilot. In addition to these findings from partial participants, one participant reported engaging with MPower staff on two other buildings that did not move forward, one building was not eligible and the timeline was not favorable for the other.

All of these building owners were open to future participation and had sufficient information on the requirements and benefits to know when participating would be advantageous. Two of them said they would approach MPower Oregon once they had site rehabilitation projects planned and two others mentioned plans to work with MPower Oregon for identifying energy efficiency opportunities at their other buildings.

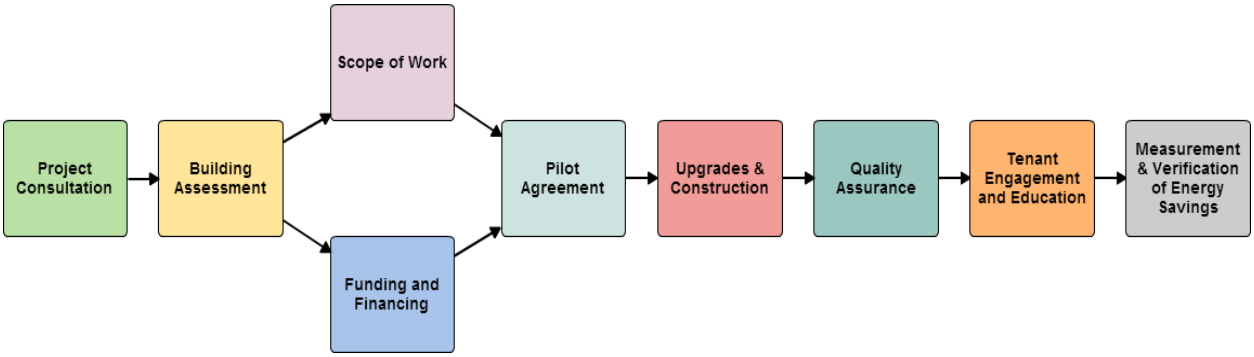
4.2. Pilot Processes

At the Pilot's launch, the participation process involved eight services provided by stakeholders to participants through MPower Oregon (Figure 4-1). MPower Oregon staff first consulted with potential participants about the overall process and determined whether their buildings were good candidates through an overview of the building's characteristics and building owner's financial situation and plans for the building. Next, Energy Trust's Existing Multifamily program management contractor performed a building assessment to identify potential cost-effective energy saving measures that would qualify for Energy Trust incentives and input those into tool developed for the Pilot that helped determine if the proposed project also had the potential to meet MPower's requirements of 20% energy savings and a 10-year payback. If so, MPower Oregon staff and the participant then developed a scope of the work and secured project funds for the project through NOAH and Energy Trust. Participants signed the Pilot's 10-year service agreement typically after the building assessment and before construction began.

After these tasks were accomplished, contractors were hired by the participant, with assistance from MPower Oregon staff if needed, who performed any construction work and installed the energy and water upgrades. When construction was completed, Energy Trust's program management contractor performed a post installation verification on select installed energy upgrades. MPower Oregon staff then provided educational training materials and information to

owners and tenants to help them maximize energy savings and benefits. Last, MPower staff committed to track energy usage data and perform M&V of energy savings at the participating property over the 10-year period of the service agreement.

Figure 4-1: MPower Pilot Participation Process Services at the Pilot's Launch



4.2.1. Building Assessment and Scope of Work

The comprehensive, investor-grade building assessment process that stakeholders revised and improved in the Build Phase included: accessing the building's energy usage data, conducting appropriate tests to identify upgrade opportunities, and performing energy modeling of the building to determine which upgrades could achieve 20% energy savings and a 10-year payback. All buildings were required to have an assessment prior to participation.

4.2.1.1. Stakeholder Perspectives

After involved stakeholders revised and improved the building assessment process in the Design and Build Phases, and used it to successfully qualify the first Pilot participant's building, they reportedly encountered additional issues while performing it in a few more buildings. Stakeholders reported that the process was a "very large team effort," in which 12 to 15 staff would be present to perform the assessment, including MPower Oregon staff, third party engineers, and representatives from the energy efficiency stakeholder organizations. Stakeholders mentioned that this resulted an inefficient division of labor and confusion over which stakeholder organization was leading the assessment process.

Involved stakeholders reported that multiple staff were necessary to conduct the building assessment because it was still very detailed and complex, capturing everything that could be done in a building. The high level of detail in the assessments was partly necessary to reduce the risk to building owners and lenders that energy savings would materialize.

However, involved stakeholders reported that after performing the process in a few buildings, they realized that the assessments were too "expensive, cumbersome, and time consuming," and ultimately beyond the scope of the assessments that ATACs performed for Energy Trust's Multifamily program. Involved stakeholders also reported that the assessments resulted in multiple buildings not qualifying for participation and that they would have "needed 100 or more properties to find 20 that would qualify," which was "clearly unsustainable."

In late 2013, stakeholders involved in the building assessments made three changes in an attempt to mitigate these issues and provide more balance in the level of effort required to achieve accurate comprehensive estimates. First, with approval from HUD, stakeholders reinterpreted the 20% savings requirement to apply to a participant's portfolio of buildings instead of to each building. This change would qualify buildings that fell short of the 20% savings requirement if the participant had another participating building that achieved more than 20% savings, such that the average savings among all the participant's participating buildings was 20%.

Second, stakeholders reported that Energy Trust designated MPower Oregon as an ATAC so that MPower Oregon staff could, in connection with the building assessment, access the building's utility usage data and be responsible for delivering required technical analysis of energy efficiency measures to Energy Trust's program management contractor consistent with Existing Multifamily program requirements, . Previously, the engineering firm performing Pilot analysis had to manage two separate contracts and report to both MPower Oregon and Energy Trust's program management contractor, Lockheed Martin, to deliver both entities with requisite information for each Pilot project. Following MPower Oregon's ATAC designation, the engineering firm delivered analysis to MPower Oregon only and then MPower Oregon was responsible for delivering the information needed by Energy Trust directly to Lockheed Martin. Involved stakeholders agreed this change would reduce the number people involved in the process and alleviate confusion associated with additional assessment analysis that was outside Energy Trust's normal scope. Lockheed Martin and, for lighting projects, their subcontractor Evergreen Consulting Group would still perform post-installation verifications consistent with Existing Multifamily requirements to confirm that qualifying upgrades were installed and appeared to be operating properly.

Third, stakeholders also reported changing the assessment process from a one-stage to a two-stage process in an effort to make the assessments more efficient. Instead of performing a comprehensive, customized investor-grade audit before developing a work scope, stakeholders would: 1) do a walk-through assessment and assign deemed savings to potential upgrades; 2) develop a work scope based on the walk-through results; and 3) perform a more targeted investor-grade assessment to determine if the upgrades only included in the work scope would result in 20% energy savings, and then revise the work scope as necessary to achieve 20% savings.

4.2.1.2. Participant Experiences

Participants were generally satisfied with their building assessments. Participants agreed that the assessments were thorough and easy to schedule. One interviewed participant mentioned that having MPower Oregon staff and the property's general contractor do the audit together and talk through potential solutions made it a "great experience."

However, some of the first Pilot participants mentioned issues concerning the number of people involved in the assessments. In one project, the participant reported 12 people were onsite to conduct the assessment at the building, and having that number people in the building at the same time negatively impacted the residents, as many people were going in and out of occupied units. The building owner communicated this to MPower Oregon staff and, reportedly,

stakeholders addressed the issue after making changes to the assessment process. Participants who experienced the building assessment process that stakeholders changed during the Pilot's implementation did not report any issues.

The area with the greatest participant dissatisfaction was presentation of assessment results, which were presented, reportedly, as a scope of work (Appendix B). While most participants indicated the results were relatively easy to understand, many felt there was missing information. Participants felt there was a "jump" in their program experience from knowing their building was in need of upgrades to being presented with what upgrades would be installed. Participants said they preferred a document outlining the findings of the assessment, including all the potential upgrades and their cost and savings estimates, how many units MPower assessment staff examined, and the condition of equipment in those units, before receiving a scope of work.

Furthermore, the presentation of the scope of work reportedly did not allow participants to pick and choose cost-effective measures. Participants said they would like to be able to discern which measures are clearly cost-effective and have the option to move forward with selected measures. When participants chose to revisit the scope of work, they said it required a lot of "back and forth" to determine the level of energy savings and appropriate measures. Revising the scope necessitated multiple visits to the property requiring substantial time from the property manager and required an updated bid from the contractor, which took more time.

4.2.2. Project Financing and On-Bill Repayment

After the building assessment process, Pilot participants could be eligible for three different funding sources provided through the Pilot to pay for their projects. These sources were: 1) the 10-year unsecured loan with no upfront costs and a six percent interest rate from NOAH; 2) grant funds provided through NOAH from HUD, stakeholders, and other investors; and 3) efficiency upgrade incentives for qualified measures from Energy Trust. Pilot participants could also make their own financial contribution to pay for project costs and had some flexibility in choosing how much of the project costs would be covered by each funding source for which they qualified. If the on-bill repayment service is implemented in the future, past participants who have loans can choose to use the on-bill repayment service to pay back their loans and future participants can use it fund some or all of their project costs.

Total project costs for the 28 projects completed during the Pilot period were more than $10 million, with an average cost per project of $371,198 and an average cost per unit of $4,478 (Table 4-4). All Pilot participants used grant funds and/or incentives, which accounted for an average of 27% of all project costs and ranged from 0.3% to 82% of project costs across all projects. Nearly all participants (89%) made their own financial contribution, which accounted for an average of 46% of all project costs and ranged from 0% to 97% of project costs across all projects. Over half of participants (54%) used the Pilot loan, which accounted for an average 27% of all project costs and ranged from 0% to 75% of project costs across all projects.

Compared to all Pilot participants, the seven interviewed participants had a lower average cost per project and cost per unit, had more of their project costs covered by loans, and had less of their project costs covered by their own financial contribution. A major reason for these

differences was due to a few large and expensive projects that occurred later in the Pilot period; owners of these later projects did not use the loan and covered most of the costs through their own financial contribution.

Table 4-4: MPower Pilot Project Costs and Sources of Project Funding

	PARTICIPANTS (N = 28)	INTERVIEWED PARTICIPANTS (N = 7)
Project Costs	$10,393,552	$970,367
Range of project costs	$5,710 - $1,153,399	$62,288 - $274,556
Average cost per project	$371,198	$138,624
Average cost per unit	$4,478	$1,952
Pilot Grants (includes Energy Trust incentives)	$1,660,063	$252,729
Number of participants (%)	28 (100%)	7 (100%)
Average grant amount per project	$59,288	$36,104
Range of grant amounts	$4,710 - $287,773	$20,410 - $68,639
Average percent of project costs covered by grants	27%	27%
Range of percent of project costs covered by grants	0.3% - 82%	20% - 36%
Pilot Loans	$1,565,313	$573,526
Number of participants (%)	15 (54%)	6 (86%)
Average loan amount per project	$104,354	$95,588
Range of loan amounts	$40,028 - $263,646	$51,659 – $205,917
Average percent of project costs covered by loan	27%	55%
Range of percent of project costs covered by loan	18% - 75%	36% - 75%
Owner contribution	$7,168,176	$144,312
Number of participants (%)	25 (89%)	4 (57%)
Average owner contribution per project	$286,727	$36,028
Range of owner contributions	$1,000 - $1,933,174	$2,234 - $60,000
Average percent of project costs covered by owner	46%	18%
Range of percent of project costs covered by owner	2% - 97%	2% - 67%

4.2.2.1. Stakeholder Perspectives

Overall, interviewed financing stakeholders thought that the financing services – the unsecured loan, grants, incentives, and on-bill repayment (when made available) – were well designed to appeal to and meet the needs of low-income multifamily building owners. Several stakeholders did mention that they thought the process of securing project funding took much longer than was initially anticipated but, according to low-income housing stakeholders, this was mostly due to the financial complexities and regulations in the low-income housing market.

In addition, some stakeholders noted that the unsecured loan product offered through the Pilot was not ideal to overcome split-incentive issues in tenant-metered buildings and was another form of debt that might not appeal to some building owners. These stakeholders did acknowledge that the unsecured loan that does not require property as collateral was better suited for the low-income multifamily market compared to a traditional secured loan.

Some stakeholders also mentioned that combining the Pilot loan with Energy Trust incentives and other grant funds could be somewhat effective at addressing the split incentive issue if participants used the latter to offset costs of upgrades made in tenant spaces so that the owner does not have to invest as much from their loan or their own contribution to pay for these upgrades. This reportedly turned out to be the case in many projects (see Sections 4.2.2.2 and 4.2.3).

On-Bill Repayment Service

At the time of the stakeholder interviews in November 2015, the on-bill repayment service of the Pilot financing services was still being developed. One of the challenges stakeholders reported with implementing the on-bill repayment service was that under EEAST, on-bill repayment agreements with utilities for multifamily buildings were voluntary, and the utilities were reluctant to do anything that was not mandated in the legislation.

Stakeholders also added that another challenge has been designing an on-bill repayment system that can interact with utilities' older billing systems. One stakeholder said that if more on-bill repayment were to happen in Oregon, it would require an expensive upgrade to the utilities' billing processes and systems.

Energy Trust and Craft3 finalized voluntary on-bill repayment agreements with Pacific Power and PGE in early 2015 after most Pilot projects were completed or in progress, and noted that the nature of the agreement meant that the utilities could stop participating at any time, which was problematic for Pilot projects since they were bound to a 10-year service agreement. Energy Trust and MPower Oregon were still working on a contract at the end of the Pilot period to allow MPower staff access to the on-bill platform that Energy Trust and Craft3 established with the utilities. MPower staff noted this is the final step that will allow them to implement the on-bill repayment service and expected it to be implemented sometime after the end of the Pilot period. They also said they would encourage past participants to opt to pay their unsecured loan off through on-bill repayment when the service is available.

4.2.2.2. Participant Experiences

Interviewed participants reported high satisfaction with the Pilot's project funding services. They expressed that the Pilot financing and incentives allowed them to include energy efficiency as a component of their facility rehabilitation project (3 of 7) and complete upgrades sooner than they would have been able to otherwise (3 of 7). A few participants mentioned that they had a backlog of needed property repairs and the funds through the Pilot made the repair projects more achievable because they could use their replacement reserve funds for capital improvement and repair projects, and use Pilot funding to complete energy efficiency upgrades.

Most participants also expressed high satisfaction with the Pilot's financing service, saying that it was economically beneficial and that the loan allowed them to install nearly all of the recommended upgrades, which would not have been possible otherwise. Some also said the process of applying for financing was "seamless" and that they were expecting "hiccups in the approval process with such a different financing type, but they did not occur." Two interviewed participants, however, reported that getting approval for the financing took longer than they initially expected.

Two participants also reported some complications in the process of applying for financing. One participant's property is subject to HUD's Section 236 mortgage stipulations and HUD was reportedly reluctant to encumber the property with a loan. This participant discussed the issue with MPower Oregon staff and staff then "explained to the HUD office what this project meant, the finance structure, lien provisions, and any other issues they may have had with it," which resulted in loan approval. Another participant reported that it took some work to figure out how to structure financing deals with MPower Oregon so that it did not affect any of the financing they already had in place or cause issues with their tax credit investor or permanent lender. This issue does not seem to have deterred the participant's interest in future participation in the program as he also stated, "now we know how to structure deals with MPower going forward."

In addition, prior to participation in the Pilot, some participants (4 of 7 interviewed participants) had used Energy Trust cash incentives provided through its Existing Multifamily program to make upgrades in their multifamily buildings. Three of these participants wanted to know more clearly the added value of going through the Pilot as opposed to participating solely in Energy Trust's program. One participant offered the following recommendation: it would be "nice if it were clear how much of Energy Trust's incentive could come to the project if MPower was not part of the package, so that you can see the benefit of bringing MPower in compared to going at it alone [with Energy Trust]."

Interviewed owners of tenant-metered buildings viewed the split-incentive issue "unfavorably" and employed two strategies to reduce the costs of making tenant unit upgrades. One strategy involved choosing which of the Pilot's different funding sources to apply to common area and tenant unit upgrades. For example, one participant with a tenant-metered building reported that Pilot participation provided flexibility to use Energy Trust's incentives and the Pilot's available grant funds to offset the costs tenant unit upgrades and to use the incentives and Pilot loan to pay for common area upgrades and the remainder of any tenant unit upgrade costs. A second strategy owners of tenant-metered buildings used to lower the costs of making tenant unit upgrades was to primarily upgrade existing equipment in tenant units that required low labor costs to install and were eligible Energy Trust's incentives (see Section 4.2.3.2).

On-Bill Repayment Service

Although the on-bill repayment service was not available to interviewed participants, the evaluation team asked if it would have motivated them to participate had it been available. None of the participants reported that the ability to do on-bill repayment would be a motivator to participate in the Pilot.

Owners with tenant-metered buildings said that trying to explain to tenants what the on-bill repayment charges were on their bills would have been complicated and difficult, and thus made that option unattractive. One participant with a tenant-metered building had planned to use on-bill repayment but belatedly learned that their electric company (Pacific Power) had not agreed to provide on-bill repayment after the upgrades had been installed and after they had finalized all the loan documentation and received the amortization schedule.

For master-metered properties, building owner participants preferred to keep their debt repayments separate from their utility payments because it provides for "cleaner" accounting. Another participant reported on-bill repayment was a negative influence in their decision to participate in the Pilot because they viewed repayment through the utility bill as a risk if the energy savings did not actualize, resulting in higher bills than before Pilot participation.

4.2.3. Installation of Upgrades, Quality Assurance, and M&V of Energy Savings

Several different types of energy and water efficiency upgrades could be installed in MPower Pilot participant buildings (Table 4-5), depending on their energy savings and cost-effectiveness. Some of these upgrades were free direct-install devices in tenant units provided by Energy Trust, including light bulbs, low-flow faucet aerators and showerheads Other upgrades, such as some lighting equipment, heating/cooling units, domestic hot water systems, appliances, insulation, and windows, were eligible for incentives through Energy Trust's Existing Multifamily program. Upgrades not provided or incented through Energy Trust may have been eligible for other Pilot grant funds, or had to be paid for through the Pilot's loan or owner's contribution.

The most common upgrades installed in the 28 Pilot projects and in the seven interviewed participants' projects were lighting upgrades, faucet aerators, ventilation upgrades, showerheads, heating/cooling upgrades, domestic hot water upgrades, water closets, appliances, and insulation (Table 4-5). Less common upgrades included doors, windows, weatherization, water conservation landscaping, and programmable thermostats. In addition, project-level data showed that an average of 7.6 types of upgrades were installed in Pilot projects; an average of 8.5 types of upgrades were installed in master-metered buildings and an average of 7.3 types of upgrades were installed in tenant-metered buildings.

Table 4-5: Categories of Energy and Water Efficiency Upgrades Installed in MPower Pilot Participating Buildings

	PARTICIPANTS (N = 28)	INTERVIEWED PARTICIPANTS (N = 7)
Lighting[a]	28	7
Faucet Aerators	21	5
Ventilation[b]	19	4
Showerheads	18	5
Heating/Cooling[c]	14	4
Domestic Hot Water[d]	12	5

Water Closet/Toilet	10	2
Appliances[e]	9	4
Insulation	9	4
Doors	8	1
Windows	7	0
Other weatherization[f]	2	1
Landscaping for Water Conservation	2	0
Programmable Thermostats	2	0

[a] Category includes fixtures, bulbs, controls, and direct install upgrades

[b] Category includes bath/kitchen/whole house fans, passive air vents, air handing units, shut-off dampers, energy recovery units, and heat recovery units

[c] Category includes heat pumps, cadet heaters, and central heating/cooling units

[d] Category includes hot water tanks and recirculation control systems

[e] Category includes dishwashers, refrigerators, clothes washers, clothes dryers, ovens/ranges, and vending machines

[f] Category includes weatherstripping and air sealing

Upon completion of the installation of upgrades in Pilot projects, energy efficiency stakeholders performed a quality assurance check on select upgrades to ensure their correct installation and operation. One year after completion of the upgrades, MPower staff began collecting energy usage data for M&V of energy savings, which would occur annually throughout the 10-year service agreement. As of February 2016, energy savings M&V had begun for some of the early Pilot projects but were not started at the time of the stakeholder interviews.

4.2.3.1. Stakeholder Perspectives

Most interviewed stakeholders were unable to comment on the construction process or the installation of the upgrades due to their lack of involvement in these activities. However, interviewed MPower Oregon staff discussed one issue they encountered with Walsh Construction regarding the size and cost of the construction projects.

Initially, MPower negotiated a contract with Walsh Construction to be the general contractor for the first several projects. Walsh Construction contributed to Pilot design, development of work scopes, and providing cost estimates, however the first Pilot projects were smaller than anticipated by Walsh Construction. As a result, the fee amounts Walsh Construction could charge did not cover the costs of its involvement in the projects. To address these concerns MPower Oregon and Walsh Construction worked together to find other contractors and create subcontracting agreements that were a better fit for the smaller-sized Pilot projects.

In addition, energy efficiency stakeholders reported the quality assurance of installed upgrades managed by Lockheed Martin had to be revised during the first few projects. At first, Lockheed Martin performed quality assurance checks on an upgrade if it met one of two criteria: it was incented by Energy Trust or, if the measure was not incented by Energy Trust, its cost exceeded $3,000. When stakeholders made changes to the building assessment process, they also changed the quality assurance process to be performed on all measures regardless of cost or incentives.

Stakeholders reported that after testing the revised process on a few buildings, fulfilling this process was sufficiently burdensome and beyond the Lockheed Martin's standard scope that stakeholders agreed to revert to using the original quality assurance criteria.

Although stakeholders had not begun the energy savings M&V at the time of the interviews, they described it as an important step in proving the Pilot's benefits and obtaining important feedback about the Pilot's effectiveness. Energy savings M&V will reportedly contribute to a longitudinal dataset to demonstrate how the benefits outweigh the costs for participating building owners and to enable stakeholders to improve the Pilot's processes.

4.2.3.2. Participant Experiences

Most interviewed participants, including all master-metered building owners, reported installing all of the measures included in the work scope. Some tenant-metered owners reported considering upgrades based on the incentives and grant funds available, the installed costs of the upgrades, and the payback period to avoid high out-of-pocket tenant unit upgrade costs. Project-level data confirms that, on average, owners of tenant-metered buildings included fewer types of upgrades (7.3 vs. 8.5) and, in tenant units, did not include as many labor-intensive upgrades like installing insulation or improving ventilation compared to owners of master-metered buildings. Many of the tenant-metered Pilot projects primarily included upgrades to existing equipment that were less labor intensive to install.

Most participants reported being satisfied with the installation process and described it as "straightforward." Participants reported that the installation process was well coordinated between MPower Oregon staff, the property management firm, tenants, and contractors. For example, one project was at a senior housing facility where many residents had health concerns and therefore might have been sensitive to construction; the property managers were prepared to make special accommodations, but reported that construction went smoothly and caused no complications for the senior tenants.

To install the upgrades, most participants preferred to use their property's general contractor or contractors with whom they had previously worked. MPower Oregon staff reported they worked with these general contractors to ensure they understood the Pilot requirements and that they sought to effectively communicate with the contractors so that the contractors would be open to doing subsequent MPower projects.

However, three participants reported issues with contractor selection. For one project outside the Portland Metro area, MPower Oregon staff solicited bids on the project, with reportedly little response. The participant was disappointed in the low number of bidders and thought this reflected poorly on the Pilot, reasoning that if MPower Oregon staff were engaged in numerous projects, they would have garnered numerous bidders for the project. The same participant skipped the contractor bidding process for another property and reported a smoother experience.

Another participant reported that the bids from the contractors were significantly higher than the cost estimates provided by MPower Oregon staff.[4] This participant expressed frustration in getting so far into the Pilot process only to learn the costs were more than they were anticipating.

A third participant ran into difficulties when their contractor's normal process required an upfront payment to purchase needed supplies. MPower Oregon staff were reportedly unable to provide funds prior to construction or another qualified contractor in the area, so the participant paid a contribution to the contractor before construction started and noted that "MPower worked as quickly as they could to get a payment to the contractor once work began."

4.2.4. Tenant Engagement and Education

MPower Oregon staff and ECP provided, and will continue to provide, building owners with tenant engagement services and materials to inform tenants how to use their building's new upgrades and of behavioral tips for saving energy and water (Appendix C). The Pilot's tenant engagement process included conducting surveys of tenants, making group presentations, and providing tenants with materials such as shower timers, and door hangers and stickers that reminded residents to turn off their lights, use cold water in the laundry room, and set their thermostats at recommended settings.

Stakeholders designed the tenant engagement materials so that MPower Oregon staff or the building owners could present them to tenants. Stakeholders also arranged for the engagement process to occur annually throughout the participants' 10-year Pilot service agreement and planned to provide different materials each time so that tenants may take notice when the changes are made.

At the time of the participant interviews, all interviewed participants reported that the tenant engagement process was scheduled to occur (2) or had already occurred at their buildings (5). Of the latter, two of the building owners presented the information and distributed materials to tenants and three preferred that MPower Oregon staff perform these activities. Some interviewed building owners also reported using their own informational mailings, electronic communications, and/or some type of signage posted in the building about the upgrades, in addition to the Pilot's tenant engagement activities and materials.

Stakeholders and participants spoke very favorably of the tenant engagement activities. Interviewed stakeholders reported that they thought the tenant engagement process and materials were well designed and would be well received by building owners, which turned out to be the case. For example, the three participants who preferred MPower Oregon staff present the materials mentioned that they appreciated, and found helpful, the tenant engagement support provided by staff because the owners do not always have time and resources to devote to educational efforts. One participant described the tenant engagement package they presented to their tenants as "extremely helpful" and "engaging" for most tenants. Another participant reported that MPower Oregon staff provided a customized presentation to tenants about saving

[4] How MPower Oregon calculates contractor cost estimates was not covered in interviews.

natural gas since usage increased after upgrades were installed, which reportedly contributed to an increase in savings "from about 10% to about 15%".

4.3. Final Pilot Model

During the course of the Build and Launch phases, stakeholders made three major changes to the launched Pilot model and processes in an attempt to continually improve the Pilot. These changes included:

- Transitioning responsibility for the building assessment from Lockheed Martin and Evergreen Consulting Group to MPower Oregon staff,
- Performing a simplified walk-through building assessment before developing a work scope and then conducting the comprehensive building assessment, instead of performing the comprehensive assessment before developing the work scope, and
- Enabling Walsh Construction to focus on larger Pilot projects and identifying other contractors or subcontractors for smaller Pilot projects.

Figure 4-2 and Figure 4-3 illustrate the MPower Pilot's model and typical flow of processes when the Pilot period ended in December 2015.

Figure 4-2: The MPower Pilot Model after the Pilot Period

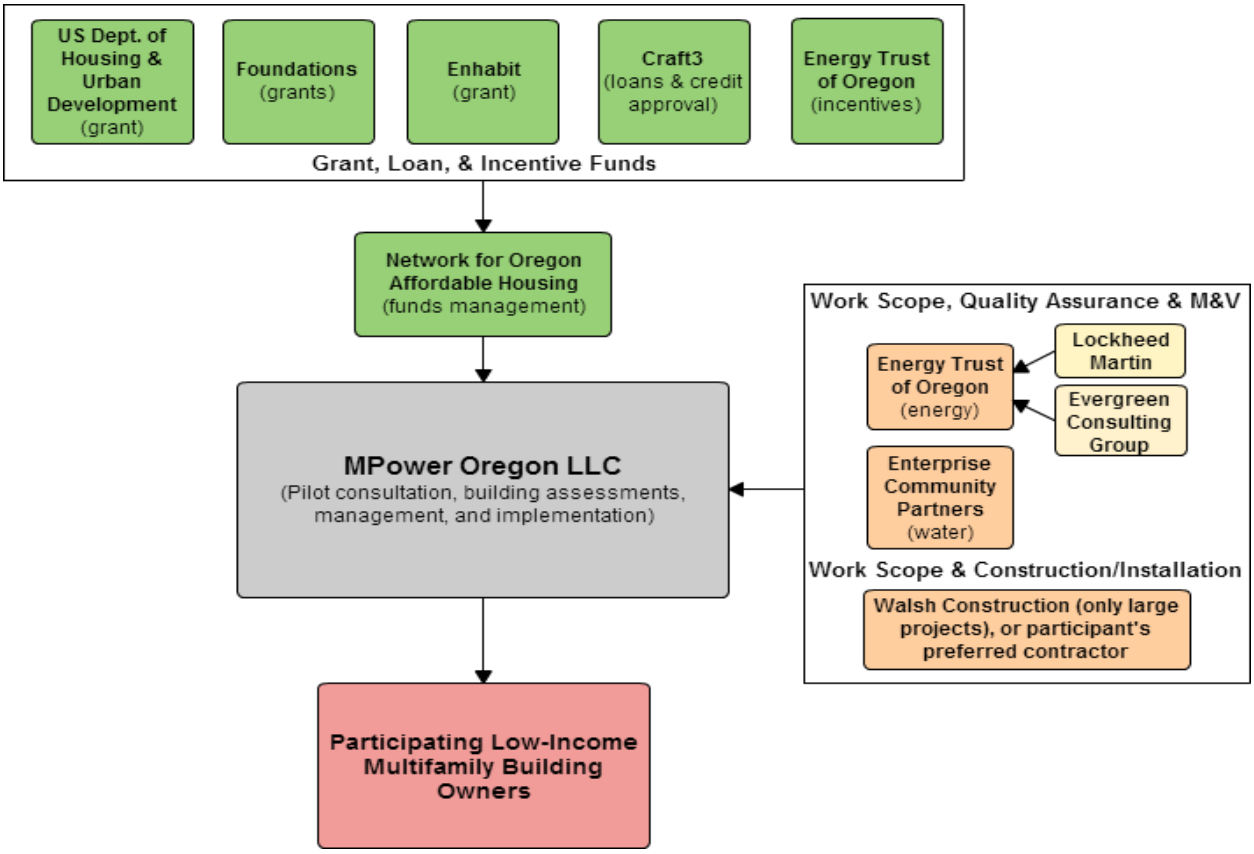
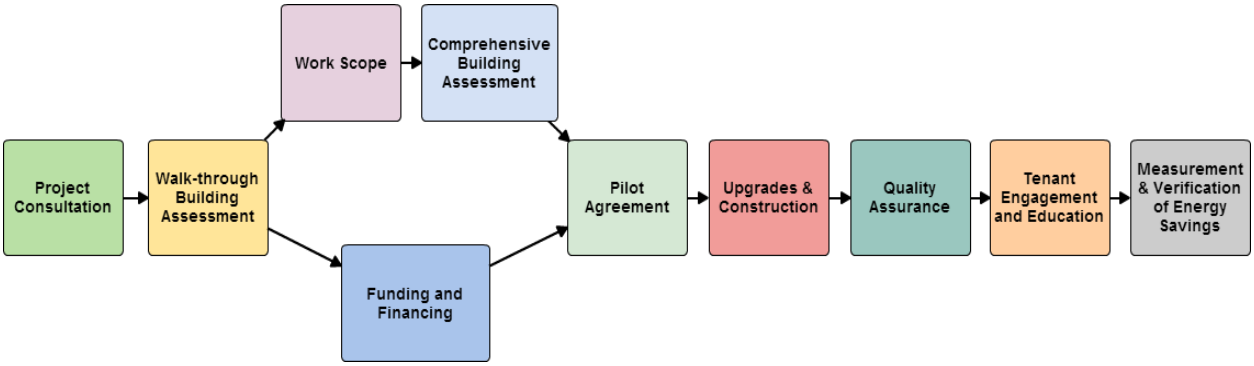


Figure 4-3: MPower Pilot Participation Process Services after the Pilot Period



5. Goal Attainment, Key Challenges & Benefits, and The Pilot's Future

5.1. Stakeholder Goal Attainment

Interviewed stakeholders reported attempting to meet four primary Pilot goals: 1) launching the Pilot with the first participant soon after HUD grant funds were awarded in July 2012; 2) demonstrating the Pilot's services were in demand and helped overcome existing market and program barriers; 3) meeting or exceeding the Pilot's project completion goals of 34 buildings and 2,550 units; and 4) meeting or exceeding the Pilot's 20% energy savings goals for each participant's portfolio of Pilot projects.

Stakeholders had almost all of the Pilot's processes ready for launch and several potential buildings in a project pipeline when the HUD grant funds arrived in July 2012. However, due to the complications stakeholders experienced in developing a building assessment process and an alternative to the on-bill repayment service, the first participant was not qualified until July 2013, one year after the goal.

Overall, the Pilot was mostly successful at generating some demand for its services and reportedly helped participants overcome market and program barriers to making comprehensive energy- and water-efficiency upgrades. For example, all the Pilot participants received grant and incentive funding for their Pilot project, and over half (15 of 28) used the Pilot's loan (including all interviewed participants), demonstrating high demand for the grant and incentive funds and moderate demand for the loan. The stakeholders were unable to implement the on-bill repayment service before the end of the Pilot due to complications with establishing agreements among involved parties but interviewed participants preferred their unsecured loan instead of one with on-bill repayment.

At the end of the Pilot period in December 2015, stakeholders had completed projects in 28 buildings with 2,321 units, reaching 82% of the project completion goal for buildings and 91% for units. Most stakeholders did not think that this resulted as much from low demand for Pilot services than from challenges they encountered developing and implementing the Pilot. Stakeholders reported several key challenges (discussed below) that inhibited progress toward reaching the Pilot project completion goal, which resulted in stakeholders having to spend more time and resources than anticipated to make substantial changes to and continually improve the Pilot.

After Energy Trust performs an energy savings analysis with the 28 completed projects, the team will determine if the Pilot met its 20% energy savings goals for these projects, and will include the results in an addendum to this report. Most stakeholders reported being cautiously optimistic about meeting the energy savings goals; the energy efficiency stakeholders reported being less confident, indicating that the energy savings may potentially not be commensurate with the level of effort and resources invested in the Pilot.

Overall, stakeholders reported mixed satisfaction with meeting the goals they established for the Pilot. By the end of the Pilot, stakeholders were mostly satisfied with the Pilot model after making the many changes and improvements, and thought it was mostly effective, from the participants' perspective, at providing the services participants needed to make energy- and water-efficiency upgrades. Stakeholders were also mostly satisfied with the number of completed projects, even though it was short the project completion goal. However, stakeholders were not satisfied with the levels of effort, time, and resources they had to invest to achieve the outcomes that occurred, primarily due to the key challenges they experienced in developing and implementing the Pilot.

5.2. Key Challenges for Stakeholders

The team identified four key interrelated challenges that occurred during the development and/or implementation of the Pilot. Interviewed stakeholders reported that these were the challenges that most inhibited their progress in developing the Pilot and attaining their goals, caused substantial strains in their collaboration when making changes to the Pilot, and led to delays in launching the Pilot and completing projects. These challenges were in large part due to the complexity involved in a program in which multiple stakeholder organizations, operating under different regulations, collaborated to package their services together in a single offering tailored to an underserved, multifaceted, and a not fully understood market.

5.2.1. Need for More Information about the Target Market

Many stakeholders indicated that, in hindsight, engaging building owners earlier and performing building stock and market needs assessments would have provided them with needed information about buildings characteristics, building owners' needs, and the level of interest in Pilot services. Stakeholders reported that when they engaged a few building owners they learned about multiple characteristics of the buildings and the owners' situations that they had not considered and, in some cases, wrongly assumed would not vary much across owners and buildings. Having more information about the target market would have reportedly enabled stakeholders to more efficiently design and build the Pilot's processes with fewer changes, particularly regarding the building assessments and financing services.

5.2.2. Need for More Staff Time and Resources than Anticipated

Most stakeholders reported that designing, implementing, and continually improving the Pilot's processes required much more time and resources than initially anticipated or planned for. Energy efficiency stakeholders, in particular, reported that when other stakeholders were resource-constrained, they often turned to the energy efficiency stakeholders for assistance. The level of effort and resources energy efficiency stakeholders invested in designing and implementing the Pilot was reportedly "too much" and repeated requests for additional assistance made their participation in the Pilot ultimately "unsustainable" in the long-term. Some stakeholders also mentioned that dedicating much of their time and resources to the Pilot's continuous improvement shifted time and resources away from other important tasks, such as

outreach to more building owners and contractors and establishing on the on-bill repayment service.

5.2.3. Integrating Stakeholders' Services into the Pilot

Energy efficiency and finance stakeholders reported difficulty in integrating their existing services into the Pilot. This was due to conflicts between regulatory and organizational requirements governing the stakeholders' services, and to other stakeholders having to learn these requirements and how to best work within them.

For example, the unsecured loan provided by finance stakeholders required a comprehensive building assessment to estimate energy savings as accurately as possible. However, the assessment was reportedly beyond the established scope of what is required by Energy Trust's Existing Multifamily program. This required stakeholders to change the assessment process and designate MPower Oregon as an ATAC so that MPower Oregon staff was responsible for delivering the required energy analysis to Energy Trust directly. Similarly, the quality assurance tests that stakeholders designed for the Pilot were also different than Energy Trust's Existing Multifamily program requirements and necessitated stakeholder choices regarding alignment.

Stakeholders also experienced difficulty in establishing a new service for the Pilot, the on-bill repayment service. Integrating the on-bill repayment service with utilities' billing practices and systems, Energy Trust's data protocols and systems, finance stakeholders' underwriting practices and standards, and MPower Oregon's Pilot management systems required much more time than anticipated during the Pilot period. Energy efficiency and finance stakeholders reported eventually establishing voluntary on-bill repayment agreements with two utilities but these came too late in the Pilot period to reach an agreement with MPower Oregon that would integrated the service into the Pilot.

5.2.4. Confusion from Pilot Complexity and Changes

All stakeholders indicated that, after the Pilot was launched, they were confused, to some extent, about many of the Pilot's requirements and processes, and other stakeholder organizations' regulatory and internal requirements. This was evidenced in stakeholder interviews, in which the team received inconsistent information from multiple stakeholders regarding several details about developing and/or implementing the Pilot. This confusion reportedly stemmed from the large number of stakeholders involved in the Pilot, the complexity of the Pilot model, in which multiple stakeholders provided their services through MPower Oregon, and the multiple changes that stakeholders made to Pilot processes. Stakeholders mentioned that confusion among stakeholders led to some miscommunications and misunderstandings , and required much effort to try update stakeholders on a continual basis.

5.3. Key Benefits for Stakeholders

The team also identified two key benefits interviewed stakeholders reported experiencing through their involvement in developing and/or implementing the Pilot: collaboration across diverse market sectors and continuous improvement of the Pilot to overcome challenges.

5.3.1. Collaboration Across Sectors

Stakeholders reported that their involvement in the MPower Pilot was beneficial for them because they developed new partnerships and learned about sectors outside of their own. For example, efficiency stakeholders reportedly learned more about low-income housing financing, which they said could improve their outreach and services to the low-income housing market. Low-income housing stakeholders said they gained a better understanding of energy and water efficiency, which they can use to protect the economic viability of their low-income properties. Finance stakeholders mentioned that they benefited from working across sectors to design and secure funds for the Pilot's financial package, and they plan to apply their experiences in other markets. Community development stakeholders reported learning more about how to better leverage energy efficiency programs to contribute to a greener, more inclusive local economy.

Stakeholders also benefited from what each stakeholder organization contributed to developing and implementing the Pilot, noting, "what each [stakeholder] brought to the table was instrumental for making progress" on the Pilot. For example, low-income housing stakeholders had many connections with housing authorities and building owners, and in-depth knowledge of low-income housing regulations, ownership structures, and financial situations. Efficiency stakeholders contributed their expertise about program design and management, the energy and water regulatory environments in Oregon, and energy- and water-related technical practices such as conducting building assessments. Finance stakeholders had experience obtaining grant funding and/or knowledge of various financing services and models. Community development stakeholders performed outreach to their local connections to recruit potential contractors and to obtain feedback on Pilot processes from actors in the low-income housing and energy efficiency sectors.

5.3.2. Building and Continually Improving the Pilot

Stakeholders expressed that they benefitted from their experience in building a Pilot model from scratch and continually improving it throughout the Pilot period. The stakeholders reported benefitting most by learning more about "what works and what doesn't work." Stakeholders also reported benefitting from the group's willingness and dedication to continually improve the Pilot as they encountered challenges. Although challenges remained at the end of the Pilot, stakeholders indicated that the Pilot likely would have foundered if stakeholders had not been so willing to collaborate through making major Pilot changes and improvements.

5.4. Participant Goals

Interviewed participants reported that their primary goals for participating in the Pilot were to improve their buildings, reduce maintenance costs, save energy and water, and provide non-energy benefits, such as increased comfort and air quality. Participants expressed overall high satisfaction with their completed projects and thought that they were an improvement to the building and would reduce future maintenance needs.

Four of the five interviewed participants with completed projects reported seeing energy savings right away, and one of these participants noted that the energy savings at the property exceeded the forecast. One participant mentioned, however, that their property that was not meeting the predicted energy and water savings due increase in gas usage after the upgrades were installed. Staff from MPower Oregon and ECP worked with this property manager to develop a customized resident engagement program and a few months after the resident engagement, the owner re-assessed its energy savings, which had increased from 10% to 15%. MPower Oregon staff are reportedly still working with the participant to find ways to increase savings closer to 20%.

All the participants reported at least one non-energy benefit resulting from the upgrades and received positive feedback from tenants in these regards. For example, at one building, insulation between units and the parking garage reportedly reduced noise for the tenants. At another, the owner was able to increase comfort by providing air conditioning to its tenants for the first time with an efficient heat pump. In a third building, the lighting that was installed in the parking lot reportedly reduced problematic nighttime activity and improved security.

5.5. Key Challenges for Participants

Partial participants, and participants with other buildings that did not participate in the Pilot, reported two main reasons for not participating. First, one partial participant's building, and a participant's building that did not participate, could not meet the 20% savings requirement without upgrades that they thought were too costly at the time. Second, one partial participant, and one participant with a building that did not participate, wanted enough upgrades installed to justify waiting to participate in the Pilot until they planned a larger rehabilitation or capital improvement project in the future.

The first Pilot participants mentioned needing to dedicate more of their own or their staff's time to their Pilot projects than anticipated. Participants noted that this was primarily due to stakeholders improving the Pilot's processes, such as the building assessments and financing services, as they performed them. They also understood in advance of their participation that their projects were some of the Pilot's first and thus would serve as early test cases for the Pilot's processes.

Some participants reported difficulty in making decisions about whether to participate in the Pilot and what upgrades to install based on the results from the building assessment report. These participants mentioned that the report was presented as a work scope that lacked information about potential upgrades not included in the work scope or financial benefits of participating in

the Pilot compared to participating only in Energy Trust's Existing Multifamily program. They thought that this limited their choices to either accept the work scope or withdraw their participation, and preferred a report that presented "packages" of different upgrades demonstrating the Pilot's added value that they could choose from that could achieve 20% savings.

Two participants experienced difficulties in finding a contractor to install the upgrades. One participant outside the Portland Metro area received bids from only one contractor and would have preferred more choices. Another participant could not find a preferable contractor whose costs were as low as the estimates provided in the work scope, and reportedly had to pay more than anticipated.

5.6. Key Benefits for Participants

All interviewed participants with completed Pilot projects reported benefitting from the performance of the upgrades. Participants expressed that the upgrades contributed to mostly meeting their goals for participating in the Pilot.

Participants reported benefitting from participating the Pilot's processes, particularly the financing services. For example, participants said that the financial services enabled them to install comprehensive upgrades that they otherwise could not have afforded and, for some participants, perform capital improvements or rehabilitations of their properties sooner than planned. Participants with tenant-metered buildings reported leveraging the Pilot's grant and incentive funds to offset costs to making upgrades in tenant units that they otherwise would not have made. In addition, those participants who were involved in the tenant education activities reported learning how to teach tenants to use the upgrades and that the materials were helpful reminders to change behaviors.

Participants mentioned benefiting from the Pilot's one-stop-shop model. Interacting primarily with one organization, MPower Oregon, through the participation process reportedly saved participants time and made participation "mostly seamless." In addition, participants reported that MPower Oregon staff worked diligently to complete their projects and address issues that arose. The participants spoke highly of the staff, with one participant reporting the staff were "extremely helpful." Another reported that MPower Oregon staff were "easy to work with and easy to get ahold of." Some participants also noted that they benefited from MPower Oregon's flexibility in planning and completing the Pilot projects. For example, some Pilot projects were included as part of a larger construction project that required a longer timeline and more coordination; some other projects were in multiple buildings under a single owner that the owner wanted to upgrade one building at a time.

Overall, these results indicate that the Pilot services helped low-income family building owners overcome market and program barriers to making energy- and water-efficiency upgrades. Without these services, participants suggested that they would not have performed an upgrade project or would have done much less than what the Pilot enabled them to do.

5.7. The Future of MPower

At the conclusion of the Pilot in December 2015, there were 28 buildings that had completed projects, two active projects in the pipeline, and 24 partial participants who had withdrawn from participating in the Pilot but expressed interest in future MPower participation. However, two major changes occurred at the Pilot's conclusion that stakeholders reported must be addressed if MPower Oregon is to continue offering its services.

First, the Pilot's designation as a "pilot initiative" under Energy Trust and MPower Oregon's status as an Energy Trust ATAC ended at the conclusion of the Pilot. ATACs are energy engineering firms that are utilized by Energy Trust's Existing Multifamily program on a limited basis to perform technical energy analysis of proposed custom energy efficiency measures. MPower Oregon's ATAC status was limited to the Pilot period and for the purpose of improving coordination and delivery of the building assessments and analysis specifically for Pilot projects. The conclusion of the Pilot and termination of ATAC status also concludes MPower Oregon's ability to access building owners' utility usage data through Energy Trust for the purpose of conducting the Pilot comprehensive building assessments. \

Second, the HUD grant agreement that provided much of the Pilot's grant funding for projects ended in December 2015. All the participants used a combination of grants and incentives, and reported the availability of these funds as one of the reasons they participated, particularly for tenant-metered building owners who used the grant funds to offset the costs of tenant unit upgrades. While participants can continue to leverage Energy Trust incentives through the Existing Multifamily Program, stakeholders suggested that MPower Oregon and NOAH would need to find and partner with grant-funding organizations in order to continue providing these additional grant funds to all future participants in similar amounts that were provided to Pilot participants.

All interviewed stakeholders expressed interest in continuing to work with MPower Oregon's program in the future if it can reach a sustainable cooperative agreement with Energy Trust and obtain the necessary funding to continue. Without these, stakeholders reported that the MPower Oregon's program would likely not be viable to continue. The energy efficiency stakeholders also mentioned that continued collaboration with MPower Oregon could be beneficial if MPower Oregon can manage and provide most of its services without as much assistance as was needed in the Pilot period.

6. Conclusions and Recommendations

The team reached the following conclusions and recommendations (C&Rs) based on key findings from the evaluation. The team made the first three C&Rs regarding what needs to occur for MPower Oregon's program to continue in future as a program. The team made the last three C&Rs under the assumption that MPower Oregon's program will continue in the future as a low-income multifamily program.

Conclusion 1: The Pilot concluded in December 2015 and stakeholders reported interest in continuing to work with MPower Oregon and providing their services through MPower Oregon's program.

> **Recommendation 1:** Assess the value of continuing to work with MPower Oregon and its program, which should include feedback or input from all involved stakeholders.

Conclusion 2: At the conclusion of the Pilot the agreements made between MPower Oregon and Energy Trust (and its ATACs) expired, which energy efficiency stakeholders reported as "unsustainable" due to the time and resources required of them. The expiration of the agreements also discontinued Energy Trust's provision of additional support and services in the Pilot outside of the scope of their standard program delivery.

> **Recommendation 2a:** Reach an agreement between MPower Oregon and Energy Trust that re-establishes the relationship the organizations shared during the Pilot period to the extent needed to continue providing the support and services required to utilize Energy Trust's Existing Multifamily upgrade incentives.

> **Recommendation 2b:** Establish a formal division of labor between MPower Oregon and Energy Trust (and its ATACs) that prevents the latter from contributing more time and resources to Pilot projects than what is typically required of them for Energy Trust's Existing Multifamily program projects.

Conclusion 3: Grant funds for pilot projects were a key component of the Pilot's financing services that participants leveraged to offset the costs of upgrades, particularly tenant unit upgrades.

> **Recommendation 3:** Identify and partner with one or more grant-funding organizations to achieve the level of grant funding that was provided during the Pilot to participants to continue uptake in participation.

Conclusion 4: Stakeholders reported that many of the challenges they encountered in the Pilot's implementation stemmed from the complexity of the Pilot's model, in which multiple stakeholder organizations, operating under different regulations, collaborated to package their existing services together into a single offering tailored to an underserved and little-understood target market.

Recommendation 4a: Consider performing building stock and market needs assessments of Pilot non-participants in the target market and using the results to inform decisions on what, if any, future improvements to make to the MPower Oregon's program to increase participation.

Recommendation 4b: Assess ways to streamline MPower Oregon's processes and structure to enable stakeholders to more seamlessly provide their services through the program, as aligned as possible with how the stakeholders provide their services to their customers outside the program.

Conclusion 5: Interviewed participants desired more transparency and information in the presentation of the building assessment results and work scope (Appendix B) to facilitate more informed decisions about moving forward with their projects.

Recommendation 5a: Present a summary sheet outlining the results of the assessment as a lead–in to the presentation of the scope of work.

Recommendation 5b: Consider providing options in the work scope to the extent feasible, including different packages of measures participants could choose.

Recommendation 5c: Consider including separate cost and incentives estimates for participating in the MPower Oregon's program and for participating in Energy Trust's Existing Multifamily program to demonstrate any added value from participation in MPower Oregon's program.

Conclusion 6: Nearly half of Pilot participants did not use the Pilot's unsecured loan and all interviewed participants preferred a loan product paid back through the participant's finances instead of an on-bill repayment service.

Recommendation 6a: Continue offering the unsecured loan with no upfront costs to participants since there was a moderate level of uptake of the loan by Pilot participants.

Recommendation 6b: Consider exploring whether other debt financing products are available through lenders and assessing building owners' level of interest in using these products to determine if others products could generate more uptake in participation.

Recommendation 6c: Assess whether nonparticipant building owners are interested in an the on-bill repayment service for paying off their debt financing and what would encourage past Pilot participants to use on-bill repayment for their Pilot loan to determine if there is any demand for it.

Appendix A. Interview Guides

A.1. Stakeholder Interview Guide

A.1.1. Introduction

Hello, may I speak to [*Name from call list*]?

Hello, my name is _____ calling on behalf of Energy Trust of Oregon from Research Into Action. I am calling to speak with you about your involvement in the MPower Pilot for low income multifamily buildings in Oregon. Would this be a convenient time for us to talk? I anticipate we will need about 30 minutes to an hour, depending on how much you have to say.

[*If not, schedule another time; if so, continue*]

When would be a more convenient time for you?

DATE:

CALLBACK NUMBER:

[*Start of Interview*]

Thank you for taking the time to talk with me today. As I mentioned earlier, we are evaluating the MPower Pilot and are interested in your feedback as a key stakeholder.

I will be taking notes as we talk and audio recording this interview to ensure the accuracy of the notes. However, both the notes and the recording are for research purposes only and will not be provided to anyone outside the Research Into Action team.

S1. Is it ok that we record our conversation?

Do you have any questions before we get started?

A.1.2. Background

First, I have a few questions about you and your role in the MPower Pilot.

Q1. How long you have been at [**STAKEHOLDER NAME**].

Q2. In general, what is your role at [**STAKEHOLDER NAME**]?

1. How long have you been in your current role?

Q3. What was your role in the MPower Pilot? [IF NOT MENTIONED: What responsibilities did you have in your role?]

1. What led to your involvement in the MPower Pilot?
2. [IF UNCLEAR] When did you first get involved in the MPower Pilot?
3. In what ways, if any, did your role change over time?
4. Are there others in your organization who worked on the Pilot? [*Probe for roles and team structure, if applicable*]

Q4. [IF NOT ADDRESSED IN Q3] Are you still involved in the MPower Pilot?

1. Do you expect your role to change in the future?

A.1.3. Performance

Next, I have a few questions about the Pilot's performance and your expectations.

Q5. What do you think makes the MPower Pilot different from other multifamily programs you are aware of?

Q6. What are the performance goals of the MPower Pilot as you understand them?

1. Which of these goals is most important to you and your organization? [*Probe: why most important*]

Q7. To what extent has the MPower Pilot met, or is it meeting these goals? [*Probe: ask about scale and schedule; why or why not*]

1. Overall, have you been satisfied with the Pilot's performance so far?

Q8. What are your expectations for the future of the MPower Pilot?

1. How do you think the Pilot can meet these expectations? [*Probe: anything else*]

Q9. What about the Pilot do you think has been the most successful so far?

A.1.4. Evolution, Collaboration, and Implementation

Now, I have a few questions about the different aspects involved in developing the MPower Pilot.

Q10. What do you think led the various stakeholders to get involved in the MPower Pilot?

1. Were there any groups with an interest in the low-income multifamily market in Oregon that – in hindsight – perhaps should have been involved in the development MPower? [IF YES, *who was not involved?*]

Q11. What did stakeholders do to collaborate or work together throughout the development of the Pilot? (*Probe: attend regular meetings, use of different communication channels, the role of leaders*)

1. What do you think worked well in the collaboration process?
2. What were some of the key areas or topics that all stakeholders seemed to agree on, if any?
3. What do you think did not work well in the collaboration process?
4. Did stakeholders have different perspectives about any key areas or topics? [IF YES] What areas or topics?
5. How was consensus reached on these topics?
6. What ways, if any, do you think the collaboration process could have been improved?
7. Do you have anything else to add about collaboration with other stakeholders?

A.1.5. Pilot Activities

Q12. Next, I want to discuss your involvement in various activities related to the MPower Pilot.

Please tell me if you were involved in each of the following processes of the MPower Pilot? [ASK ABOUT EACH TOPIC IN THE QUESTION BELOW]

1. Designing the Pilot
2. Determining the criteria for participation in the Pilot
3. Recruiting contractors or participants
4. The building assessment process
5. Financing mechanisms and processes for providing financing, including on-bill financing
6. Determining which energy efficiency upgrades would be included in the Pilot
7. Managing the installation or quality assurances processes to guide contractors
8. Launching or administering the Pilot

A.1.6. Challenges and Benefits

Q13. [IF Q12.1 = YES] What were your responsibilities in designing the Pilot?

1. In hindsight, do you think you had adequate support for designing the Pilot? [*Probe: financial support, staff support, background research*] [IF NO] Why not?
2. What, if anything, would you have done differently?
3. What worked well in designing the Pilot that you would not have done differently?

4. Do you have anything else to add about the process of designing the Pilot?

Q14. [IF Q12.2 = YES] What were your responsibilities for determining the participation criteria for MPower?

1. In hindsight, do you think the participation criteria were adequate for the Pilot design? Why?
2. What, if anything, would you have done differently?
3. [IF NOT MENTIONED] Did you collaborate with other stakeholders on this activity? [IF YES AND NOT MENTIONED] What challenges, if any, did you experience in your collaboration?
4. Do you have anything else to add about determining the participation criteria for the Pilot?

Q15. [IF Q12.3 = YES] What were your responsibilities for recruiting contractors and/or participants?

1. In hindsight, do you think the recruiting process for contractors is adequate for the Pilot design? Why?
2. What about for participants, do you think the recruiting process is adequate for the Pilot design? Why?
3. What, if anything, would you have done differently to recruit contractors?
4. What about to recruit participants, what would you have done differently?
5. Do you have anything else to add about designing the recruiting process for contractors or participants for the Pilot?

Q16. [IF Q12.4 = YES] What were your responsibilities for the building assessment process for MPower?

1. In hindsight, do you think the building assessment process was adequate for the Pilot design? Why?
2. What, if anything, would you have done differently?
3. [IF NOT MENTIONED] Did you collaborate with other stakeholders on this activity? [IF YES AND NOT MENTIONED] What challenges, if any, did you experience in your collaboration?
4. Do you have anything else to add about developing the building assessment process for the Pilot?

Q17. [IF Q12.5 = YES] What were your responsibilities for the financing mechanisms and process for receiving financing (including on-bill financing)?

1. In hindsight, do you think the financing mechanisms and process for receiving financing were adequate for the Pilot design? Why?
2. What, if anything, would you have done differently?

3. [IF NOT MENTIONED] Did you collaborate with other stakeholders on this activity? [IF YES AND NOT MENTIONED] What challenges, if any, did you experience in your collaboration?
4. Do you have anything else to add about deciding on the financing mechanisms and process for receiving financing for the Pilot?

Q18. [IF Q12.6 = YES] What were your responsibilities for deciding which energy efficiency upgrades would be included in MPower?

1. In hindsight, do you think the energy efficiency upgrades were adequate for the Pilot design? Why?
2. What, if anything, would you have done differently in deciding on which upgrades would be included in MPower?
3. [IF NOT MENTIONED] Did you collaborate with other stakeholders on this activity? [IF YES AND NOT MENTIONED] What challenges, if any, did you experience in your collaboration?
4. Do you have anything else to add about deciding which energy efficiency upgrades would be included for the Pilot?

Q19. [IF Q12.7 = YES] What were your responsibilities for managing the installation and quality assurance processes?

1. In hindsight, do you think the installation and quality assurance processes were adequate for the Pilot design? Why do you say that?
2. What, if anything, would you have done differently?
3. Do you have anything else to add about designing the installation and quality assurance processes for the Pilot?

Q20. [IF Q12.8 = YES] What were your responsibilities in launching or administering the MPower Pilot?

1. Do you think the launch and administration of the Pilot met expectations? Why do you say that?
2. What, if anything, would you have done differently to launch or administer MPower?
3. [IF NOT MENTIONED] Did you collaborate with other stakeholders on this activity? [IF YES AND NOT MENTIONED] What challenges, if any, did you experience in your collaboration?
4. Do you have anything else to add about launching or administering the MPower Pilot?

Q21. Are there any other noteworthy Pilot activities you want to discuss? [*Probe: conducting background research for the Pilot, planning for the future, communicating between the different stakeholder organizations, obtaining funds for MPower, MPower marketing and outreach*] [IF YES] What activities?

[REPEAT Q21.1 – Q21.5 for each activity mentioned, as needed]

1. What were/are your responsibilities in [**Activity**]?
2. Do you think the [**Activity**] was/were appropriate for the Pilot design? [IF NO] Why not?
3. What, if anything, would you have done differently?
4. Do you have anything else to add about [**Activity**]?

Q22. Overall, were you satisfied with the process of developing and launching the MPower Pilot?

Q23. What other noteworthy challenges or issues did you encounter during your involvement in the MPower Pilot?

1. How did you overcome this challenge/these challenges?

Q24. [IF NOT MENTIONED] Overall, what has been the *most challenging aspect* of the Pilot for you?

Q25. What about challenges for multifamily building owners – are any challenges you expect they will encounter contemplating participation in MPower?

1. What do you think should be done to overcome these challenges?

Q26. And, how about for multifamily tenants who live in a property that is participating in MPower? Do you know of or expect any challenges they might face?

1. What do you think should be done to overcome these challenges?

Q27. How have you as a stakeholder benefited from the MPower Pilot so far, including intangible benefits such as learning?

1. [IF MORE THAN ONE BENEFIT MENTIONED] What has been the most beneficial to you?
2. What about for participating multifamily building owners? How do you think they will benefit from participating in MPower?
3. And, what about for multifamily tenants in participating properties? How do you think they will benefit?

A.1.7. Continuous Improvement [ASK ALL]

Q28. Are there any aspects of the MPower Pilot we have not discussed that you think could be improved?

1. [IF YES] What improvements do you think should be made?

Q29. Will your organization continue to have an interest in the MPower Pilot and its performance going forward? Please explain.

[IF NO, CONSIDER RELEVANCE OF THE NEXT QUESTION BASED ON THEIR EXPLANATION]

Q30. What challenges or issues do you expect to encounter going forward?

1. How do you plan to approach this/these challenge(s)?

Q31. What benefits do you hope to get from the MPower Pilot going forward?

1. What, if anything, would need to change about the Pilot for you to realize these benefits? Why?

That is all the questions I have for you today, thank you very much for your time and input. Is there anything else you would like to say about the MPower Pilot?

Would it be okay if I contacted you in the future if we need to follow-up about a particular question?

A.2. Participant Interview Guide

A.2.1. Introduction

Hello, may I speak to [**CONTACT NAME**]?

Hello, my name is _____ and I'm calling on behalf of Energy Trust of Oregon from Research Into Action to speak with you about your participation in Energy Trust's MPower Pilot, a program that supports retrofits of low income multifamily buildings in Oregon. I would like to ask you a few questions about your [**PROPERTY NAME**] property located in [**PROPERTY CITY**]. Our records indicate that this property participated in the MPower Pilot. Is that correct?

[IF NO, *ask for clarification regarding property name and city, and then the question below to see if someone else might know more*]

Are you the best person in your organization to speak with about the MPower project at [**PROPERTY NAME**] property?

[IF NO, *record contact name and number*]

CONTACT NAME:

CONTACT NUMBER:

Would this be a convenient time for us to talk? I anticipate that we'll need about 30 minutes to 45 minutes, depending on how much you have to say. [IF NO, *schedule another time*]

DATE/TIME:

CONTACT NUMBER:

[*Start of Interview*]

Thank you for taking the time to talk with us today. As I mentioned earlier, we are evaluating the Energy Trust of Oregon MPower Pilot and are interested in your feedback as a participant in the program.

We will be taking notes as we talk and audio recording this interview to ensure the accuracy of the notes. However, both the notes and the recording are for research purposes only and will not be provided to anyone outside the Research Into Action team.

Is it ok that we record our conversation?

Do you have any questions before we get started?

A.2.2. Respondent Characteristics and Properties [ASK ALL]

S2. First, I want to ensure we have the most up-to-date status of the MPower project at [**PROPERTY NAME**]. Is the MPower project at [**PROPERTY NAME**] [**PROJECT STATUS: COMPLETED/NOT COMPLETED**]?
[*IF NO: Update the project status in the database and, if the "quota" is met for the project status, ask about another **PROPERTY NAME** with the needed project status or, if participant does not have another MPower property with the needed status, say "We are interviewing participants whose property is **PROJECT STATUS**. Thank you for your time and have a great day."*]

S3. [IF PROJECT STATUS = NOT COMPLETED] At what stage of project completion is your [PROPERTY NAME] property? [*Probe: audit completed, contract signed, construction started, construction about half completed, construction completed*]

Next, I would like to ask a few general questions about your organization and low-income multifamily property or properties.

S4. What is your title in your organization? [*Open-ended with pre-codes*]

1. Owner/President
2. Property manager
3. Maintenance/Facilities manager
4. Other (please specify): _____

S5. How long have you been involved in the low-income multifamily housing business?

S6. Not including your [**PROPERTY NAME**] property, how many other low-income multifamily properties does your company own or manage in Oregon?

[IF S5=0 → SKIP TO Q1]

S7. [IF S5>0] Is this property/Are these properties also participating with MPower?

S8. [IF S6= NO] Do you have any interest or plans for this property/any of these properties to participate with MPower in the future? [IF YES → Skip to S9]

S9. [IF S7=NO] Do you have any interest or plans for making energy efficient upgrades in this property/any of these properties in the future?

S10. [IF S7 or S8=YES] What types of energy efficient upgrades are you interested in or planning for this property/these properties?

S11. [IF S8=YES] Why are you not planning to make these upgrades through participating in MPower?

A.2.3. Involvement and Upgrade Activities

Next, I have a few questions about how your decision to participate in MPower.

Q1. Before your involvement with the MPower Pilot, did you explore any energy efficiency options for your [**PROPERTY NAME**] property?

[IF YES]

1. What energy efficiency upgrades were you interested in before participating in MPower?

Q2. What led to your interest in pursuing energy efficiency upgrades at the [**PROPERTY NAME**] property?

Q3. How did you become aware of the MPower Pilot?

Q4. What were the reasons your [**PROPERTY NAME**] property participated with the MPower Pilot?

[IF NOT MENTIONED: Were any of the following reasons important to your participation?]

1. To improve cash flow by reducing energy costs
2. To reduce energy costs for tenants
3. To contribute to environmental or green objectives like lowering energy-related carbon emissions
4. To contribute to potential tenant health benefits
5. To increase the property's market value
6. To attract tenants by advertising energy efficient housing

Q5. Was your [**PROPERTY NAME**] property's participation with MPower focused solely on making energy efficiency upgrades or was it part of a larger project that included more than energy efficiency upgrades?

1. [IF PART OF LARGER PROJECT] What other types of work besides energy efficiency upgrades was included in the project?

Q6. How did your participation with MPower fit into your long-term capital upgrade plan or planning for [**PROPERTY NAME**] property?

Next, we are interested in finding out about your experience with participating MPower with your [**PROPERTY NAME**] property.

Q7. Were you the person primarily responsible for managing the MPower project at your [**PROPERTY NAME**] property or did you share responsibilities with others in your organization?

1. [IF RESPONSIBILITY WAS SHARED] Who else in your organization shared responsibility for managing the project? [RECORD NAME AND CONTACT INFORMATION]

[IF RESPONSIBILITY WAS SHARED WITH OTHERS] For the next series of questions please let me know if we should contact someone else in your organization to obtain their perspectives as well.

Q8. Did you receive [IF PROJECT STATUS = NOT COMPLETED: Have you received] all the information you needed during your participation with MPower? [IF NOT MENTIONED] What other information would have been/would be helpful?

1. Was the information you did receive easy to find or acquire?
2. Are you satisfied with the types of information you received?

Q9. Have you interacted with MPower or Energy Trust staff or administrators?

[IF YES]

1. What did you discuss generally?
2. Did you experience any issues in your interactions with staff or administrators? [IF NOT MENTIONED] What issues?
3. Were you satisfied with your interactions with MPower and Energy Trust staff or administrators? [IF NOT] Why not?

Q10. Did you receive a grant, a loan, or both a loan and a grant as part of participating with MPower for the [**PROPERTY NAME**] property?

1. Did MPower offer sufficient funding for completing the desired upgrades? [IF NO] Why do you say that?
2. How did MPower's financing affect your decision-making or plans for the project? [*Probe: motivation to act and why or why not*]
3. Were there any issues or challenges involved in applying for or getting financing for your project?
4. [IF Q10 = YES] Overall, were you satisfied with the financing you received? [IF NO] Why do you say that?
5. Were you satisfied with the process of applying for and receiving financing? [IF NO] Why do you say that?
6. How do you think the financing process could be improved?

7. What other financing options, if any, would you have been interested in pursuing had they been available as part of MPower?
8. [IF S6 = YES] Was your experience with financing for your [**PROPERTY NAME**] property similar to or different from your experience with your other MPower property/properties?
9. [Q10_8 = DIFFERENT] What was different?

Q11. Next, I have some questions about the building audit that MPower performed at your [**PROPERTY NAME**] property. The audit was performed early in the process to identify potential upgrades that could be made to your property through MPower. Do you recall the building audit that was performed at your property?

[IF YES, ASK 1-10; IF NO, SKIP TO 11]

1. Was the audit easy to schedule?
2. Do you think the audit of your property was thorough? [IF NO] Why do you say that?
3. Did you experience any issues during the audit process? [IF NOT MENTIONED] What issues?
4. Were you able to resolve them? [IF NOT MENTIONED] How?
5. Were the results from the audit easy to understand?
6. Overall, were you satisfied with the audit process?
7. What do you think would improve the audit process?
8. [IF S6 = YES] Has your other MPower property/properties received a building audit?
9. [IF YES] Was your experience with the building audit for your [**PROPERTY NAME**] property similar to or different from your experience with your other MPower property/properties?
10. [IF DIFFERENT] What was different?

[IF NO:]

11. Is there someone else in your organization I could speak to about the building audit? [RECORD NAME AND CONTACT INFORMATION]

[IF NO UPGRADES HAVE BEEN INSTALLED OR ARE CURRENTLY BEING INSTALLED, SKIP TO Q13]

Q12. How much time elapsed between the completion of the building audit and start of the installation process?

1. Do you think that was a reasonable amount of time? [IF NO] Why do you say that?
2. What worked well in the installation process?
3. What didn't work well?

4. Has the installation of the upgrades met your expectations overall? [IF NO] Why do you say that?
5. Are you satisfied with the installation process? [IF NO]Why do you say that?
6. How do you think the installation process could be improved?
7. [IF S6 = YES] Have any upgrades been installed in your other MPower property/properties?
8. [IF YES] Was your experience with the installation of upgrades at your [**PROPERTY NAME**] property similar to or different from your experience with your other MPower property/properties?
9. [IF Q12_8 = DIFFERENT] What was different?

Q13. What energy efficiency upgrades have been installed [IF PROJECT STATUS = NOT COMPLETED: will be installed] through MPower at your [**PROPERTY NAME**] property?

1. Why did you decide on this/these particular upgrade(s)?
2. [IF PROJECT STATUS = COMPLETED] Did you experience any issues with the performance of the upgrades? [IF NOT MENTIONED] What issues?
3. Were you able to resolve them? [IF NOT MENTIONED] How?
4. [IF PROJECT STATUS = COMPLETED] Overall, are you satisfied with the upgrades that were installed? [IF NO] Why do you say that?
5. [IF S6 = YES] Was your experience with the performance of the upgrades in your [**PROPERTY NAME**] property similar to or different from your experience with your other MPower property/properties?
6. [IF Q13_5 = DIFFERENT] What was different?

Q14. Are there any upgrades that have not been done as part of MPower but [IF PROJECT STATUS = NOT COMPLETED: that will not be done as part of MPower but] that you are planning to do in the future in your [**PROPERTY NAME**] property?

1. [IF NOT MENTIONED] What upgrades are you planning to do in the future?
2. [IF YES] Why are you planning this/these upgrade(s) for later?

Q15. [IF PROJECT STATUS = COMPLETED] Has MPower performed a quality assurance inspection on the upgrades that were installed?

[IF YES]

1. How long after the upgrades were installed was the inspection performed?
2. Were you satisfied with the inspection process? [IF NO] Why do you say that?
3. Do you have any suggestions for improvement?

Q16. [IF PROJECT STATUS = COMPLETED] Have you been able to see any energy savings so far?

1. [IF YES] Are you satisfied with the energy savings that have so far resulted from your participation in MPower? [IF NO] Why do you say that?

Q17. How did/has participating with MPower affect/affected your building tenants?

1. Were tenants generally supportive of the project?
2. [IF NOT MENTIONED] What noteworthy issues, if any, arose before or during the project?
3. How were you able to resolve this issue/these issues?

Q18. [IF PROJECT STATUS = COMPLETED] What type of feedback have you received from your tenants regarding the upgrades since the completion of the project?

1. [IF NO FEEDBACK] How do you think your tenants are doing since the completion of the project?

Q19. Have you planned or do you have plans to inform your tenants of steps they can take to save energy? [*Probe: What about saving energy using the upgrades installed through MPower?*]

A.2.4. Challenges, Benefits, and Improvements

Q20. What benefits, if any, were realized [IF PROJECT NOT COMPLETED, do you expect to realize] as a result your participation in the MPower Pilot?

1. What about for your tenants?

Q21. Is there anything else about the program that worked well during your participation that we haven't discussed so far?

Q22. What other major challenges or issues, if any, did you experience during your involvement in the MPower Pilot?

1. What about for your tenants?

Q23. Is there anything else you can think of about MPower that could be improved? [IF YES] What improvements?

Q24. Overall, how satisfied are you with your experience of participating in the MPower Pilot?

1. [IF LOW SATISFACTION] Why do you say that?

A.2.5. The Role of OBR (On-Bill Repayment)

These last couple of questions concern on-bill repayment. As you may know, on-bill repayment is a financing mechanism that allows you to pay for energy efficiency upgrades through your utility bill. MPower is currently setting up this mechanism, but I have a few questions about it.

Q25. Did you discuss this repayment plan with MPower staff?

Q26. Was the ability to participate in an on-bill repayment plan influential on your decision to participate in MPower?

Q27. If on-bill repayment was not an option, do you think you would have done anything differently on your MPower project? [IF YES] What? [*Probe for specifics like not performing the retrofit, not participating in MPower, participating sooner/later, installing more/less/different upgrades, using different financing tools, etc*.]

That is all the questions I have for you today, thank you very much for your time and input. Is there anything else you would like to say about your experience with MPower?

Would it be okay if I contacted you in the future if we need to follow-up?

A.3. Partial Participant Interview Guide

Hello, may I speak to [**CONTACT NAME**]?

Hello, my name is _____ and I'm calling on behalf of Energy Trust of Oregon from Research Into Action to speak with you about your consideration to participate in Energy Trust's MPower Pilot, a program that supports retrofits of low income multifamily buildings in Oregon. I would like to ask you a few questions about your [**PROPERTY NAME**] property located in [**PROPERTY CITY**]. Our records indicate that you considered participating in the MPower Pilot with this property but did not. Is that correct?

[IF NO, *ask for clarification regarding property name and city, and then the question below to see if someone else might know more*]

Are you the best person in your organization to speak with about the [**PROPERTY NAME**] property?

[IF NO, *record contact name and number*]

CONTACT NAME:

CONTACT NUMBER:

Would this be a convenient time for us to talk? I anticipate that we'll need about 5 minutes. [IF NO, *schedule another time*]

DATE/TIME:

CONTACT NUMBER:

[*Start of Interview*]

Thank you for taking the time to talk with us today. As I mentioned earlier, we are evaluating the Energy Trust of Oregon MPower Pilot and are interested in your feedback as someone who considered participating in the program.

We will be taking notes as we talk and audio recording this interview to ensure the accuracy of the notes. However, both the notes and the recording are for research purposes only and will not be provided to anyone outside the Research Into Action team.

Is it ok that we record our conversation?

Do you have any questions before we get started?

S1. What is your title in your organization? [*Open-ended with pre-codes*]

1. Owner/President
2. Property manager

3. Maintenance/Facilities manager
4. Other (please specify): _____

S2. How long have you been involved in the low-income multifamily housing business?

S3. Before your involvement with the MPower Pilot, did you explore any energy efficiency options for [**PROPERTY NAME**] property?

[IF YES]

1. What specific energy efficiency upgrades were you interested in before participating with MPower?

S4. What led to your interest in pursuing energy efficiency upgrades at the [**PROPERTY NAME**] property?

S5. How did you become aware of the MPower Pilot?

S6. What led you to decide to not continue to participate with MPower with your [**PROPERTY NAME**] property? [*Probes: project scheduling/timing, delays, project costs/financing, types of upgrades included/not included, building audit results, contractor issues]*

S7. Not including your [**PROPERTY NAME**] property, how many other low-income multifamily properties does your company own or manage in Oregon?

S8. [IF S7>1] Do you have any interest or plans for this property/any of these properties to participate with MPower in the future?

S9. [IF S8=NO] Do you have any interest or plans for making energy efficient upgrades in this property/any of these properties in the future?

S10. [IF S8 or S9=YES] What types of energy efficient upgrades are you interested in or planning for this property/these properties?

S11. [IF S9=YES] Why are you not planning to make these upgrades through participating in MPower?

That is all the questions I have for you today, thank you very much for your time and input. Is there anything else you would like to say about your experience with MPower?

Would it be okay if I contacted you in the future if we need to follow-up?

Appendix B. Anonymized Pilot Work Scope & Pilot Tenant Education Materials

Below is an anonymized building assessment (audit) report for an MPower Pilot project.

MPOWEROREGON [redacted] - Schedule A BuildingAudit Report

Schedule A: Building Audit Report

ESA Schedule A provides detail on efficiency measure package savings and scope:

Schedule Index

MPOWEROREGON [redacted] - Schedule A BuildingAudit Report

Section 1: Executive Summary

A walk through was conducted to assess the current state of the building. Deemed and prescriptive savings were determined based on Energy Trust of Oregon's standard energy savings. Lighting tools were created to assess savings and cost potential based on new design work as well as existing common area lighting.

Section 2: Efficiency Measure Descriptions

Rockwood Landing		
Number	Efficiency Measure	Detailed Description
DHW3	Aerators bathroom and kitchen	Replace bathroom and kitchen aerators with high efficiency models
DHW-11	Shower Heads/wands	Replace shower heads with high efficiency models
LGT-7	CFL upgrade	Replace incandescents with CFLs
LGT-6	Lighting upgrade in unit kitchens	In unit lighting
LGT-6	Lighting Upgrade (building)	Lighting Upgrade per Evergreen Lighting Tool
MECH-2	Bathroom fan	Install Pansonic WhisperSense Light FV-08VQCL6 in each unit
APP-1	Refrigerator Upgrade	Replace 6 outdated refrigerators with new High efficiancy ENERGY STAR units
ENV-2	Infiltration (door replacement)	Replace existing entry doors with better insulated doors.

MPOWEROREGON

Schedule A BuildingAudit Report

Section 3: Efficiency Measure Performance

Table illustrating efficiency measure savings performance:

MPOWEROREGON

Project Details

Project Name	[redacted]
Project Address	
Project Address	
Project Sponsor	
Number of Units	35
Square Feet	40,000

Energy Usage Intensity	
Pre Retrofit	55.83
Post Retrofit	38.41

Financial Summary

Project Costs	$	%
Total Measure Cost	$ 80,841	87.0%
MPower Project Mgt Fee	$ 12,126	13.0%
Total Project Costs	$ 92,967	100.0%

Financing Sources	$	%
Loan Amount	$ 69,725	75.0%
Grant Amount	$ 23,242	25.0%
Owner Investment	$ -	0.0%
Total Project Investment	$ 92,967	100.0%

MPower Loan Summary	
MPower Loan Amount	**$ 69,725**
Loan Term (Years)	10
Loan Rate	6.0%
Loan Payment - Annual	$ 9,283

Total MPower Investment	$ 92,967
Total Owner Payments	$ 92,830
Effective Interest Rate	**-0.02%**

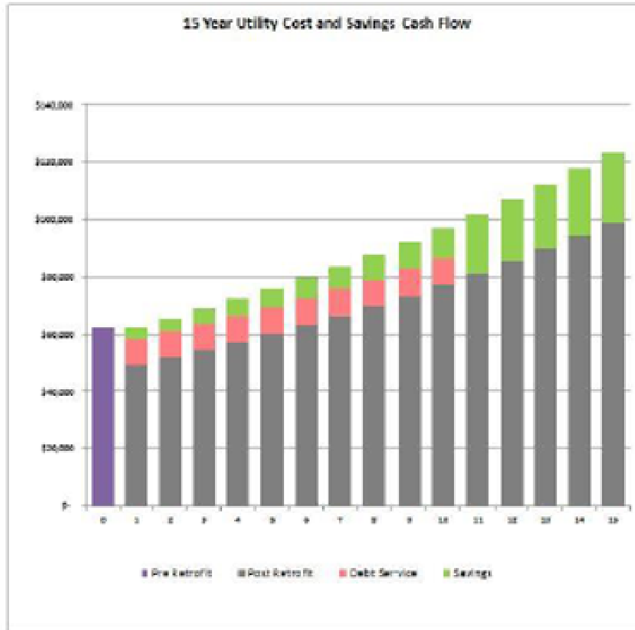
Selected Efficiency Measures

	Efficiency Measure	Projected Measure Cost	Annual Energy Savings	Annual Water & Sewer Savings	Total Annual Utility Savings
1	Aerators bathrooms and kitchen	$ -	$ 537	$ 1,664	$ 2,450
2	Shower Heads/wands	$ -	$ 1,875	$ 4,505	$ 6,385
3	CFL upgrade	$ -	$ 362	$ -	$ 362
4	Lighting upgrade in unit kitchens	$ 3,265	$ 572	$ -	$ 572
5	Lighting Upgrade (building)	$ 16,509	$ 5,001	$ -	$ 5,001
6	Bathroom fan	$ 25,144	$ 446	$ -	$ 446
7	Refrigerator Upgrade	$ 9,722	$ 41	$ -	$ 41
8	Infiltration (door replacement)	$ 26,600	$ 147	$ -	$ 147
9	Project Coordination fee (3%)	$ 588	$ -	$ -	$ -
10	0	$ -	$ -	$ -	$ -
11	0	$ -	$ -	$ -	$ -
12	0	$ -	$ -	$ -	$ -
13	0	$ -	$ -	$ -	$ -
14	0	$ -	$ -	$ -	$ -
15	0	$ -	$ -	$ -	$ -
16	0	$ -	$ -	$ -	$ -
17	0	$ -	$ -	$ -	$ -
18	0	$ -	$ -	$ -	$ -
19	0	$ -	$ -	$ -	$ -
20	0	$ -	$ -	$ -	$ -
21	0	$ -	$ -	$ -	$ -
	Total (*)	**$ 80,841**	**$ 6,440**	**$ 6,187**	**$ 12,233**
	Per Unit	$ 2,266	$ 179	$ 188	$ 368

Measure Group Annual Utility Savings Detail

Annual Impacted Utility Costs:	Electricity	Gas	Water	Sewer	Total	Per Unit
Pre Retrofit	$ 26,353	$ -	$ 10,660	$ 26,000	$ 63,296	$ 1,750
1st Year Post Retrofit	$ 18,906	$ -	$ 9,092	$ 21,064	$ 49,063	$ 1,362
Annual Savings	**$ 6,446**	**$ -**	**$ 1,768**	**$ 5,010**	**$ 13,233**	$ 368
% of Total Utility Cost	33%	0%	16%	19%	**21%**	

Annual Utility Usage:	KWH	Therms	Gallons	Gallons
Pre Retrofit	342,530	2,306	2,330,252	2,454,136
1st Year Post Retrofit	215,430	2,306	2,417,355	2,033,341
Annual Savings	**87,302**	-	**477,368**	**411,268**



Cash Flow

Year	1	2	3	4	5	6	7	8
Annual Efficiency Savings	$ 13,233	$ 13,625	$ 14,444	$ 15,000	$ 15,705	$ 16,471	$ 17,200	$ 17,318
less: MPower Debt Service	*$ 9,469*	*$ 9,283*	*$ 9,283*	*$ 9,283*	*$ 9,283*	*$ 9,283*	*$ 9,469*	*$ 9,289*
Net Building Surplus	**$ 3,944**	**$ 4,536**	**$ 5,154**	**$ 5,801**	**$ 6,476**	**$ 7,182**	**$ 7,919**	**$ 8,689**
Cumulative Building Surplus	$ 3,944	$ 8,479	$ 13,634	$ 19,435	$ 25,911	$ 33,092	$ 41,011	$ 49,700

Year	9	10	11	12	13	14	15	Total
Annual Efficiency Savings	$ 18,762	$ 19,623	$ 20,501	$ 21,410	$ 22,377	$ 23,370	$ 24,424	**$ 274,517**
less: MPower Debt Service	*$ 9,283*	*$ 9,469*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	***$ 92,830***
Net Building Surplus	**$ 9,493**	**$ 10,354**	**$ 20,501**	**$ 21,410**	**$ 22,377**	**$ 23,370**	**$ 24,424**	**$ 181,695**
Cumulative Building Surplus	$ 59,193	$ 69,536	$ 90,027	$ 111,446	$ 133,823	$ 157,201	$ 181,625	

MPOWEROREGON [redacted] Schedule A BuildingAudit Report

Section 4: Efficiency Measure Scope

Description: Detailed auditor methodology and scope for each proposed efficiency measure.

Section D Term Definitions –

- **Methodology** – Description of baseline conditions and proposed measure replacement.
- **Base Scope** – Description of proposed measure base scope.

Note: While product specifications are fixed based on the below scope, MPower may make brand/model substitutions based availability and/or contractor experience/preference.

Scope of Work

LGT-1 **- COMMON AREA AND IN UNIT LIGHTING UPGRADES**

MECH-1 **- BATHROOM FAN**

APP-1 **- REFRIDGERATOR UPGRADE**

ENV-1 **- ATTIC INSULATION**

ENV-2 **- DOOR REPLACEMENT (Infiltration)**

LGT-1 COMMON AREA AND IN UNIT LIGHTING UPGRADES

Overview - Specific lighting conditions are selected for upgrade based on the Evergreen lighting audit and on site observations.

Existing Conditions – Existing lighting conditions are documented in the Evergreen lighting audit report

Scope of work: Replace fixtures or ballasts in the locations and quantities noted in the Evergreen lighting audit. (See Attached, Evergreen/ETO Lighting Tool)**Please add to Lighting Tool any additional fixtures, lamps or controls found in common areas yet not listed in lighting tool.**

MECH-1 BATHROOM FAN

Overview - Replace existing bathroom fans with occupancy sensing ventilation units as indicated by client.

Existing Conditions – Current bath fans are manually operated fan units.

Scope of Work – Replace current units with Whisper Green fans specified Panasonic Whisper Sense-Lite FV-08VQCL6 (see attached cut sheet). Must include removal and disposal and recycling where applicable of existing fans and installation of new fans including adaptation of duct opening at fan unit only. Does not include any new venting or alteration of existing wiring

except to bypass existing switch for fan. Existing switch for fan will be removed and the resulting empty spaces will be covered with "blank" plates.

APP-1 REFRIGERATOR UPGRADE

Overview - Replace the existing in unit refrigerators with higher efficiency units.

Existing Conditions – Currently there are 6 in unit refrigerators of below efficiency rating. Size of current models range from 29-32" width x 28- 32" depth x 62-68". Opening of space is 36"w x 32" d x 70" H

Scope of Work- Replace in unit, average efficiency refrigerators units with high efficiency models. Apartment units # 206, 107, 207, 212, 117 & 217

Include unit cost, install cost, other parts as needed and hauling of old unit to be recycled where applicable. Must be ENERGY STAR rated to qualify. Color: white 14+ cubic feet. 20% more efficient than federal standards, Must be "active" on ENERGY STAR qualified list – visit www.energystar.gov

Sample models include:

- Frigidaire Model # FFHT1614Q
- GE Model # GPE16DTHWW

ENV-2 DOOR REPLACEMENT (Infiltration)

Overview – Replace existing exterior back doors with new energy efficient models

Existing conditions – Current doors contain large plate window where window glazing is damaged based on design of the doors for every unit.

Scope of work – Replace 36 exterior back doors with Metal or Fiberglass doors with upper sash plates that are smaller than current sash. Must fit tightly to reduce infiltration and be able to prove effectiveness of air tightness.

Section 5: Lighting Scope Detail

Detailed lighting scope including existing and proposed equipment:

Note: Product specifications are set per "PROPOSED EQUIPMENT" below. Product brand/model selection will be the contractor's discretion based on experience and availability.

Form 103L
Lighting Analysis and Incentive Estimates

EnergyTrust of Oregon

To be completed by Participant and Trade Ally

PROJECT INFORMATION

Lighting Analysis and Incentive Estimates

Project ID		FastTrack ID	
Project Name	[redacted]		
Contact			
Contact Phone	<Enter on Participant.Info sheet>	Prepared On	
Business Type	Multifamily	Annual Hours	4,380

Initial or Final	Date Proposed	Project Coordinator	Lighting Specialist	Date Completed
Initial	11/3/14		(optional)	

ALL PROJECTS MUST BE PRE-APPROVED

This analysis is an estimate only, actual savings and incentives will vary based on final installed measures and costs, operating hours, energy rates and building usage.

	EXISTING EQUIPMENT						PROPOSED EQUIPMENT							PROJECT COST		kW, kWh SAVINGS + INCENTIVES BY EQUIPMENT					
	Location Area/Room	Existing Equipment Category (Choose from drop-down first)	Existing Equipment Specific fixture, lamp type (Choose from drop-down second)	Measure Description	Watts per Fixture	Fixt Qty	Proposed Equipment Category (Choose from drop-down first)	Proposed Equipment Specific fixture, lamp type (Choose from drop-down second)	Measure Description	Custom	Watts per Fixture	Fixt Qty	Annual Operating Hours	Labor & Material Cost (each)	Total Cost	Ave. kW Saving	kWh Before	kWh After	Proposed kWh Savings	Proposed Equipment Incentive (Each)	Proposed Incentive Amount
1	Poles	HID	Metal Halide, 400 watts	Pole Shoebox	461	8	LED_Exterior_Fixtures	Exterior LED fixture, 150W or less	EnviroTech ENV-LED-RX/GI-120	☐	120	8	4,380	$ 750.00	$6,000	2.7	16,153	4,205	11,948	$275	$2,200
2	Trash Enclosures	T12_8ft	8', 2 lamp T12 HO	Surface Strip	219	2	T8_HP_RW	8' tandem, 4 lamp 4' HP T8 (28W, BF≥1.0)	4 lamp T8 tandem retrofit	☑	126	2	4,380	$ 222.00	$444	0.2	1,918	1,104	815	CustomCalc	$204
3	Gooseneck Poles	INCAN	Incandescent	1 bulb	100	10	LED_Lamps	LED A-Lamp	Cree A19-75W-50K-T12	☐	13.5	10	4,380	$ 75.00	$750	0.9	4,380	591	3,788	$10	$100
4	Stairwell Sconce	INCAN	Incandescent	1bulb	60	54	LED_Lamps	LED A-Lamp	Cree A19-60W-27K-B1	☐	9.5	54	4,380	$ 65.00	$3,510	2.7	14,190	2,247	11,944	$10	$540
5	Stairwell Ceiling	INCAN	Incandescent	1 bulb	60	18	LED_Lamps	LED A-Lamp	Cree A19-60W-27K-B1	☐	9.5	18	4,380	$ 65.00	$1,170	0.9	4,730	749	3,981	$10	$180
6	Balcony Ceiling	INCAN	Incandescent	1 bulb	60	18	LED_Lamps	LED A-Lamp	Cree A19-60W-27K-B1	☐	9.5	18	4,380	$ 65.00	$1,170	0.9	4,730	749	3,981	$10	$180
7	Clubhouse Sconce	INCAN	Incandescent	1 bulb	60	11	LED_Lamps	LED A-Lamp	Cree A19-60W-27K-B1	☐	9.5	11	4,380	$ 65.00	$715	0.6	2,891	458	2,433	$10	$110
8	Clubhouse Wallpack	HID	Metal Halide, 250 watts	Cut off wallpack	296	1	LED_Exterior_Fixtures	Exterior LED fixture, 50W or less	Edenlight E-OP6L03CZ	☐	36	1	4,380	$ 225.00	$225	0.3	1,292	158	1,134	$125	$125
9	Unit Kitchens	T12_4ft	4', 2 lamp T12	4' T12 wrap	77	36	T8_HP_RW	4', 2 lamp HP T8 (28W, 0.85<BF≤1.0)	lamp and ballast retro	☐	49	36	4,380	$ 85.00	$3,060	1.0	12,141	7,726	4,415	$25	$900
10	Clubhouse Bathrooms	INCAN	Incandescent	4 bulb vanity	240	2	LED_Lamps	LED A-Lamp	Cree A19-60W-27K-B1	☐	38	2	4,380	$ 100.00	$200	0.4	2,102	333	1,769	$10	$20
11	Clubhouse Lobby	INCAN	Incandescent	2 bulb surface light	120	1	LED_Lamps	LED A-Lamp	Cree A19-60W-27K-B1	☐	19	2	4,380	$ 50.00	$100	0.1	526	166	359	$10	$20
12	Clubhouse Kit, Storage, HVAC	T12_4ft	4', 2 lamp T12	Surface Strip	77	3	T8_HP_RW	4', 2 lamp HP T8 (28W, 0.85<BF≤1.0)	lamp and ballast retro	☐	49	3	4,380	$ 85.00	$255	0.1	1,012	644	368	$25	$75
13	Clubhouse Office	INCAN	Incandescent	2 bulb surface light	60	2	LED_Lamps	LED A-Lamp	Cree A19-60W-27K-B1	☐	19	2	4,380	$ 50.00	$100	0.1	526	166	359	$10	$20
14	Clubhouse Laundry	T12_4ft	4', 2 lamp T12	Surface Wrap	77	6	T8_HP_RW	4', 2 lamp HP T8 (28W, 0.85<BF≤1.0)	lamp and ballast retro	☐	49	6	4,380	$ 85.00	$510	0.2	2,023	1,288	736	$25	$150
15										☐											

Existing Quantity *(this page)*	172	Proposed Quantity *(this page)*	173	*Cost (this page)*	$ 18,209	*Incentive (this page)*	$ 4,824
				plus Controls	$ 250	*plus* Controls	$ 125
Existing Quantity (addendum)	0	Quantity (addendum)	0	Cost (addendums)	$ -	*plus* Energy Trust incentive from Addendums	$ -
Total Existing Quantity	172	Total Proposed Quantity	173	Total Installed Cost	$ 18,459	Total Energy Trust Incentive (*without LED Case Lighting*)	$ 4,949
Existing Quantity (LED Case)	0	Quantity (LED Case)	0	Cost (*LED Case*)	-	plus Incentive from LED Case Lighting Tab	$ -
Total Existing Quantity	172	Total Proposed Quantity	173	Total Installed Cost	18,459	**Total Estimated Energy Trust Incentive**	$ 4,949

OVERALL kWh SAVINGS

	Before	After	Savings	% Savings
Analysis	68,613	20,583	48,031	70%
Controls	577	733	244	25%
LED Case Lighting			0	
TOTAL			48,275	70%

Total Cost and Total Energy Trust Incentive include occupancy sensor costs and incentives when appropriate.

LIGHTING POWER DENSITY

0.5 Watts per square foot

INCENTIVE PER KWH

0.103 per kWh

PROJECTED ANNUAL COST SAVINGS

Utility: (select)	Rate Schedule: 83	Rate/kWh	0.066
		Estimated Annual kWh Savings	48,275
		Demand Rate/kW	$ 4.59
		Estimated Monthly kW Demand Savings	11.0
		Estimated Annual Cost Savings	$ 3,785
		Estimated Rate of Return (Before Energy Trust Incentive)	21%
		Estimated Rate of Return (After Energy Trust Incentive)	28%

Project Description *(please note unusual cost, etc.)*

http://library.cee1.org/content/commercial-lighting-qualifying-pro	Manufacturer	Model Number
High Performance T8 Lamp		
High Performance T8 Ballast		

PROJECT QUALIFICATIONS

	Standard	Actual	YES/NO
CHECK - IS kWh SAVINGS GREATER THAN	25%	70%	YES
CHECK - ARE PROJECTED INCENTIVES GREATER THAN	$100	$ 4,949	YES
CHECK - IS SIMPLE PAYBACK AT LEAST ONE YEAR	1	4.9	YES

Form 103L v1.1 140109

[redacted]

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MPOWEROREGON [redacted] Schedule A BuildingAudit Report

Section 6: Lighting Controls Scope Detail

Lighting controls scope including proposed control types and count:

Note: Product specifications are set per "PROPOSED CONTROLS" below. Product brand/model selection will be the contractor's discretion based on experience and availability.

Energy Savings Analysis Form—Controls

EnergyTrust of Oregon

To be completed by Trade Ally and Participant

Project ID
FastTrack ID

Instructions: Fill in Control Type, Control Qty, and Installed Cost (each) for each appropriate row where controls are installed

0.25 <=Default Reduction

Date Prepared

	Location Area/Room (optional)	Equipment Controlled	Number of Fixtures	Watts per Fixture	Baseline Operating Hours	Controls *(note type, wall mount or ceiling mount)*	Number of Controls	Installed Cost (each)	Total Cost	Fixture Watts Controlled	Percent Savings	kWh Before	kWh After	kWh Savings	Proposed Incentive (Each)	Proposed Incentive Amount
1	Poles	Exterior LED fixture, 150W or less	8	120	4,380											
2	Trash Enclosures	8' tandem, 4 lamp 4' HP T8 (28W, BF=1.0)	2	126	4,380											
3	Gooseneck Poles	LED A-Lamp	10	14	4,380											
4	Stairwell Sconce	LED A-Lamp	54	10	4,380											
5	Stairwell Ceiling	LED A-Lamp	18	10	4,380											
6	Balcony Ceiling	LED A-Lamp	18	10	4,380											
7	Clubhouse Sconce	LED A-Lamp	11	10	4,380											
8	Clubhouse Wallpack	Exterior LED fixture, 90W or less	1	36	4,380											
9	Unit Kitchens	4', 2 lamp HP T8 (28W, 0.85<BF≤1.0)	36	49	4,380											
10	Clubhouse Bathrooms	LED A-Lamp	2	38	4,380	Switch OCC Sensor	2	$ 50.00	$ 100	38	0.25	333	250	83	$25.00	$50.00
11	Clubhouse Lobby	LED A-Lamp	2	19	4,380											
12	Clubhouse Kit, Storage, HVAC	4', 2 lamp HP T8 (28W, 0.85<BF≤1.0)	3	49	4,380	Switch OCC Sensor	3	$ 50.00	$ 150	49	0.25	644	483	161	$25.00	$75.00
13	Clubhouse Office	LED A-Lamp	2	19	4,380											
14	Clubhouse Laundry	4', 2 lamp HP T8 (28W, 0.85<BF≤1.0)	6	49	4,380											
15																
						Totals:	5		$ 250			977	733	244		$125.00
															% Savings:	25%

Controls v1.1 140109
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[redacted]

Page 1 of 1

MPOWEROREGON [redacted] Schedule A BuildingAudit Report

Section 7: Cut Sheet Appendix

Cut sheets for proposed measures:

Note: Product cut sheets establish fixed product specifications. Final product brand/model selection will be the contractor's discretion based on experience and availability.

Panasonic

consumer | business | industrial

support | search

> WhisperSense-Lite > FV-08VQCL6

FV-08VQCL6

WhisperSense-Lite™ 80 CFM Ceiling Mounted Ventilation Fan-Light with Dual Motion and Humidity Sensor Technology

See dealer for price

Architectural Specs
Operating Instructions

Print this page

View/compare all models

overview | features | support & resources

ENERGY STAR AWARD 2013
PARTNER OF THE YEAR
Sustained Excellence

Exclusive Dual Sensor Technology

WhisperSense-Lite features Exclusive Dual Sensor Technology that reacts to both motion and humidity, ensuring excess moisture is exhausted and automatically turning the fan on when needed. The SmartAction motion sensor automatically activates whenever someone enters or leaves the room. The built-in humidity sensor detects rapid rise in relative humidity (RH), automatically turning on the fan to remove moisture and to help prevent mold and mildew.

Delay Timer

Built-in adjustable delay timer can be set from 30 seconds to 60 minutes and activates when motion is no longer detected or when humidity levels are below preset levels. The auto shut off feature can help eliminate unnecessary energy use and further reduce operating costs.

Bright Ideas

INCLUDES: (2) 13W ENERGY STAR rated self ballasted GU24 base CFL/lamps and a 4W night light. 3500Kelvin/HighCRI/997 Lumens per lamp/75 Lumens Per Watt/10,000 hours, rated average life/equivalent to (2) 75W incandescent lamps.

Quiet Operation at .25" Water Gauge

ASHRAE 62.2, ENERGY STAR, LEED for Homes, and HVI have set the industry standard for performance measurement at .25" w.g. The new WhisperSense fans provide powerful CFM output at .25" w.g., plus our sones have also been certified at .25" w.g. So they are quiet under pressure and after installation.

ENERGY STAR-Qualified for Energy Savings

ENERGY STAR-qualified products feature super-quiet operation and high CFM-to-Watt efficiency. The ENERGY STAR program was created to help consumers identify products that can save them money and protect the environment by saving

energy. As an ENERGY STAR partner, all of our fans are ENERGY STAR-qualified and labeled accordingly.

Continuous, Trouble-free Operation for Many Years

This fan is designed to give you continuous, trouble-free operation for many years thanks in part to its high-quality components and permanently lubricated motors which wear at a slower pace. Also, since heat is always detrimental to motor life (the cooler the environment, the longer the motor will last), we designed the electrical configuration of this model's condenser motor to allow it to operate at lower temperatures, increasing the life of the motor and bearings.
And, the fan housing is made of heavy-gauge zinc galvanized steel and painted to protect it from rust.

User-Friendly Installation

Detachable 4 or 6 inch adaptors, firmly secured duct ends, adjustable mounting brackets (up to 26"), fan/motor units that detach easily from the housing and uncomplicated wiring all lend themselves to user-friendly installation. This model also features a double-hanger bar system for ideal positioning.

Tired of Cold Air Coming Through Your Ventilation Fan?

This Panasonic fan has a built-in damper to prevent backdraft, which helps to prevent outside air from coming through the fan. Also, thanks to our efficient, cool running motors, it does not create excessive heat. Loose fill or battery insulation can be placed directly over the fan housing to prevent heat from escaping.

FRIGIDAIRE

Top Mount Refrigerators

FFHT1514Q S/W/Z[1]/B

15 Cu. Ft. Top Mount

Product Dimensions

Height (Including Hinges & Rollers)	60-5/8"
Width	28"
Depth (Including Door)	29-7/8"

More Easy-To-Use Features

Garage-Ready
Our top freezer offers the flexibility to work in your home or in your garage. It's built to handle extreme temperature conditions.

Ready-Select® Controls

A.D.A.-Compliant[2]
With accessible shelving, and controls that are positioned within arm's reach and allow one-hand operation, our top-freezer refrigerator is A.D.A.-Compliant.

ADA

ENERGY STAR®

Available in:

Stainless (S) | White (W/Z[1]) | Black (B)

[1]Left-Swing Door.
[2]When properly installed, this model is A.D.A.-qualified based on the United States Access Board's A.D.A./A.B.A. Accessibility Guidelines and the Department of Justice's 2010 A.D.A. Standards for Accessible Design.

Signature Features

ENERGY STAR®-Qualified
Maximize your energy and dollar savings with ENERGY STAR®-Qualified Appliances.

Bright Lighting
Our bright lighting makes it easy to see what's inside.

Reversible Door
Door can be installed to open left or right based on your needs.

Store-More™ Humidity-Controlled Crisper Drawers
Our humidity-controlled crisper drawers are designed to keep your fruits and vegetables fresh so you don't have to worry about stocking up.

frigidaire.com

FRIGIDAIRE

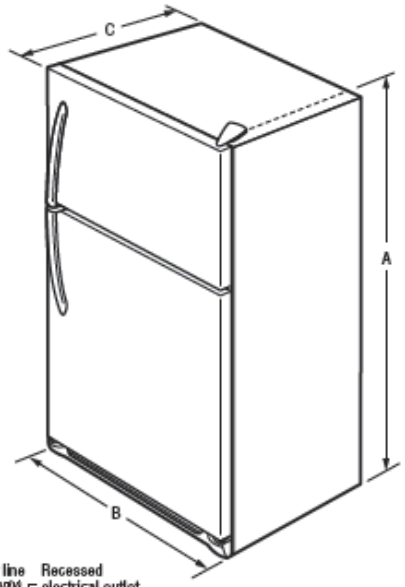
Top Mount Refrigerators

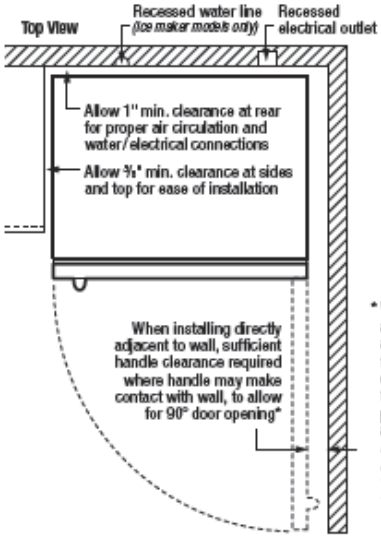
FFHT1514Q S/W/Z[1]/B 15 Cu. Ft.

Features	
Door Design	Square
Door Handle Design	Color-Coordinated
Cabinet Finish (Textured)	Color-Coordinated
Door Stops	Yes
Door Hinge Covers	Color-Coordinated
Door Reverse Option	Yes (S/W/B), No (Z)
Left-Swing Door	Yes (Z Model Only)
Rollers - Front/Rear	Fixed/Yes
Sound Package	
Toe Grille	Color-Coordinated
Garage-Ready	Yes
Refrigerator Features	
Interior Lighting	Bright
Refrigerator Shelves	2 Full-Width SpaceWise® Wire
Deli Drawer	
Wine/Can Rack	
Store-More™ Crisper Drawers	2 Clear
Humidity Controls	2
Dairy Compartment	Clear Dairy Door
Door Bins	
Door Racks	2 Full-Width White 1 Half-Width White
Non-Slip Bin Liner	
Tall Bottle Retainers	
Gallon Door Storage	1
Freezer Features	
Door Bins	
Door Racks	2 Full-Width White
Freezer Shelves	1 Half-Width Wire
Factory Ice Maker w/ Large Ice Bin	Optional (PN# IM116)
Lighting	
Certifications	
A.D.A. - Compliant[1]	Yes
ENERGY STAR®	Yes
Specifications	
Total Capacity (Cu. Ft.)	14.6
Refrigerator Capacity (Cu. Ft.)	10.9
Freezer Capacity (Cu. Ft.)	3.7
Power Supply Connection Location	Right Bottom Rear
Water Inlet Connection Location	Bottom Right
Voltage Rating	120V/60Hz
Connected Load (kW Rating) @ 120 Volts[2]	.72
Amps @ 120 Volts	6.0
Minimum Circuit Required (Amps)	15
Shipping Weight (Approx.)	175 Lbs.

[1]When properly installed, this model is A.D.A.-qualified based on the United States Access Board's A.D.A./A.B.A. Accessibility Guidelines and the Department of Justice's 2010 A.D.A. Standards for Accessible Design.

[2]For use on adequately wired 120V, dedicated circuit having 2-wire service with a separate ground wire. Appliance must be grounded for safe operation.





* When installing refrigerator adjacent to wall, cabinet or other appliance that extends beyond front edge of unit, 20" minimum clearance recommended to allow for optimum 140° door swing, providing complete crisper access and removal. *(Absolute 3" minimum clearance will ONLY allow for 90° door swing which will provide limited crisper access with restricted removal.)*

NOTE: For planning purposes only. Always consult local and national electric and plumbing codes. Refer to Product Installation Guide for detailed installation instructions on the web at frigidaire.com.

C US

Product Dimensions	
A - Height (Incl. Hinges & Rollers)	60-5/8"
B - Width	28"
C - Depth (Incl. Door)	29-7/8"
Depth with Door Open 90°	56"

Accessories information available on the web at frigidaire.com

FRIGIDAIRE

USA • 10200 David Taylor Drive • Charlotte, NC 28262 • 1-800-FRIGIDAIRE • frigidaire.com
CANADA • 5855 Terry Fox Way • Mississauga, ON L5V 3E4 • 1-800-265-8352 • frigidaire.ca

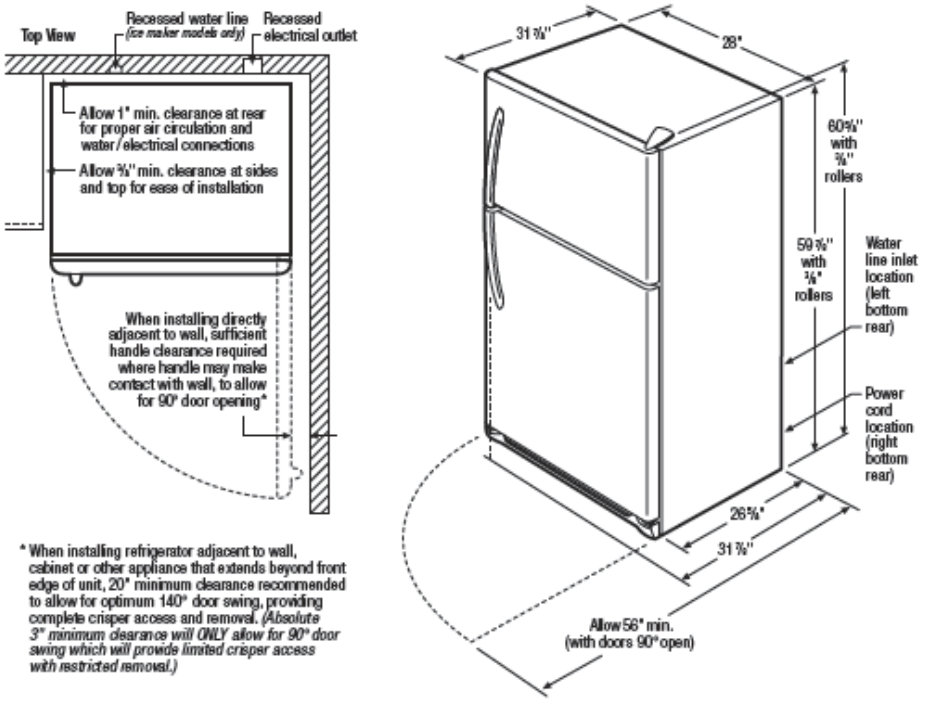
FFHT1514Q 07/14

Specifications subject to change.

FRIGIDAIRE

Top Mount Refrigerators

FFHT1514Q S/W/Z¹/B 15 Cu. Ft.



* When installing refrigerator adjacent to wall, cabinet or other appliance that extends beyond front edge of unit, 20" minimum clearance recommended to allow for optimum 140° door swing, providing complete crisper access and removal. *(Absolute 3" minimum clearance will ONLY allow for 90° door swing which will provide limited crisper access with restricted removal.)*

Top Mount Refrigerator Specifications

- Product Shipping Weight (approx.) – 175 Lbs.
- An electrical supply with grounded three-prong receptacle is required. The power supply circuit must be installed in accordance with current edition of National Electrical Code (NFPA 70) and local codes & ordinances.
- Voltage Rating – 120V/60 Hz/15 Amps
- Connected Load (kW Rating) @ 120 Volts = .72 kW
- Amps @ 120 Volts = 6.0 Amps
- Always consult local and national electric & plumbing codes.
- Floor should be level surface of hard material, capable of supporting fully loaded refrigerator.
- Minimum 3/8" clearance required for sides and top of refrigerator with 1" clearance at rear to allow for ease of installation, proper air circulation, and plumbing/electrical connections.
- When installing refrigerator adjacent to wall, cabinet or other appliance that extends beyond front edge of unit, 20" minimum clearance recommended to allow for optimum 140° door swing, providing complete crisper access and removal. *(Absolute 3" minimum clearance will ONLY allow for 90° door swing which will provide limited crisper access with restricted removal.)*
- To ensure optimum performance, do not install in areas where temperature drops below 55°F or rises above 110°F and avoid installing in direct sunlight or close proximity to range, dishwasher or other heat source.
- For proper ventilation, front grille MUST remain unobstructed.
- Recess electrical outlet when possible.
- Optional Ice Maker Kit (PN # IM116) available for installation in ice maker-ready models only.
- Water recess on rear wall recommended to prevent water line damage.
- Water Pressure – Cold water line must provide between 30 and 100 pounds per square inch (psi).
- Copper tubing with 1/4" O.D. recommended for water supply line with length equal to distance from rear of unit to household water supply line plus 7 additional feet. Optional Water Supply Installation Kits available.

Note: For planning purposes only. Refer to Product Installation Guide on the web at frigidaire.com for detailed instructions.

Optional Accessories

- Ice Maker Kit – (PN # IM116).

FRIGIDAIRE
USA • 10200 David Taylor Drive • Charlotte, NC 28262 • 1-800-FRIGIDAIRE • frigidaire.com
CANADA • 5855 Terry Fox Way • Mississauga, ON L5V 3E4 • 1-800-265-8352 • frigidaire.ca

FFHT1514Q 07/14

C US

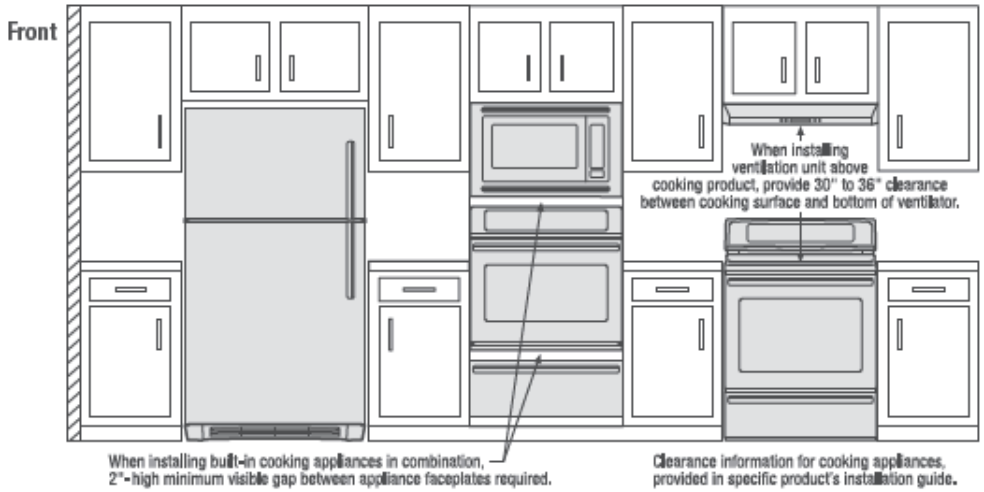
Specifications subject to change.

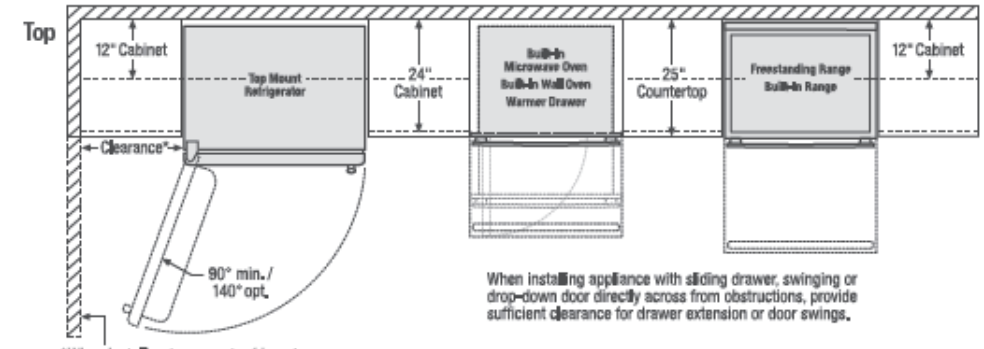
FRIGIDAIRE

General Installation Guidelines

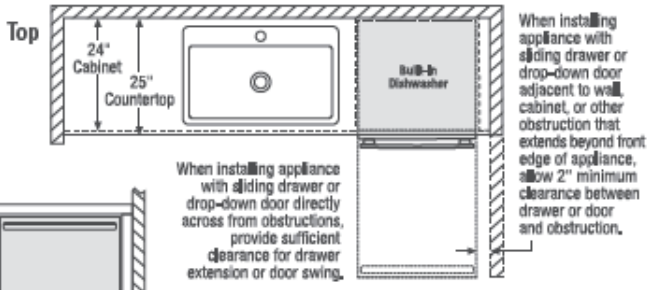
with Top Mount Refrigerator

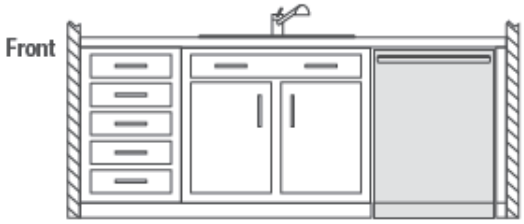
Use these dimensions and clearance instructions for planning purposes only. For detailed installation instructions, refer to installation guide, packed with product, or on the web at frigidaire.com.





*When installing top mount refrigerator adjacent to wall, cabinet or other appliance that extends beyond front edge of unit, 20" minimum clearance recommended to allow for optimum 140° door swing, providing complete crisper access and removal. *(Absolute 3" minimum clearance will ONLY allow for 90° door swing which will provide limited crisper access with restricted removal.)*





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INSTGDLNS_TMR FR 01/14

Specifications subject to change.

Hilumz
Putting The World In A New Light

Product Specifications

RETROFIT KITS

Easy Replacement for 95% of Traditional Fixtures

DZ130

Back of DZ130

130W LED Retrofit

PRODUCT	LED WATTAGE	NUMBER OF LEDs	AMPS	REPLACES	LUMENS*	CRI	VOLTAGE	L x W x H DIMENSIONS	FULL KIT WEIGHT
DZ130	130W	16	5	400W HID	14,130	75	100 – 277V 347 – 480V	**HEAD** – 6.75" x 4.5" x 3.0" **DRIVER** – 8.7" x 2.7" x 1.5"	6 lbs.

**Lumen values based on highest color temperature*

ADDITIONAL SPECIFICATIONS:

- **LED L70 Life Hours:** >100,000 @ 55°C
- **Beam Angle:** 125°
- **Operating Temperature:** -40°C to +60°C
- **Color Temperature:** 5000K | 4000K (Special Order)
- **Protection:** Short circuit / Over-current / Over-voltage / Over-temperature protection with auto-recovery

Certification: ETL (UL-1598-C) & cETL (ANSI/UL 1598/ CAN/CSA C22.2) A DesignLights Consortium® QPL Product

DZ130 With Optics

ADDITIONAL FEATURES:

- **SUNON® MagLev Fan Technology:** 70,000+ hours operating life suitable for 24/7 operation, providing a cool running LED unit.
- **Light Dispersion:** Multiple lensing options available for maximum light distribution, if needed.
- **Mounting:** Bracket mounting system or custom-fabricated plates to fit most any HID fixture.

Hilumz 10/5 year WARRANTY Diamonz

HiLumz Diamonz 10/5 Year Warranty

Included in this warranty are the Diamonz product series or any fixture containing a Diamonz LED engine. 10-year warranty on components, including the LEDs, fan heat sink, etc. and a 5-year warranty on the LED Driver. See full warranty on website.

HiLumzUSA.com
Info@HiLumzUSA.com

PHONE: (1) 770-888-8338 FAX: 404-537-1900

30-Day Money Back Satisfaction Guarantee
Limit of 2 Retrofit Kits per customer trial. Includes shipping costs. ALL reseller customers may participate.

ORDERING OPTIONS:

When placing an order, build your SKU code by selecting the various options in each column below. Use the numbers in bold as the numbers/characters to create the appropriate SKU code. See example below.

Example: *HiLumz® Diamonz® 130W, 5000K Color Temp, 100-277V Driver Dimmable*

	Product		Color Temp		Driver		Mounting
SKU:	**DZ130**	–	**50K**	–	**DV150-277D**	–	**H**

PRODUCT	COLOR TEMP	DRIVER TYPE	MOUNTING
DZ130	**50K** – 5000K **40K** – 4000K (Special Order)	**DV150-277** - 100-277V, 150W Driver **DV150-277D** - 100-277V, 150W, *Dimmable* Driver **DV150-480** – 347-480V, 150W Driver	**H** – Horizontal Mount **V** – Vertical Mount

OTHER OPTIONS:

SURGE PROTECTION	
PRODUCT SKU#	**DESCRIPTION**
SP277	Surge Protector 20kA, 100-277V
SP480	Surge Protector 20kA, 347-480V

PHOTO CELL SENSOR	
PRODUCT SKU#	**DESCRIPTION**
PC120	Photo Cell 120V
PC277	Photo Cell 208-277V
PC120R	Photo Cell 120V Rotatable

OPTICS	
PRODUCT SKU#	**DEGREES**
DZ130	**T3** – Type 3 **T5** – Type 5 **56** – 56° **A** – Aisle 30° x 106°

	Product		Optics
OPTICS SKU: *Example*	**DZ130**	–	**56**

HiLumzUSA.com
Info@HiLumzUSA.com
PHONE: (1) 770-888-8338 FAX: 404-537-1900

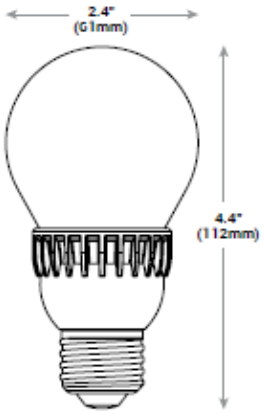
A19
LED Bulbs

Product Description

The Cree® LED A19 bulbs deliver up to 1100 lumens of warm 2700K light or cool 5000K light, while consuming at least 84% less energy than the incandescent bulbs they replace. These lamps feature a consistent and balanced omnidirectional light source within a real glass bulb, turn on instantly, and are compatible with most standard incandescent dimmers. Powered by Cree® LED Filament Tower™ Technology, the Cree® LED A19 bulbs are ENERGY STAR® qualified and are designed to last 25,000 hours.

Performance Summary

- Utilizes Cree LED Filament Tower™ Technology
- Made in the U.S.A. of U.S. and imported parts
- **Lamp Delivered Light Output:** 450 lumens (40W eq); 800 lumens (60W eq); 1,100 lumens (75W eq)
- **Input Power :** 6 watts (40W eq)
  9.5 watts (60W 2700K eq)
  9 watts (60W 5000K eq)
  13.5 watts (75W eq)
- **CRI:** 80
- **CCT:** 2700K, 5000K*
- **Limited Warranty[1]:** 3 years
- **Lifetime:** Designed to last at least 25,000 hours
- **Dimming:** Dimmable to 5% with select dimmers**
- Must order in multiples of master carton (MC) quantities



Ordering Information

Example: A19-60W-27K-T24

QUICKSHIP™ Click below to select Quick Ship products: A19-60W-50K-B1

For full list of Cree Quick Ship products visit www.cree.com/lighting/quickship

A19						
Product	**Watt Equivalent**	**CCT**	**Voltage**	**Base**	**CRI**	**Packaging Options**
A19	**40W** 40 Watt (450 lumens) **60W** 60 Watt (800 lumens) **75W** 75 Watt (1100 lumens)	**27K** 2700 Kelvin **50K*** 5000 Kelvin	**Blank** 120 Volt	**Blank** E26 (screw base)	**Blank** 80 CRI	**B1** (6) Blister Pack bulbs in master carton (MC=6) **T24 - 40W & 60W Equivalent** (24) Tray Pack bulbs in master carton (Bulk Pack) **T12 - 75W Equivalent** (12) Tray Pack bulbs in master carton (Bulk Pack)

[1] See www.cree.com/lighting/products/warranty for warranty terms
* Not available for A19 40W equivalent
**Reference www.cree.com/lighting for recommended dimming controls

Rev. Date: V5 10/20/2014

US: www.cree.com/lighting T (000) 236-6000 F (262) 504-5415

Canada: www.cree.com/canada T (000) 473-1234 F (000) 000-7507

A19

Product Specifications

CONSTRUCTION & MATERIALS

- A-type bulb design weighs less than 4 ounces (113g) and uses a standard E26 screw base
- Silicon coated globe for increased safety
- Bulb meets ANSI standards for A19 dimensions
- Mercury free

OPTICAL SYSTEM

- Proprietary Cree LED Filament Tower™ creates perfect omnidirectional light distribution
- Glass globe offers increased optical spread

ELECTRICAL SYSTEM

- **Power Factor:** > 0.9 nominal
- **Input Voltage:** 120V
- Dimming: Dimmable to 5% with select dimmers
- Suitable for use in operating environments between -25°C and +45°C (-13°F and +113°F)

REGULATORY & VOLUNTARY QUALIFICATIONS

- cULus Listed
- Suitable for damp locations; not for use where exposed directly to weather or water
- Suitable for use in enclosed light fixtures
- **ENERGY STAR® qualified:**
  Please refer to http://www.energystar.gov/productfinder/product/certified-light-bulbs/results for most current information
  A19 40W (27K): BA19-04527OMF-12DE26-2U100
  A19 60W (27K): BA19-08027OMF-12DE26-2U100
  A19 60W (50K): BA19-08050OMF-12DE26-2U100
  A19 75W (27K): BA19-11027OMF-12DE26-1U100
  A19 75W (50K): BA19-11050OMF-12DE26-1U100

A19 B1
(6) Blister Pack bulbs in master carton (MC = 6)

A19 T24 -
40W & 60W Equivalents
(24) Tray Pack bulbs in master carton (Bulk Pack)

A19 T12 -
75W Equivalents
(12) Tray Pack bulbs in master carton (Bulk Pack)

Product Number	UPC	Description	Bulb Type	Watts	CCT	Lamps per Master Carton	Pallet Qty	CRI	Lumens	Rated Life (hrs)
A19-40W-27K-B1*	810048028092	40W Warm White A19 Equivalent	A19	6W	2700K	6	480	80	450	25,000
A19-60W-27K-B1*	810048028108	60W Warm White A19 Equivalent	A19	9.5W	2700K	6	480	80	800	25,000
A19-60W-50K-B1*	810048028115	60W Daylight A19 Equivalent	A19	9W	5000K	6	480	80	800	25,000
A19-75W-27K-B1*	849665001133	75W Warm White A19 Equivalent	A19	13.5W	2700K	6	480	80	1,100	25,000
A19-75W-50K-B1*	849665001140	75W Daylight A19 Equivalent	A19	13.5W	5000K	6	480	80	1,100	25,000
A19-40W-27K-T24	810048028283	40W Warm White A19 Equivalent	A19	6W	2700K	24	1,296	80	450	25,000
A19-60W-27K-T24	810048028290	60W Warm White A19 Equivalent	A19	9.5W	2700K	24	1,296	80	800	25,000
A19-60W-50K-T24	810048028306	60W Daylight A19 Equivalent	A19	9W	5000K	24	1,296	80	800	25,000
A19-75W-27K-T12	849665001171	75W Warm White A19 Equivalent	A19	13.5W	2700K	12	130	80	1,100	25,000
A19-75W-50K-T12	849665001188	75W Daylight A19 Equivalent	A19	13.5W	5000K	12	130	80	1,100	25,000

* Must be ordered in quantities of 6

US: www.cree.com/lighting T (800) 236-6800 F (262) 504-5415

Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

CREE

GE Lighting

72262 - GE232MAXP-L/ULTRA (replaces GE232MAX-L/ULTRA)

GE LFL UltraMax™ Professional Series Electronic High Efficiency Multivolt Instant Start Ballast

- Energy saving high efficiency instant start electronic ballast (> 90%)
- Multi-Voltage Technology handles voltage from 120 to 277V
- UL Type CC Rating provides protection against arcing in electrical devices.
- Anti-Striation Control for better light quality, with no striations.
- Cold temperature -20F Minimum Starting Temperature

GENERAL CHARACTERISTICS

Application	2 or 1- F32T8 120 to 277 "L".77 BF
Category	Linear Fluorescent
Ballast Type	Electronic - High Efficiency Multivolt Instant Start
Starting Method	Instant start
Lamp Wiring	Parallel
Line Voltage Regulation (+/-) (NOM)	10.0 %
Ambient Temperature (MIN)	-22.0 °F
Ambient Temperature (MAX)	131.0 °F (55 °C)
Case Temperature (MAX)	70.0 °C
Ballast Factor	Low (.77)
Power Factor Correction	Active
Sound Rating	A (20-24 decibels)
Additional Info	Anti-striation control / Auto-restart / Thermally protected

PRODUCT INFORMATION

Product Code	72262
Description	GE232MAXP-L/ULTRA (replaces GE232MAX-L/ULTRA)
Standard Package	Case
Standard Package GTIN	10043168722626
Standard Package Quantity	10
Sales Unit	Standard Pack
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	10
UPC	043168722629

DIMENSIONS

Case dimensions	
Length (L)	9.5 in(241.30 mm)
Width (W)	1.3 in(33.02 mm)
Height (H)	1.0 in(25.40 mm)
Mounting dimensions	
Bracket Length (BL)	NaN in(NaN mm)
Mount Length (M)	9.0 in(228.60 mm)
Mount Width (X or F)	NaN in(NaN mm)
Mount Slots (MS)	NaN in(NaN mm)
Weight (NOM)	0.7 lb
Exit Type	Side
Remote Mounting Distance (NOM)	18.0 ft
Remote Mounting Wire Gauge (NOM)	18.0 AWG

Lead lengths	Qty	Exit	Length (± 1 in.)
Black	1	Left	25 (635 mm)
Red	1	Left	37 (940 mm)
White	1	Left	25 (635 mm)
Blue	2	Right	31 (787 mm)

ELECTRICAL CHARACTERISTICS

Supply Current Frequency (MIN)	50.0 Hz
Supply Current Frequency (NOM)	60.0 Hz / 50.0 Hz

SAFETY & PERFORMANCE

- cUL Listed
- FCC - CLASS A Non-Consumer
- NRCan
- UL Class P
- UL Listed
- UL Type 1 Outdoor
- UL Type CC
- UL Type HL
- NEMA Premium®
- Product is compliant with material restriction requirements of RoHS

SPECIFICATIONS BY LAMP & WATTAGE

Lamp	# of Lamps	Line Volts	System Watts	Nom. Line Current	System Ballast Factor	Ballast Efficacy Factor	Power Factor% (>=)	Crest Factor (<=)	THD% (<=)	Min. Starting Temp (°F/ °C)
FE15T8	1	120	14	0.12 A	0.78	5.57	99	1.5	12.0	0.0 °F / NaN

For additional information, visit www.gelighting.com

Page 1

FE15T8	1	277	15	0.07 A	0.78	5.20	73	1.5	40.0	0.0 °F / NaN
FE15T8	2	120	21	0.18 A	0.78	3.71	99	1.5	9.0	0.0 °F / NaN
FE15T8	2	277	22	0.09 A	0.78	3.55	93	1.5	13.0	0.0 °F / NaN
F32T8/WM	1	120	27	0.23 A	0.78	2.89	99	1.5	8.0	60.0 °F / NaN
F32T8/WM	1	277	27	0.1 A	0.78	2.89	95	1.5	12.0	60.0 °F / NaN
F32T8/WM	2	120	47	0.39 A	0.78	1.66	99	1.5	5.0	60.0 °F / NaN
F32T8/WM	2	277	46	0.17 A	0.78	1.70	98	1.5	9.0	60.0 °F / NaN
F32T8/25W	1	120	22	0.0 A	0.77	3.50	99	1.5	10.0	60.0 °F / NaN
F32T8/25W	1	277	22	0.0 A	0.77	3.50	97	1.5	10.0	60.0 °F / NaN
F32T8/25W	2	120	38	0.0 A	0.77	2.03	99	1.5	10.0	60.0 °F / NaN
F32T8/25W	2	277	38	0.0 A	0.77	2.03	98	1.5	10.0	60.0 °F / NaN
F32T8	1	120	28	0.23 A	0.77	2.75	99	1.5	8.0	-22.0 °F / NaN
F32T8	1	277	28	0.11 A	0.77	2.75	95	1.5	12.0	-22.0 °F / NaN
F32T8	2	120	48	0.42 A	0.78	1.60	99	1.5	5.0	-22.0 °F / NaN
F32T8	2	277	48	0.19 A	0.78	1.60	98	1.5	8.0	-22.0 °F / NaN
F31T8	2	120	49	0.41 A	0.77		99.8			
F31T8	1	120	28	0.24 A	0.77		99.6			
F31T8	2	277	48	0.18 A	0.77		98.2			
F31T8	1	277	28	0.11 A	0.77		95.19999999999999			
F29T8	2	120	46	0.39 A	0.78		99.8			
F29T8	1	120	28	0.23 A	0.78		99.7			
F29T8	2	277	46	0.17 A	0.78		98			
F29T8	1	277	28	0.11 A	0.78		95.19999999999999			
F28T8	1	120	25	0.21 A	0.77	3.08	99	1.5	8.0	60.0 °F / NaN
F28T8	1	277	25	0.1 A	0.77	3.08	94	1.5	13.0	60.0 °F / NaN
F28T8	2	120	43	0.36 A	0.77	1.79	99	1.5	6.0	60.0 °F / NaN
F28T8	2	277	42	0.16 A	0.77	1.79	98	1.5	9.0	60.0 °F / NaN
F26T8	2	120	42	0.36 A	0.76		99.8			
F26T8	1	120	26	0.22 A	0.77		99.6			
F26T8	2	277	42	0.16 A	0.76		97.6			
F26T8	1	277	26	0.1 A	0.77		94.5			
F25T8WM	2	277	34	0.13 A	0.81	2.00	96.6	1.5	10.0	-22.0 °F / NaN
F25T8/WM	1	277	21	0.08 A	0.80	3.00	89.60000000000001	1.5	13.0	-22.0 °F / NaN
F25T8	1	120	23	0.19 A	0.80	3.48	99	1.5	9.0	-22.0 °F / NaN
F25T8	1	277	23	0.09 A	0.80	3.48	93	1.5	13.0	-22.0 °F / NaN
F25T8	2	120	39	0.33 A	0.80	2.05	99	1.5	6.0	-22.0 °F / NaN
F25T8	2	277	39	0.14 A	0.80	2.05	97	1.5	10.0	-22.0 °F / NaN
F25T12	1	120	24	0.2 A	0.80	3.33	99	1.5	9.0	0.0 °F / NaN
F25T12	1	277	24	0.09 A	0.80	3.33	94	1.5	13.0	0.0 °F / NaN
F25T12	2	120	41	0.35 A	0.80	1.95	99	1.5	6.0	0.0 °F / NaN
F25T12	2	277	41	0.15 A	0.80	1.95	98	1.5	9.0	0.0 °F / NaN
F17T8WM	2	120	24	0.21 A	0.81	3.00	99.57000000000001	0.5	8.0	-22.0 °F / NaN
F17T8WM	1	120	16	0.14 A	0.81	5.00	99	1.5	11.0	-22.0 °F / NaN
F17T8WM	2	277	24	0.1 A	0.81	3.00	94	1.5	12.0	-22.0 °F / NaN
F17T8WM	1	277	16	0.08 A	0.81	5.00	79	1.5	36.0	-22.0 °F / NaN

F17T8	1	120	17	0.14 A	0.79	4.65	99	1.5	11.0	-22.0 °F / NaN
F17T8	1	277	17	0.08 A	0.79	4.65	80	1.5	36.0	-22.0 °F / NaN
F17T8	2	120	27	0.23 A	0.79	2.93	99	1.5	8.0	-22.0 °F / NaN
F17T8	2	277	27	0.1 A	0.79	2.93	95	1.5	12.0	-22.0 °F / NaN

CAUTIONS & WARNINGS

Warning

- Risk of Electric Shock
  - Properly ground ballast and fixture.
  - Turn power off before servicing--see instructions.

WARRANTY INFORMATION

GE Lighting warrants to the purchaser that each ballast will be free from defects in material or workmanship for period as defined in the attached documents from the date of manufacture when properly installed and under normal conditions of use.

GE
Lighting

Ultra Energy Saving 4' T8 Ecolux®

28 Watt Lamp

Low Operating Cost*
- Relamp existing F32T8 with F28T8 and save up to 15% in energy
- Retrofit existing T12 fixture with GE UltraMax® System and save up to 36% in energy
- Additional energy savings available in low ballast factor and GE UltraStart® systems
- UL Type CC, parallel operation and anti striation control

Up to 50% Longer Life than Standard T8*
- 80,000 hours for 3hrs/start cycle
- 84,000 hours for 12hrs/start cycle
- Extend group relamp cycles by over 8 years compared to a standard T8 lamp
- Significantly reduce spot relamping costs

Nearly the same Lumen Output
- 2,600 initial lumens vs. 2,800 lumens for standard T8
- Increased light output available in high ballast factor systems

Reduced Mercury
- Ecolux® low mercury products pass Federal TCLP tests

GE Express Lamp & Ballast Warranty Service Program
- Warranty based on GE Lamps operating on GE Ballast. See program documents for full details.

Requires Open Circuit Voltage >550 Volts

DOE LPW Regulation:

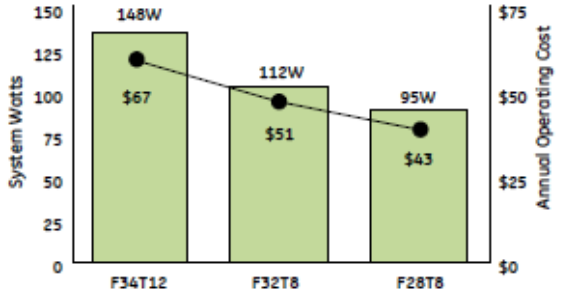
Meets new minimum efficiency standard, effective July 14, 2012

For more information, log on to:
www.gelighting.com/legislation

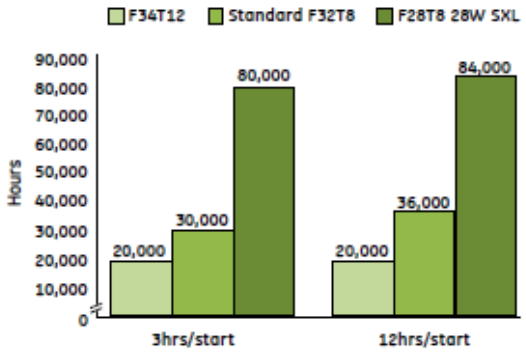
New Longer Life & Extended Warranty!

Energy Savings*

Save over $24 a year or $466 over the life of the lamp compared to F34T12!



Programmed Start Life Ratings



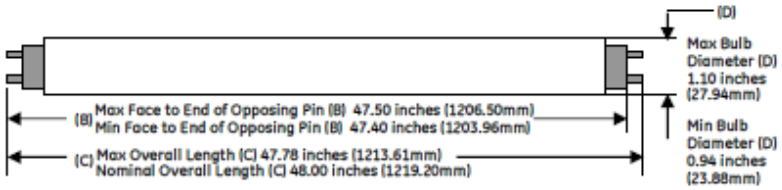
*Energy saving based on 4-lamp system life rating, programmed start ballasts $0.11 kWh energy cost, group relamp cycle at 70% rated life, and 4,100 annual burn hours.

imagination at work

4' T8 Ecolux® UltraMax® 28 Watt Lamp Specs

Lamp Characteristics – F28T8/SXL/SPX41/ECO Product Code 93903

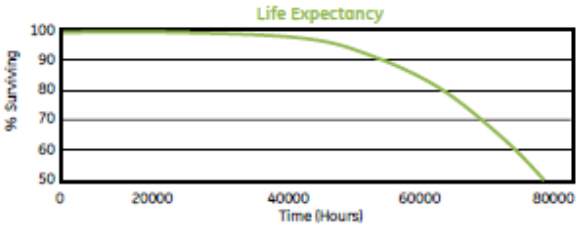
Nominal Lamp Watts (W)	28
Nominal Lamp Voltage (V)	---
Bulb Designation	T8
Bulb Material	Soda Lime
Base Type	Medium Bi-Pin (G13)
TCLP Compliant	Yes
LEED – EB MR Credit	20 picograms Hg per mean lumen hour

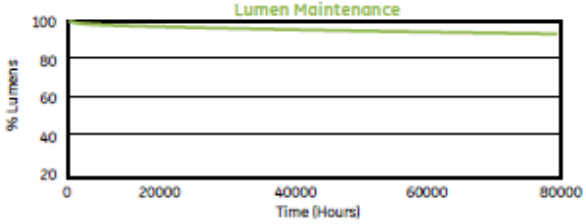


Products

Product Code	Description	Case Qty.	Nominal Lamp Watts (W)	Initial Lumens	Mean Lumens	Initial Nominal Efficacy (Lumens/Watt)	Instant Start (IS) Rated Life (3hr/Start)	Instant Start (IS) Rated Life (12hr/Start)	Programmed Rapid Start (PRS) Rated Life (3hr/Start)	Programmed Rapid Start (PRS) Rated Life (12hr/Start)	Color Temp (K)	CRI	IS/PRS System Warranty (months)*
66471	F28T8/XL/SPP35/ECO	36	28	2,600	2,440	93	20,000	28,000	40,000	45,000	3500	80	36/48
66472	F28T8/XL/SPP41/ECO	36	28	2,600	2,440	93	20,000	28,000	40,000	45,000	4100	80	36/48
66473	F28T8/XL/SPP50/ECO	36	28	2,600	2,440	93	20,000	28,000	40,000	45,000	5000	80	36/48
72863	F28T8/XL/SPX30/ECO	36	28	2,675	2,515	96	24,000	34,000	45,000	50,000	3000	85	48/60
72864	F28T8/XL/SPX35/ECO	36	28	2,675	2,515	96	24,000	34,000	45,000	50,000	3500	85	48/60
72866	F28T8/XL/SPX41/ECO	36	28	2,675	2,515	96	24,000	34,000	45,000	50,000	4100	82	48/60
72867	F28T8/XL/SPX50/ECO	36	28	2,675	2,515	96	24,000	34,000	45,000	50,000	5000	80	48/60
66346	F28T8/XL/SPX65/ECO	36	28	2,600	2,440	93	24,000	34,000	45,000	50,000	6500	78	48/60
93902	F28T8/SXL/SPX35/ECO	36	28	2,600	2,440	93	40,000	55,000	80,000	84,000	3500	82	60/84
93903	F28T8/SXL/SPX41/ECO	36	28	2,600	2,440	93	40,000	55,000	80,000	84,000	4100	82	60/84
93904	F28T8/SXL/SPX50/ECO	36	28	2,600	2,440	93	40,000	55,000	80,000	84,000	5000	80	60/84
With covRguard®													
73292	F28T8/XLSPX30ECO/CVG	36	28	2,595	2,440	93	24,000	34,000	45,000	50,000	3000	85	48/60
73293	F28T8/XLSPX35ECO/CVG	36	28	2,595	2,440	93	24,000	34,000	45,000	50,000	3500	85	48/60
73294	F28T8/XLSPX41ECO/CVG	36	28	2,595	2,440	93	24,000	34,000	45,000	50,000	4100	82	48/60
73295	F28T8/XLSPX50ECO/CVG	36	28	2,595	2,440	93	24,000	34,000	45,000	50,000	5000	80	48/60

*After date of purchase or hours of operation, whichever comes first; Time period from date of manufacture; Linear fluorescent operating at 4,000 hours per year, high intensity discharge at 5,000 hours per year.





*Operating hours on 3hr/start cycle on Programmed Start Ballast

System Information using F28T8/SXL/SPX41/ECO

Ballast	Ballast Product Code	Ballast Description	# of Lamps	Line Volts	System Watts	System Ballast Factor	Ballast Efficacy Factor	Min. Starting Temp (°F/°C)	System Initial Lumens	System Mean Lumens	Initial System LPW	Lamp Warranty with GE System	Ballast Warranty
UltraMax®	72266	GE232MAX-N/Ultra	2	277	48	.87	1.81	60° / 16°	4,741	4,457	98	48 Months	5 Years
	78627	GE432MAX-N/Ultra	4	277	92	.87	0.95	60° / 16°	9,483	8,915	103	48 Months	5 Years
UltraStart®	96714	GE232MVPS-N/Ultra	2	277	50	.88	1.76	60° / 16°	4,697	4,509	95	84 Months	5 Years
	96716	GE432MVPS-N/Ultra	4	277	95	.83	0.87	60° / 16°	9,047	8,505	95	84 Months	5 Years

For additional product and application information, please consult GE's Website: www.gelighting.com

Information provided is subject to change without notice. Please verify all details with GE. All values are design or typical values when measured under laboratory conditions, and GE makes no warranty or guarantee, express or implied, that such performance will be obtained under end-use conditions.

PREMIUM LED WALL PACK - SMALL
36-WATT LED
(E-WP6L SERIES)

Applications: Security, pathway and perimeter lighting; ideal for entryways and other applications where control of spill light is important.
Typical Mounting Height: 8 to 15 feet **Typical Spacing:** 1 to 2 times the mounting height

CREE LEDs

9.5"D x 8.75"W x 4.5"H
Weight: 7.0 lbs.

Catalog #	Description	Input Voltage	Initial Delivered Lumens	CCT	CRI	50K Hours Projected Lumen Maintenance Factor at 25°C [1]	Comparable To:
E-WP6L03CZ	36W LED Cool white	120V-277V	3350	5000K	70	50,000 Hours	100W PSMH
E-WP6L03NZ	36W LED Neutral white	120V-277V	3350	4000K	70	50,000 Hours	100W PSMH

[1] Calculated L_{70} based on 6,048 hours of LM-80 testing- >36,000 hours

Performance
- Estimated 50,000 hours of maintenance-free operation to L_{70}
- Minimum starting temperature: -40°F
- 5-year limited warranty

Electrical
- Non-dimmable
- 75°C minimum supply wire required
- Universal voltage (120V through 277V)

Construction & Materials
- Low copper, die-cast aluminum housing and lens frame
- Dark bronze polyester powder-coat finish
- Fixed cutoff glare shield to reduce light pollution
- Tempered glass lens, thermal shock and impact resistant
- Patented lens design delivers true IES Type III distribution
- Mounts over recessed junction box or with conduit
- Die-cast detachable back box for easy mounting
- Heat dissipating fins
- Conduit entries on all sides of the fixture
- Two knockouts provided on back for conduit or J-box mounting
- Cree® LEDs inside

Regulatory
- UL Listed for wet locations
- RoHS compliant

Accessories

CAT. # E-ACP1 (120 volts)
CAT. # E-ACP2 (208/240/277 volts)
Photocell is field installed.
For use with adjustable slip fitter only.

e-conolight®

Due to continuous product improvement, information in this document is subject to change. All published photometric testing performed to IESNA LM-79-08 standards by a NVLAP certified laboratory. Fixture photometry was completed on a single representative fixture. Actual production units may vary up to ±10% of initial delivered lumens. Lumen maintenance values at 25°C (77°F) are calculated per TM-21 based on LM-80 data and in-situ fixture testing.

1501 96th Street, Sturtevant, WI 53177 | Phone (888) 243-9445 | Fax (262) 504-5409 | www.e-conolight.com

Appendix C. Pilot Tenant Education Materials

Below are the tenant education and engagement materials MPower Oregon provided Pilot participants.

Shower Timer

Clothes Washer Placard

Lights and Thermostat Stickers

Door Hanger