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EnergyFitNYC

FINAL REPORT



PRATT CENTER FOR COMMUNITY DEVELOPMENT



Bringing health, comfort and savings home

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EnergyFit NYC's standard package approach and streamlined process offer an opportunity to dramatically scale residential retrofits in NYC's dense low- and moderate-income communities.

I. Executive Summary

For more than a decade, Pratt Center for Community Development has worked with low-and moderate-income (LMI) homeowners to promote energy efficiency in New York City's small homes market. From this experience, we have concluded there is a critical need to significantly redesign energy efficiency programs for small homes, defined as 1-4 family residential buildings, because many homeowners, even highly motivated homeowners, find it too difficult to participate.

Despite the hard work of community-based organizations, contractors, and other stakeholders, moving homes through the retrofit process has been exceedingly challenging. Recent data released by New York State Energy Research and Development Authority (NYSERDA) underscores this point: although the two main home performance programs offered in the state—Home Performance with ENERGY STAR (HPwES) and Assisted Home Performance with ENERGY STAR (AHPwES)—have seen significant traction upstate, these programs are not working in New York City. **Only 1.73% of all NYS retrofits that have occurred since 2010 have taken place in New York City,¹ despite having over 860,000 eligible small residential buildings.²**

If New York is to meet both its climate action goals and its commitments to ensuring equitable access for LMI communities to the economic, environmental and health benefits of clean energy (highlighted by both the New York State Energy Plan and NYC's OneNYC sustainability plan), new ideas are required. **It is time for a NYC-focused residential energy efficiency program, specifically designed to leverage the opportunities that arise from NYC's unique 1-4 family housing stock, and crafted for the families who live in and own these buildings.**

Pratt Center piloted EnergyFit NYC as a way to test program design features that we believe can have a transformative impact on the marketplace, namely a streamlined process coupled with a standardized package of energy efficiency measures developed for specific building types. From this experience, we recommend the following program elements:

- 1 Offer a Standard Package of retrofit measures
- 2 Simplify the homeowner engagement process
- 3 Elevate the importance of Health & Safety in program design and communication
- 4 Address additional barriers particular to moderate income households

The negative impacts of climate change and the continued rising cost of living in New York City make it imperative that we quickly transform the way energy efficiency programs are designed and implemented for low-and moderate-income households. This report provides recommendations on what a New York City focused program can incorporate to rapidly scale the retrofit marketplace for NYC's 1-4 family homes.

1. New York State Open Data, Residential Existing Homes (One to Four Units) Energy Efficiency Projects with Income-based Incentives by Customer Type: Beginning 2010, <https://data.ny.gov/Energy-Environment/Residential-Existing-Homes-One-to-Four-Units-Energ/fph5-fqtr>, accessed June 1, 2018.
 2. NYC DCP PLUTO 2017 v1



EnergyFit NYC builds on Pratt Center's extensive work over the past 10+ years in the residential energy retrofit marketplace.

II. Background

Through partnerships with community-based organizations and other collaborators, Pratt Center has first-hand experience with energy retrofit programs including NYSEERDA's Green Jobs-Green New York and Energy Smart Communities and our own project, Retrofit NYC Block by Block. In these programs, we worked closely with community groups and had direct contact with homeowners as they sought to identify, finance and implement energy efficiency measures. This work has given us insight into the on-the-ground implementation challenges and reasons why New York City sees such abysmal numbers of retrofits in the Home Performance with ENERGY STAR (HPwES) and Assisted Home Performance with ENERGY STAR (AHPwES) programs, which are specifically for 1-4 family households. There are over 860,000 1-4 family buildings in New York City. **Figure 1** shows how many of those homes could potentially participate in the three main retrofit programs available for this building stock. Yet of the 49,717 retrofits that occurred statewide from 2010 to early 2018, only 1.73% occurred in New York City homes (see **Figure 2**). The current programs are clearly not impacting the market and miss an extraordinary opportunity to reduce the city's carbon footprint while also benefitting low-and moderate-income residents.

Pratt Center hypothesized an alternative strategy: rather than considering every building as a unique case requiring an intensive, individualized retrofit process, a simplified model designed around building stock similarities could greatly increase the number of retrofits in NYC. **Our focus was on proving that buildings with similar architecture and design have similar energy efficiency needs and that there is a great opportunity to capitalize on the redundancy in the city's building stock.**

Pratt Center's multi-year *Retrofit Standardization Study*³ confirmed this hypothesis, demonstrating the consistency in required energy efficiency measures for similarly built small homes in NYC. The study recommended a standard measures approach, based on a package of set energy efficiency measures tailored for 1-4 family buildings. The standard package, coupled with a streamlined and well-communicated process, would facilitate homeowner participation in retrofitting their buildings.

FIGURE 1

Retrofit Program Potential in NYC

PROGRAM	NO. OF 1-4 UNIT BUILDINGS BY INCOME LIMITS	NUMBER OF RETROFITS FROM 2010-2018	PERCENT OF TOTAL
Empower <60% AMI	247,629	Data not available*	Data not available
Assisted Home Performance with ENERGY STAR 60%-80% AMI	308,975	463	.15%
Home Performance w/ ENERGY STAR >80% AMI	307,263	398	.13%

*Currently the NYS Open Data website does not have available information on the Empower program.

Source: NYC DCP PLUTO 2017 v1 ; U.S Census ACS 2012 – 2016 5 year estimates – Median Household Income; NYS Open Data, Residential Existing Homes (One to Four Units) Energy Efficiency Projects with Income-based Incentives by Customer Type: Beginning 2010

FIGURE 2

Existing Retrofit Programs have not addressed the NYC market

	NEW YORK STATE	NEW YORK CITY	NYC AS % OF TOTAL
Total Number of Projects	49,717	861	1.73%
Assisted Home Performance (AHPwES)	20,688	463	2.24%
Home Performance (HPwES)	29,029	398	1.37%

Source: NYS Open Data, Residential Existing Homes (One to Four Units) Energy Efficiency Projects with Income-based Incentives by Customer Type: Beginning 2010

To this end, Pratt Center launched the EnergyFit NYC Pilot in January 2016 to test this approach and inform the development of a citywide program. Pratt Center believes EnergyFit to be a transformative tool for the City and State's efforts to scale retrofits in New York, particularly for low- and moderate-income (LMI) homeowners in New York City.

3. *Retrofit Standardization Study*, Pratt Center for Community Development, December 2015, <http://prattcenter.net/research/retrofit-standardization-phase-2-study>



The EnergyFit NYC Pilot was designed to bypass the typically required comprehensive home energy assessment and energy modeling by offering a standardized package of energy conservation measures based on building typology. From January to June 2016, EnergyFit tested the Standard Package approach in NYC's small homes.

III. Pilot Details

The Pilot tested the standard package approach in a specific sub-set of New York City's 1-4 family buildings: one-and two-family, masonry, gas-heated, attached homes built before 1930. The primary objectives were: (1) to greatly increase the number of home energy retrofits in the 1-4 family residential marketplace, with a focus on LMI households; (2) to enable homeowners to easily and efficiently reduce energy consumption and costs and address health and safety issues; (3) to reduce soft costs for contractors to facilitate job creation and incentivize more contractors to join the energy retrofit marketplace; and (4) create a model that can be expanded to a citywide program. **In the six months the pilot ran from January to June 2016, EnergyFit NYC connected with 730 interested homeowners, conducted 414 intakes and 89 assessments, and retrofitted 32 homes.**³

Using data from Retrofit Standardization Study, the EnergyFit Pilot assessments, and working with our technical partners, we crafted a package of energy conservation measures that were needed consistently across this building stock. (See Retrofit Measures on page 10). After the retrofits were completed, each participating building's energy usage was tracked for the following year to determine the retrofit's impact on energy usage and cost. While most participants were found to have saved on their utility bills, our analysis showed that a larger sample size of buildings would be needed in order to provide a statistically significant answer to whether the specific package of energy efficiency measures chosen for this building stock was appropriate. While the standard package tested during this Pilot may or may not be cost effective in its current form, an expanded pilot with hundreds of retrofits and the use of a control group will enable us to refine and inform the standard package and find the mix of measures that works best using an iterative, empirical approach. EnergyFit is currently on track to expand through a new initiative where we will increase the number of retrofits in the sample, test the appropriate ECM mix, and confirm the savings data.

It is important to highlight that we believe the Standard Package approach is a model worthy of continued testing and refinement. Our work on this Pilot confirmed that the convenience the standard package offering and streamlined process brings to homeowners is extraordinarily valuable in helping them overcome many barriers they face in getting their home retrofit. As the recommendations in this report highlight - there are a number of program design features that EnergyFit NYC has shown as necessary for ensuring an increase in the number of retrofits in New York City's small homes.



3. Drop-off at each stage occurred due to pilot participation requirements, many of which would not be necessary in a full-scale program. See Appendix page 33 "Eligibility restrictions used in the Pilot would not be replicated in a larger citywide program."

Retrofit Measures

All 32 homes were selected to receive the retrofit based on the opportunity to install the full package of measures (see below).⁴ We also tracked the need for (but did not install) LEDs, pipe wrap, and water efficiency measures. Additional details on the Pilot structure and final package can be found in the Appendix.



Air sealing and insulating the attic cavity

Attic cavities were sealed along the perimeter and then insulated to approximately an R-40 value using blown in cellulose.



Three-tiered air sealing and weather-stripping the residence(s) and the basement

Air sealing was conducted on a three-tiered basis, which prioritized (1) the top-level of the home, (2) the basement with varying approaches for conditioned and non-conditioned basements, and (3) additional air sealing tactics throughout the rest of the building as time allowed.



Air sealing and insulating the roof hatch

Typical for pre-1930s construction, all of the homes had a push-up roof hatch providing rooftop access. Roof hatches were air sealed and insulated to limit air infiltration but access to the roof was maintained.



Health and safety tests and improvements

Evaluations included (but were not limited to) testing for gas leaks and high carbon monoxide (CO) levels. Each home had a \$400 health and safety budget to cover improvements, including combination CO/smoke detectors, gas leak fixes, combustion equipment clean and tunes, and ventilation improvement.

4. Two homes did not receive attic air sealing or insulation because, at the time of the retrofit, it was determined that they had sufficient insulation.



What drives a low-or moderate-income homeowner to retrofit their home? This question should always be asked during the design, implementation, and evaluation phases for any retrofit program that desires to see positive outcomes.

IV. Homeowner Experience

Understanding the motivating factors or major barriers for participation is an integral step that is frequently overlooked as government programs strive to meet policy goals, such as reducing CO₂ emissions. While these goals are important, they are often not the drivers that ensure participation by the target demographic. In New York City, most homeowners, regardless of their income level, will not pursue an energy retrofit if the program design does not take into account their actual lived experience and their needs and motivations. The following highlights just some of the ways that HPwES and AHPwES have inadvertently put up barriers to participation.

First and foremost, the complexity of navigating through the comprehensive energy assessment, modeling and recommendation process is a significant deterrent to homeowner participation in energy efficiency programs. The use of technical and financial terminology that the average homeowner does not always understand (e.g. savings to investment ratio [SIR], CFM, pascal, etc.), the lack of transparency in pricing of measures, the inability of homeowners to get a second quote to compare pricing and recommendations,⁵ difficulty understanding the incentive options, and large total project cost figures with inadequate financing and support - these are just a few of the ways in which the homeowner remains unprepared and discouraged from participating.

Another important issue for homeowners is time. Many homeowners have limited free time and in order to undertake a home improvement project like a retrofit they have to make trade-offs that may not always be immediately beneficial to them. Long assessments, multiple day retrofits, and extensive efforts to understand the suggested scope of work and its costs – all of these take time that many low- and moderate-income homeowners cannot afford, especially if they don't have a flexible employment situation, which can literally mean lost money. A major complication in most of the current programs is that there are many steps between a homeowner expressing interest in energy efficiency and the homeowner actually going forward with the retrofit. Too many decision points, and pauses in service delivery and communication, become barriers to completion as customers' attention and time is lost to other needs that they have.

Health and safety issues also arise as barriers to retrofit. LMI households are more likely to live in buildings that have maintenance needs that must be resolved before the home can receive a retrofit. Many of these can be quite hazardous, such as elevated carbon monoxide levels, mold, and gas leaks. These can be found in poorly maintained buildings, where neglect due to financial barriers exists, and in households that lack awareness

FIGURE 3
Distribution of health and safety issues identified in the Pilot

HEALTH AND SAFETY	89 ASSESSMENTS			32 RETROFITS		
	COUNT OF BUILDINGS	PERCENT OF TOTAL	NO. OF OCCUPANTS	COUNT OF BUILDINGS	PERCENT OF TOTAL	NO. OF OCCUPANTS
Asbestos-like materials	16	18%	71	2	6%	12
Clean and tune	25	28%	107	10	31%	55
Gas leak	10	11%	44	4	13%	20
Mold-like materials	2	2%	11	0	0%	0
Ventilation	12	13%	59	4	13%	20
CO/Smoke (houses needing 1+)	75	84%	327	28	88%	141
None (excluding CO/Smoke)	42	47%	175	16	50%	71
At least One (excluding CO/Smoke)	47	53%	214	16	50%	87
Need CO/Smoke & Clean and Tune	24	27%	103	10	31%	55

5. Current retrofit programs allow for only one covered home assessment

of the need for regular equipment maintenance. Both of these scenarios put households at risk for carbon monoxide poisoning, respiratory problems such as asthma, and more. The EnergyFit NYC Pilot corroborated what many in the energy efficiency industry already know – that health and safety issues are found in a large percentage of homes. Half of all buildings in the assessment phase of the Pilot were found to have health and safety problems (See **Figure 3**).⁶

Clear, transparent, and accessible communication and an easy-to-understand process are also greatly desired by homeowners. During the intake stage of the Pilot many homeowners stated that they had intended on tackling draftiness and energy efficiency in their home for quite some time but did not know whom to contact or how to participate in available programs. Some reported that they had tried to participate in other energy efficiency programs but felt they were too complicated or felt uncomfortable with the way energy efficiency measures were priced, particularly when the program only allowed for a quote from one contractor.

The straightforward, easy-to-understand nature of the Pilot, including an up-front description of the work that would and would not be performed in the home and why, made it easier for homeowners to quickly decide if they wanted to participate.

Post-retrofit surveying of homeowners confirmed that the transparent and accessible support that came with participating in our Pilot was an important feature of why they participated.

Even those homeowners who recognized there were many simple energy saving measures they could undertake themselves, such as changing light bulbs or caulking around leaky areas, had not done so and those who were less likely to take a DIY approach did not have a “go-to” contractor for this type of work. Some homeowners we talked to who had tried to previously engage in a retrofit program reported they were confused or overwhelmed, lacked guidance, and/or desired better support in determining how to get work done in their homes.

These homeowner reflections point to important opportunities a successful energy retrofit program must capitalize on in order to increase the number of retrofits occurring in New York City. Homeowners want to make their homes more comfortable, safe and energy efficient, but clearly they need better support in order to get the work done.

The high response rate from Pratt Center’s outreach during the Pilot indicates great interest in the marketplace for assistance with home improvements and lowering energy use and costs. EnergyFit NYC’s outreach focused on low-income communities and homeowners of one- and two-family, attached, masonry, gas-heated buildings built before 1930. Nonetheless, interested homeowners included those in three- and four-family buildings, semi-attached and detached homes, wood framed homes, electric and oil heated homes, and more recently built homes, demonstrating demand across multiple building types. The Pilot’s offer of a deep subsidy to cover most of the cost of the retrofit was likely a large contributor to the high interest. However, homeowners across income bands sought to participate, including low-income homeowners already eligible to receive free retrofits through EmPower, moderate-income homeowners with some incentive options through NYSERDA’s AHPwES (but who still struggle to afford the discounted rates) and homeowners with higher incomes who could arguably afford to pay for the retrofit but reported they lacked the time, information on how to pursue a retrofit, or confidence in finding trustworthy contractors.

Understanding the people who are the targets of an energy efficiency program is vital to the success of that program. The current landscape of offerings fails to do that. With NYC-based, LMI homeowners in mind, Pratt Center has created a set of recommendations that we believe are integral in moving a more significant portion of the 860,000+ 1-4 family buildings through retrofit.

6. Health and safety testing followed the Building Performance Institute’s (BPI) 1200 Standard. The BPI 1200 standard requires testing for the presence of gas leaks and checking for the presence of asbestos-like and mold-like materials and the need for ventilation and CO/smoke detectors. In addition, combustion equipment (i.e. boiler, furnace and/or hot water heater) were tested for spillage and draft, two issues that can lead to high carbon monoxide levels but can almost always be resolved by a simple clean and tune of the combustion equipment.



The following recommendations stem from Pratt Center's deep experience working with homeowners and community groups to advance energy efficiency retrofits, particularly in low- and moderate-income neighborhoods. Together, these recommendations form the basis for an alternative approach to energy efficiency programming that can transform the 1-4 family marketplace.

v. Recommendations

List of Recommendations:

1 Offer a Standard Package of retrofit measures

- 1A. Clearly explained, pre-determined, energy conservation measures that are widely needed in the targeted building stock
- 1B. Tiered standard package options
- 1C. Consistent, structured pricing based on income level with incentives included in price
- 1D. Short energy walk-through evaluation; no energy modeling

2 Simplify the homeowner engagement process

- 2A. Reduced timeline and number of decision points
- 2B. One continuous point of contact for advisement and support
- 2C. More robust support for local energy advisors
- 2D. Shared database for program administrators
- 2E. Coordination and communication between State and City incentive programs

3 Elevate the importance of Health & Safety in program design and communication

- 3A. Funding for health and safety fixes for low- and moderate-income households
- 3B. Increased direct messaging on health and safety

4 Address additional barriers particular to moderate-income households



1. Offer a Standard Package of Retrofit Measures

A successful NYC-based program will structure its offerings through a standard package model. A standard package is defined as a set bundle of energy conservation measures (ECMs), tailored to a specific building typology, with a fixed, consistent price based on income level.

This includes:

- 1A. Clearly explained, pre-determined, energy conservation measures that are widely needed in the targeted building stock
- 1B. Tiered standard package options
- 1C. Consistent, structured pricing based on income level with incentives included in price
- 1D. Short energy walk-through evaluation; no energy modeling



1A.

Clearly explained, pre-determined, energy conservation measures that are widely needed in the targeted building stock

The EnergyFit NYC Pilot and Pratt Center's previous Retrofit Standardization Study have both shown the consistency of need for certain ECMs in New York City buildings built during a similar time with similar materials and architectural design. The creation of a program that acknowledges this redundancy and utilizes the Standard Package design will ensure more homes receive retrofits more quickly because energy modeling and complex home assessments will no longer be necessary. It will simplify the process for homeowners, allowing them to more easily understand the specific scope of work for their home and to feel more confident that they can trust the recommendations from the contractor.

There is already a wealth of information about the needs of different building typologies in New York City from the current retrofit programs—EmPower, Weatherization Assistance Program and Home Performance/Assisted Home Performance. This data presents an opportunity to structure a Standard Package model for retrofits by analyzing the findings of the comprehensive home assessments and associated savings from the years of data from each of these programs, rather than having to energy model every building. Measures that are consistently recommended in specific building typologies can be crafted into a Standard Package. This eliminates the need for comprehensive home assessments for each building moving forward. In order to understand savings estimates, the current NYS Technical Resource Manual (TRM)⁷ recommendations could be used and then usage monitoring could occur post-retrofit to understand how the package impacts energy savings. A “test, measure, adjust” model could then be used to change package measures over time, if needed. The measurement process will be aided as Con Edison and National Grid roll out their smart meter programs and real time monitoring can occur.

7. The New York Technical Resource Manual (TRM) provides energy savings metrics at the measure level for retrofit savings estimates.



1B.

Tiered standard package options

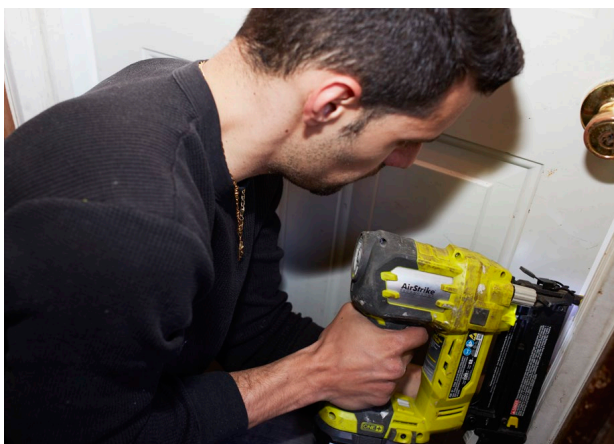
Pratt Center envisions a program that provides 2-3 ECM standard package offerings, structured from basic to advanced, with variances based on building needs. The program will have a base package, comprised of the most affordable and impactful measures, such as air sealing, weatherstripping, lighting, and pipe wrap. Each package that is offered beyond the base package makes the retrofit more comprehensive, albeit more expensive. The tiered system is important because despite the vast similarities in the energy efficiency needs of a particular building stock, some variation will always exist and a successful program must take this into consideration.

Due to limited resources, Pratt Center was only able to offer one package during the EnergyFit Pilot. However, a tiered package offering would have allowed more homes to participate. When we initially began the Pilot, we did not plan to air seal and insulate the attic cavities in the initial cohort, and planned to only offer a “base” package. However, during the assessment phase of the Pilot, we found 30% of homes had no attic insulation, and 51% had poor attic insulation (defined as insulation estimated to be under R-10). It was decided that the Pilot's package would include attic air sealing and insulation with blown-in cellulose. However, for the homes that did not need their attic insulated, all other measures would have still been relevant. In a full-scale, fully funded (i.e. post-pilot) program, those homes that did not need the attic insulation would have received the “base” package.

1C.

Consistent, structured pricing based on income level with incentives included in price

The Standard Package must have a set price for each tiered option. It should also be based on income level, with incentives wrapped into the cost. Providing a set, all in upfront price builds trust and means the homeowner and/or contractor does not have to spend time calculating the final project cost based on income and incentive levels. It will save time and limit confusion for the homeowner.



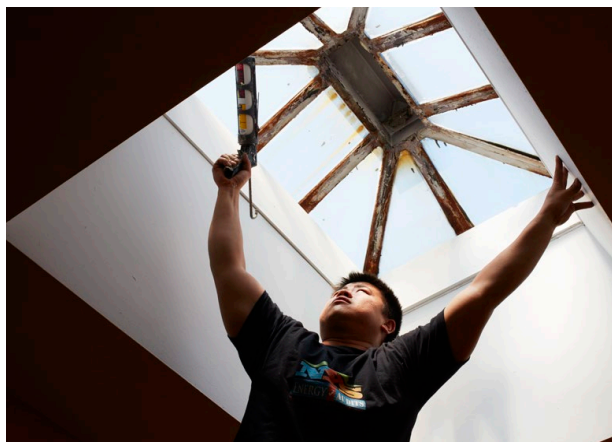
Pratt Center envisions programs will still be run by government agencies or utilities that contract with other entities for program administration and implementation. Knowing that a government agency or utility stands behind a program will help a homeowner to feel confident the energy contractor is offering them an honest price for the retrofit. It will ensure that there are no surprises in what a recommended scope of work will cost them and entail. It will allow participants to easily recommend the program to neighbors, providing them with firm price expectations. Lastly, it will enable a homeowner to be more financially prepared for the expected costs of the program, prior to participation.

1D.

Short energy walk-through evaluation; no energy modeling

An important factor in the Standard Package approach is the shortened assessment and the exclusion of energy modeling for individual homes. By shortening the home assessment to a 90-minute walk-through evaluation, ridding the process of the administrative time it takes to run a building energy model for each and every home, and keeping the retrofit to one day of work, EnergyFit NYC was able to quickly move homeowners to "yes" while respecting their personal time constraints to participating. At one point during the Pilot, we were able to reduce the amount of time required to move a homeowner from initial contact to completed retrofit to only three days.

Since the Standard Package approach has already identified the most relevant ECMs for the building type, eliminating the need for comprehensive assessments, the shortened assessment serves as a checklist for determining whether a home requires the base package or one of the other tiered options. This is also when health and safety testing would occur, and the contractor could begin to forge a relationship with the homeowner by answering questions and providing energy education.



2. Simplify Homeowner Engagement

A successful program for New York City will simplify the homeowner engagement process. This means designing a program that streamlines and reduces the number of steps between the initial touch point with an interested homeowner and a completed retrofit, while also planning for unforeseen barriers with implementable solutions.

This includes:

- 2A. Reduced timeline and number of decision points
- 2B. One continuous point of contact for advisement and support
- 2C. More robust support for local energy advisors
- 2D. Shared database for program administrators
- 2E. Coordination and communication between State and City incentive programs

2A.

Reduced timeline and number of decision points

Homeowners face many competing demands for their time and attention. It is important that an energy efficiency program take this into account by reducing the time it takes to move a homeowner from outreach to retrofit. Pratt Center deliberately designed EnergyFit to minimize time and decision points by utilizing the Standard Package design, implementing a streamlined, semi-automated screening process, offering a clear price structure and having a transparent progression of decision-making. Ultimately this reduced the time it took a homeowner to get from filling out the online Interested Homeowner Form to receiving a retrofit to just three days. The following recommendations, along with the Standard Package from Recommendation #1, are designed to ensure a NYC focused retrofit program can meet the goal of a shortened timeline.



2B.

One continuous point of contact for advisement and support

Appointing a single advisor to a homeowner can ease and accelerate the decision-making process. Having a trusted contact who can advise a homeowner when they have questions about picking a contractor, choosing the appropriate package, or understanding how to navigate financing will both increase the satisfaction of the homeowner and increase the likelihood of a retrofit of the home. These advisors should be local to the community when possible, both as a way to instill trust and increase community engagement on energy efficiency issues. It is also a way to ensure that the benefits of the green economy are distributed equitably.



Pratt Center's initial screening process enabled staff to follow up by phone with only those homeowners who met the Pilot's basic eligibility. That subsequent intake conversation followed by timely, consistent and informative communications as a homeowner moved through the stages of the Pilot proved critical in forming a trusting relationship with the homeowner and ensuring client satisfaction and engagement. In post-retrofit follow-up, homeowners highlighted that the Pilot's transparent and timely communication with customers, including the professional and on-time contractor that was verified by Pratt Center, were favored features of their participation. This demonstrates that detailed interaction with the homeowner at each stage is critical to homeowner engagement.

2C.

More robust support for local energy advisors

Energy advisors must be well supported in their work so they can successfully fulfill their roles and should be local to the communities they serve. This means providing fairly funded contracts to community-based organizations (CBO) that allow for organizations to pay livable wages to their staff, while also having enough money to cover all administrative costs associated with the work.⁸ It also means providing ample workforce training opportunities so that energy advisors are well versed in both the technical, financial, and behavioral components of energy retrofit work and homeowner advisement. Adequate funding ensures staff retention, continuous growth of institutional knowledge, and the assurance that the energy advisor will be fully engaged with their role, acknowledging the valuable role advisors play in advancing projects to completion.

The need for local community-based energy advisors is especially important for a program designed for LMI homeowners. Real estate speculation and ESCO (energy services company) harassment has been rampant in many New York City neighborhoods. Low-and moderate-income homeowners are rightly mistrustful of anyone trying to sell them on a product or service, even when they are beneficial such as with energy efficiency. By contracting with local, on-the-ground CBOs, a program administrator, coupled with a smartly designed program that's easy to sell, can simultaneously meet the goals of increased numbers of retrofits for LMI households and green sector workforce development. Low-income communities have also not been party to many of the workforce benefits that have accrued in the clean energy sector and this is one way to better address that discrepancy.

8. Green Jobs-Green New York was modeled to have CBOs act as advisors to homeowners, yet they were woefully underfunded and under-supported, and asked to market programs (AHPwES/HPwES) that were extremely difficult to sell due to the complicated design and limited incentive structures. Staff members at these CBOs typically had to work on several other programs within their organization because of the lack of resources dedicated to funding energy advisors as a singular position with a livable wage. This was one reason turnover for this program was high and CBOs had to spend a lot of time and effort starting over and onboarding new staff as their institutional knowledge left for better opportunities.



2D.

Shared database for program administrators

An important way to shorten the retrofit timeline is to streamline how information is shared between the various contracted parties that work with homeowners including energy advisors, Home Performance contractors, program administrators, and finance companies. Creating one shared database with appropriate privacy protocols, where a client's information can be easily stored, shared, and updated will help reduce the amount of administrative time spent by various parties working on a retrofit project.⁹

During the EnergyFit NYC Pilot, Pratt Center used the online app Fulcrum to organize communication between the contractor and Pratt Center staff, which streamlined and allowed for real time information sharing, allowing decisions to be made more quickly. This is just one example of how a program could reduce administrative barriers to retrofits.

2E.

Coordination and communication between various City and State incentive programs

A Standard Package that is priced consistently and inclusive of energy efficiency incentives greatly streamlines the retrofit process. It does this by eliminating the multi-step process of pursuing a retrofit and then applying for incentives retroactively. This also forces greater coordination between the various entities providing energy efficiency incentives during program design so that a homeowner does not need to apply to multiple programs to receive energy incentives for various aspects of a retrofit project.

Additionally, there is a need to streamline and coordinate the numerous external incentive programs that are available to homeowners and tenants for building repairs that complement energy efficiency upgrades. Examples include FloodHelpNY, NYC's Housing Preservation and Development's (HPD) small homes programs, and grants through NYS's Affordable Housing Corporation, which can all help fund home improvements that pair well with energy work, and in some cases are required before energy work can proceed. For example, a homeowner that wants to install attic insulation as part of an energy retrofit could not do so if there was an unresolved roof leak that could lead to mold growth or deterioration of the insulation. While an energy program would pay for insulation, the roof repair would not be covered, and the homeowner would need to pursue help elsewhere, such as through HPD. In a business-as-usual scenario, these two programs remain completely separate and a homeowner is left to navigate both independently, most likely not completing either, due to time constraints and/or frustration. In a more coordinated scenario, the energy and home repair program staff work together to streamline the applications, providing the homeowner with one point of contact to support the completion of the roof repair and the insulation. Since both the City and State have climate action goals, collaboration benefits both the City and State as well as the program participants so that energy reductions occur and resources are deployed efficiently.

9. During Green Jobs-Green New York, communication between CBOs, the program administrator, and the Home Performance contractors was fragmented through the use of three different databases, making it difficult for the energy advisor to know how to most effectively advocate on behalf of the homeowner.

3. Elevate the importance of Health & Safety in program design and communication

A successful program for New York City should elevate the issue of health and safety to a more pronounced position of importance within the energy retrofit process.

This includes:

- 3A. Funding for health and safety fixes for low- and moderate-income households
- 3B. Increased direct messaging on health and safety

Improving the health and safety of low-income New Yorkers' homes is vital to ensuring positive health outcomes for residents who typically experience the negative impacts of unsafe buildings at higher rates than wealthier residents. While the goal of energy efficiency programs including EnergyFit NYC is to reduce energy usage and carbon emissions, an equally important benefit is resolving health and safety issues, of which homeowners may not be aware and which can be quite dangerous. A large-scale program, even with a standardized approach, will need to include a plan for resolving these health and safety issues promptly so as not to exclude a large swath of buildings from participating.



3A.

Funding for health and safety fixes for low- and moderate-income households

All programs must increase monetary support for resolving health and safety issues. This is particularly true for programs aimed at serving LMI households, as many homeowners may not be able to afford the necessary fixes or have disposable income for energy efficiency upgrades after resolving their health and safety issues. This can be a major roadblock to increased retrofits. Currently, the Assisted Home Performance program states that health and safety improvements are not eligible for the 50% discount that ECMs are eligible for and this is a big oversight. This lack of funding acts as a barrier that many households cannot overcome, and ensures that the larger goals of decreasing energy usage in low-and moderate-income households will not be met.

A successful NYC focused program must include a dedicated funding stream specifically for health and safety, ensuring equitable access to energy efficiency programs, while also mitigating some of the long-standing environmental injustices that low-income communities in NYC have faced. Through the expansion of funding for health and safety fixes, a larger universe of LMI homeowners will be able to move forward with retrofitting their homes. This can be done by directly increasing the available funds through the retrofit program or collaborating with other entities that have goals aligned with health improvements for LMI communities.



3B.

Increase direct messaging on health and safety

A NYC based program should create a communications narrative around the health and safety issues found in the one-to four-family building stock, and how an energy retrofit can help address these problems. The importance of a healthy home cannot be overstated and in some cases, where a home has a carbon monoxide problem or gas leak, it can be life or death. A New York City based program should prominently highlight the connection of residents' health and safety to energy retrofits. Leading with health and safety is a smart way to motivate homeowners to reap the dual benefits of improving health and safety and energy efficiency. Messaging can include information on reduction in asthma attacks, reduction in lost work or school time due to sick days, the risk of carbon monoxide poisoning, and explanations of how energy retrofits can help identify and resolve these health problems.

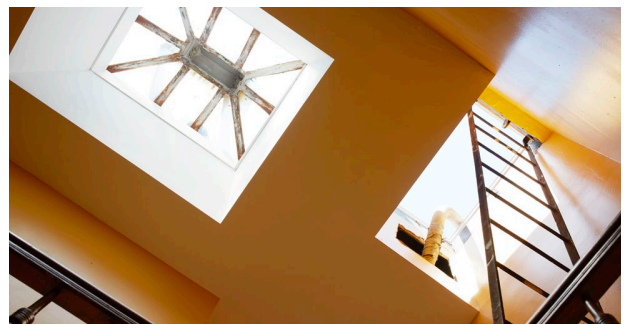
Pratt Center encourages policymakers and program implementers to think more critically and creatively about how to raise the importance of health and safety improvements into energy retrofit communications strategies. Messaging should also target non-conventional groups that may not typically focus on energy efficiency, such as health care providers or social workers.

4. Address additional barriers particular to moderate-income households

A New York City based program must increase support for moderate-income households through a more nuanced sliding scale incentive structure.

The definition of low- vs moderate-income plagues any program that utilizes income-based subsidies, no matter what the policy area. This is because the rigidity and arbitrary delineation of government income guidelines in determining who is low-income and who is moderate-income does not take into consideration the real-life implications of these strict thresholds: a household that falls outside of the low-income guidelines may only do so by a few dollars, but that immediately changes that household's ability to receive a significant amount of support in retrofitting their home.

Currently, if a home falls at or below 60% area median income (AMI) the household is considered low-income. This qualifies them for the EmPower retrofit program, where they receive a number of free energy conservation measures. However, if the household makes even \$1 more than what the EmPower guidelines qualify as low-income, they immediately fall into the moderate-income category, which pushes them into Assisted Home Performance with ENERGY STAR. Suddenly, what would have been a free program, becomes a program requiring a 50% cost share. For many homeowners in New York City, where the cost of living is exorbitantly high, this is too high a price for them to bear. The same happens for moderate-income homeowners that may fall \$1 over the moderate-income limits (above 80% AMI). These homeowners shift to Home Performance with ENERGY STAR and can no longer access the 50% cost share incentive for retrofit projects. CBOs working with Pratt Center on the Green Jobs Green New York contract often reported this as one of the main reasons why LMI participants never moved from assessment to retrofit.



This issue must be resolved so that households that fall right at the delimiting income levels are not lost as real participants.

Creating a greater number of income brackets, coupled with a sliding scale cost share structure could help resolve the challenge that the current rigid thresholds and limited incentive amounts pose. We recommend a more gradual increase in cost share and more nuanced income level gradations. For example, cost share could increase in 20% or 25% increments, rather than the current 50% jump, and be tied to smaller income ranges (such as 60% AMI and below are free, 60-75% AMI pay 20% of project cost, 75-90% AMI pay 40%, and so on).

We understand that there will always be the need for income limits in program design and as such income “cut offs” will always be an issue to some degree. However, we believe that program administrators can find ways to encourage greater participation by offering more flexible financial support, and that our suggested program improvements are more aligned with the needs of low- and moderate-income households.



There are more than 860,000 1-4 family homes in New York City, representing an significant opportunity to reduce carbon emissions, yet current programs are not adequately designed to support retrofit completion, particularly in LMI communities. Improving program design could greatly increase retrofits in NYC.

VI. Closing

New York City's small homes present an incredible opportunity to help both New York State and New York City achieve their goals to reduce carbon emissions while supporting low- and moderate-income communities. However, business-as-usual is not going to get us there – the numbers prove that. Despite accounting for 19% of the City's emissions,¹⁰ the continued pursuit of retrofits through poorly designed programs for these homes will only lead to failure.

If a truly equitable and impactful approach to fighting climate change is to occur, it must start with the particular challenges facing low- and moderate-income communities and their residents. A NYC focused program must take into account the true, lived experience of LMI homeowners and support, not discourage, participation. Residents may want to save money, and live in healthy and comfortable homes, but those desires are not enough to get buildings retrofitted if the process is onerous, slow and unaffordable. We believe the EnergyFit NYC approach addresses these challenges and will greatly increase the number of energy efficiency retrofits in the more than 860,000 1-4 family homes in New York City.



List of Recommendations:

1 Offer a Standard Package of retrofit measures

- 1A. Clearly explained, pre-determined, energy conservation measures that are widely needed in the targeted building stock
- 1B. Tiered standard package options
- 1C. Consistent, structured pricing based on income level with incentives included in price
- 1D. Short energy walk-through evaluation; no energy modeling

2 Simplify the homeowner engagement process

- 2A. Reduced timeline and number of decision points
- 2B. One continuous point of contact for advisement and support
- 2C. More robust support for local energy advisors
- 2D. Shared database for program administrators
- 2E. Coordination and communication between State and City incentive programs

3 Elevate the importance of Health & Safety in program design and communication

- 3A. Funding for health and safety fixes for low- and moderate-income households
- 3B. Increased direct messaging on health and safety

4 Address additional barriers particular to moderate-income households

10. One City Built to Last Technical Working Group Report, Transforming New York City Buildings for a Low-Carbon Future, 2016, p. 9, http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/TWGreport_04212016.pdf

Appendix

Pilot Structure

In order to guarantee efficient and effective implementation of the Pilot, Pratt Center developed a detailed and robust process for every step of the Pilot. A summary of the key activities for each step is described below.

Pre-Launch

Prior to publicly launching the Pilot in January 2016, Pratt Center refined the methodology for the Retrofit Standardization Study and created the necessary infrastructure for tracking data collected for the Pilot. Key steps of the pre-launch phase included:

- *Contractor Focus Group:* Seven NYC-based home performance¹¹ contractors attended a half day-long focus group to provide input on the Pilot design, price and retrofit scope of work to ensure the Pilot structure was feasible for contractor participation.
- *Building Typology Selection:* Using NYC Department of Finance and PLUTO tax lot data, Pratt Center mapped NYC's one- to four-family building stock, ultimately selecting two-family, attached, masonry homes built before 1930 as the focus for the Pilot. Pratt Center mapped 24,730 such residential buildings classified as B1 or B3 that met these requirements across all five boroughs.¹² This typology was selected due to a combination of prevalence, neighborhood clusters, energy efficiency opportunity, and feasibility to implement the Pilot in a short amount of time. Additional single-family homes that met all other requirements were added post-launch.
- *Eligibility Criteria Finalization:* To ensure the homes receiving the retrofit all had similar characteristics, Pratt Center created a detailed eligibility screening process. In addition to the building typology elements, buildings were deemed ineligible for the Pilot for several reasons, including structural issues such as if they had front "bump-out" additions, peaked roofs, attached garages, or all glass exterior walls. Additionally, buildings needed to be owner-occupied with consistent occupancy throughout the year and have at least one year of energy bills with primarily "actual" energy usage as opposed to estimated meter readings. This strict eligibility criteria would not need to be in place post pilot. See page 33 for more detail.
- *Building Performance Institute (BPI) Certified Home Performance Contractor Engagement:* Pratt Center issued a Request for Qualifications to a wide number of local home performance contractors, ultimately selecting NYS Energy Audits (NYSEA), a BPI¹³ home performance contractor that had significant experience with the Pilot's building stock. Together with CLEAResult, the Pilot's Technical Partner, Pratt Center developed Contractor Guidelines that outlined the exact scope of work to be completed in each home, including a tiered approach to air sealing that prioritized the top-level of the home, followed by the basement with varying approaches for conditioned and non-conditioned basements, and then by additional air sealing tactics if time allowed. In addition, the guidelines provided specifications for air sealing and insulating the roof hatch and attic cavity.

11. Home Performance is the industry term for contractors that specialize in improving building comfort and operations primarily, but not solely, through energy efficiency. The New York State Energy Research and Development Authority's (NYSERDA) main energy efficiency program for one- to four-families is called Home Performance with Energy Star®. However, the term home performance in this paper is used as a more general description of the types of contractors Pratt Center engaged with for the Pilot.

12. Buildings with commercial on the ground floor or more than 4 floors were excluded from the data set. Heating type could not be determined from the PLUTO dataset and were determined in the second eligibility screening.

13. The Building Performance Institute (BPI) offers certifications and standards for the energy efficiency and home performance industries.

- **Data Collection System Design:** The rigorous, data-heavy eligibility screening process for the Pilot required a clear and organized approach to tracking all the information collected both in the office and out in the field. In order to ensure this was done efficiently, Pratt Center utilized Fulcrum, an online information collection platform, to manage all qualitative and quantitative data collected through a number of "surveys." These included GIS-located surveys used to guide field canvassers in targeting the appropriate homes for door-knocking activities; a simple online form for interested homeowners to apply; over-the-phone intakes; in-home contractor assessment surveys with text and photo data collection done via tablets; retrofit surveys tracking all work done on the home; and other quality control- and payment-related tools.

Recruitment

Pratt Center employed a multi-pronged outreach and recruitment strategy to inform homeowners of the Pilot and the benefit of energy retrofits in general. Utilizing the list of addresses generated from the building typology mapping exercise, Pratt Center mailed postcards to potentially eligible homeowners directing interested residents to the dedicated EnergyFit NYC phone number and the EnergyFit NYC website. These postcards generated the highest number of leads of all outreach tactics. Other successful tactics included employing a team of canvassers to knock on doors in neighborhoods with large clusters of potentially eligible buildings, partnering with community organizations and block associations, and posting on neighborhood listservs. Pratt Center also created a homeowner referral system,

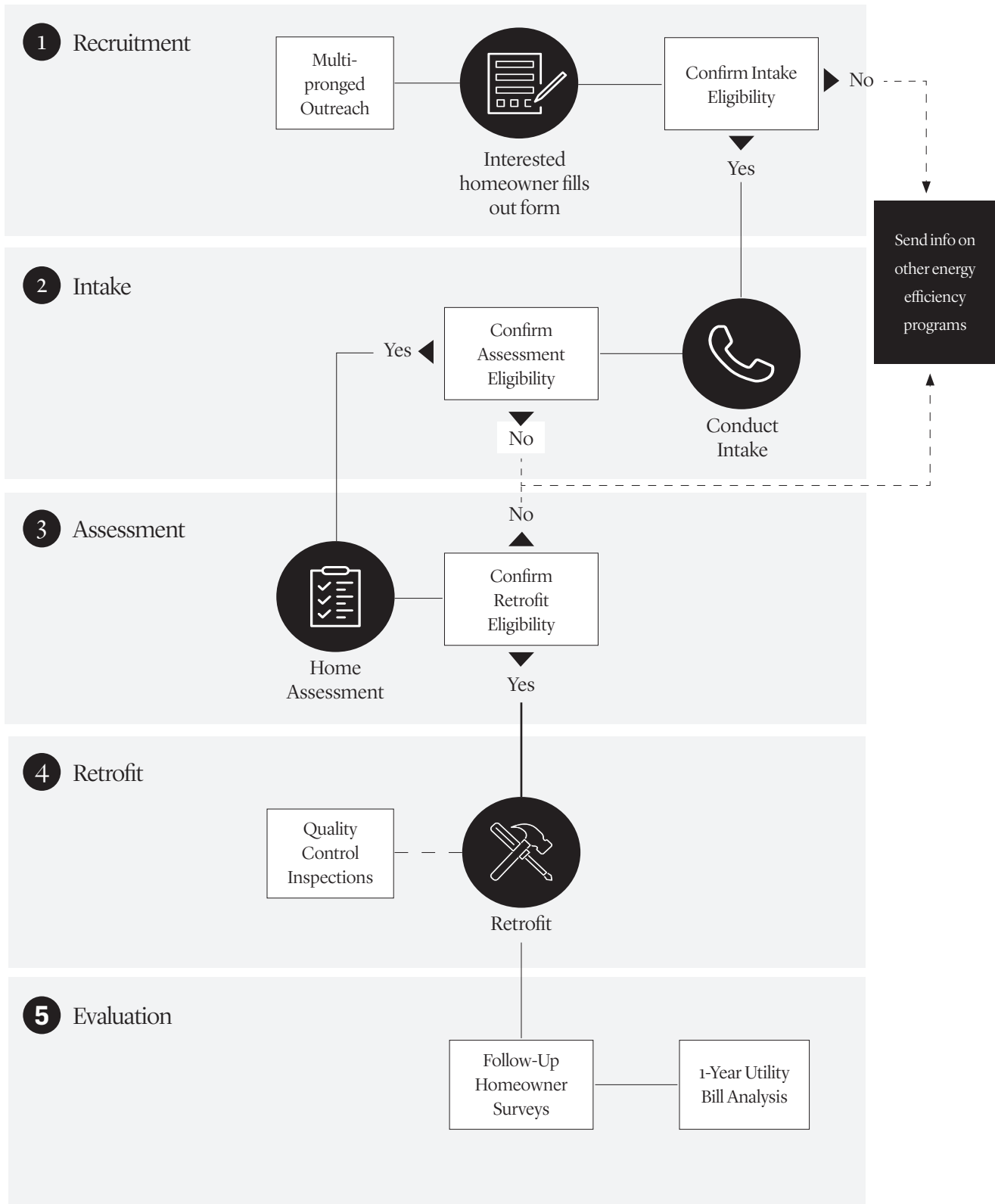
offering \$200 to anyone who referred a homeowner who would go on to complete a Pilot retrofit. Those interested in the Pilot whose buildings did not meet the basic eligibility criteria were provided with information about other energy efficiency programs.

Intake

The Intake process included two steps. First, homeowners were encouraged to fill out an Interested Homeowner Form on the EnergyFit website to determine basic eligibility such as owner occupancy, heating source, length of time in the building, and building façade material. If the answers provided met the Pilot's initial requirements, Pratt Center staff then conducted an in-depth phone interview with each homeowner to gather more details on the building to determine further eligibility for the in-home assessment. Some examples of the information collected included ensuring consistent occupancy in the home (e.g. home not used as an AirBnB), existence of sufficient energy bills to form a pre-retrofit research baseline, no known presence of building health and safety issues (e.g. asbestos, roof leaks, etc.), and no recent major renovations affecting energy use. This conversation also proved crucial in establishing a trusting relationship with each homeowner so that all participants were fully aware of the Pilot's goals and participation requirements along with the complete scope of work that would be performed in their homes. Again, homeowners that were not selected for the next stage of the Pilot received information about other energy efficiency programs.

FIGURE 4

The EnergyFit Process



Icons in figure 1 created by Arslan Shahid, naim, Arthur Shlain, Oliviu Stoian from the Noun Project.

Assessment

In contrast to a full Comprehensive Energy Audit that is a requirement for most energy efficiency incentive programs, the EnergyFit NYC Pilot Assessment was designed to take no more than 90 minutes and did not require energy modeling for individual buildings or a blower door test (blower door tests were performed instead on the day of the retrofit, to track air infiltration reductions for the Pilot, but would not be required in a citywide program). The EnergyFit NYC contractor, NYSEA, performed all of the assessments. The purpose of the assessment was to confirm each building's need for all measures in the retrofit package (e.g. confirming that a building did not have existing and adequate attic cavity insulation) and to conduct basic health and safety tests to confirm the safety of the home for both residents and the contractor on the day of the retrofit. While not part of the Pilot package of measures, the assessment also tracked the number of LED light bulbs, number of low-flow showerheads and aerators, and length of basement heating pipe and Domestic Hot Water (DHW) pipe wrap needed. This information was tracked in order to understand the building's need and savings that would accrue if installed. In a larger, citywide program, the time needed for the assessment could be reduced further as many of the data points captured for the study purposes of the Pilot would not be necessary.

Pratt Center and CLEAResult then reviewed each assessment report through a comprehensive scoring tool and selected eligible homes to receive the retrofit. Some examples of the reasons homes were not selected included buildings that required health and safety corrections that cost more than \$400, homes that had asbestos where the contractor could not safely run the blower door test, or homes that had existing, adequate attic insulation and did not need more insulation. Homeowners did have the option to coordinate and pay for health and safety fixes on their own and still participate in the Pilot if all other eligibility requirements were met. All homeowners not selected for a retrofit were provided with information about other energy efficiency programs as well as tips on how to implement simple energy saving measures on their own. A number of the homes not selected stated that

they were still interested in participating in the Pilot if the eligibility requirements changed, demonstrating their high interest in energy efficiency.

Retrofit

The EnergyFit NYC Pilot standard package was developed to meet the consistent needs of homes built at a similar time and of similar measures. Each home that received the retrofit received the same package, which included a three-tiered system of air sealing of the residence(s) and basement, air sealing and insulating of the roof hatch, air sealing and insulating of the attic cavity, and health and safety upgrades (see page 32 for further discussion of the package scope). The retrofit package was designed to be completed in one day, minimizing the inconvenience to homeowners of taking time off from work or other commitments. The only exception was if a building had a health and safety issue that needed to be resolved before work could begin, such as completion of a boiler clean and tune or fixing of a gas leak. NYSEA, the Pilot Contractor, also conducted test-in and test-out blower door tests, a critical data point for the Pilot's research purposes, and test-out health and safety checks.

For every retrofit, NYSEA followed the EnergyFit NYC Contractor Guidelines and through the online data collection tool uploaded a post-retrofit checklist that documented the work completed in the home (including photographs). CLEAResult completed Quality Control inspections in half the homes on separate days.

EnergyFit NYC Pilot Final Scope of Work

The EnergyFit NYC Pilot is an extension of Pratt Center's *Retrofit Standardization Study*. As part of the Study's first phase completed in 2014, Pratt Center identified a "Starter Package," a standard set of measures applicable to all 22 two-family buildings in the Study's data set, which consisted of air sealing the residences and basement, air sealing and insulating the roof hatch, replacing incandescent lightbulbs with LEDs, installing low-flow showerheads and aerators, insulating basement pipes, and health and safety testing and upgrades. A variation on this package included attic air sealing and insulation, a measure that is widely known to have a significant impact on energy savings. However, within the Study sample, the need for attic insulation was only found in a smaller subset of buildings and as such was not included in the Starter Package.

When the EnergyFit NYC Pilot began, Pratt Center sought to confirm the opportunity to implement the Starter Package during its first 15 Assessments.

These initial assessments demonstrated that in fact, the need for attic insulation was much greater than originally thought. Of the 89 Assessments completed, 30% of homes were found to have no attic insulation, and 51% had poor attic insulation (defined as insulation estimated to be under R-10).

Additionally, through the Intakes and the Assessments it became evident that many homeowners had begun replacing their incandescent lighting in the two years since the original Retrofit Standardization Study was conducted. While many homes still had incandescent lights that should be replaced, the need for LED lighting was less universal. To accommodate the higher priced (and more widely needed) attic insulation and to ensure that a consistent scope of work was installed in each home, Pratt Center opted to modify the package of measures in the Pilot.

Ultimately, it was decided attic air sealing and insulation would replace the lighting, showerheads, aerators and pipe wrap from the package to have a consistent scope of work in each home and to better assess savings associated with tightening the building envelope, which all of the homes required. Additionally, savings associated with lighting, pipe wrap, and low-flow fixtures are widely agreed upon, and further research was less critical. However, in recognition that these measures can still have a significant impact on a building's energy use, the need for these measures was tracked in each assessment. The range in need for these measures was wide. For example, in the 89 homes that received an assessment, there was the opportunity to replace some incandescent lightbulbs per home. However, while the need averaged 30 incandescents per home, it ranged from 0 to 86 (with a median need of 6) with 90% of assessed homes needing at least four bulbs replaced.

Eligibility restrictions used in the Pilot would not be replicated in a larger, citywide program

Pratt Center opted to restrict eligibility in the Pilot to one- and two-family, fully attached, gas heated masonry homes built before 1930 to establish a full data set of buildings with similar characteristics. However, the standardized approach and the EnergyFit protocol could translate to other typologies such as three- and four-family buildings, buildings with a differing attached status or homes with electric or oil heat. Wood frame homes could also be considered for the standardized approach. Similarly, most of the secondary eligibility criteria utilized for the Pilot that were the main reasons a homeowner was not selected to move to the next stage were due to the Pilot's specific research protocol and would not be inhibitors in a larger, citywide program. These include:

ESTIMATED ENERGY BILLS

The number one reason besides not meeting the basic eligibility requirements (i.e. 1-2 units, attached, masonry, gas heated homes built before 1930) that homeowners were ineligible to participate in the Pilot was a lack of actual meter readings on their utility bills. In order to complete the planned post-retrofit analysis, it was critical to only enroll homeowners who had energy bills showing actual meter reads, as opposed to estimated bills, for at least one year prior to the retrofit in order to have accurate baseline data. Many homeowners had numerous estimated meter reads, which would have limited Pratt Center's ability to

accurately account for the retrofit's impact on the post-retrofit usage of the building. However, in a larger, citywide program, estimated billing would not pose the same challenge since post-retrofit analysis would not be required for each home. Therefore, estimated bills would not preclude a homeowner from moving forward with a retrofit. Additionally, Con Edison and National Grid are in the process of installing or planning to install remote meter readers, further reducing the likelihood that this will be an issue in a larger program, even if post-retrofit analysis was incorporated.

ASBESTOS

The EnergyFit NYC Pilot focused on buildings built before 1930, many of which still have asbestos. While most asbestos in these homes is either hidden behind walls and ceilings and/or in an undisturbed state around basement pipe wrap, Building Performance Institute (BPI) guidelines prohibit blower door tests to be performed in homes where there is a risk of asbestos particles becoming airborne. Blower door tests, while not required for the

retrofit, were critical for research purposes as a main preliminary data point of the retrofit's impact. While guided blower door air sealing is helpful in achieving air infiltration reductions, in a full roll-out of the program, the blower door numbers would not be required and the guided air sealing unnecessary as the air sealing approach would have already been tailored to the specific building type.*

INCONSISTENT/INSUFFICIENT OCCUPANCY

Several homeowners who were interested in participating in the Pilot had either recently moved into their home or did not consistently use their second unit but kept it available for interim guests (e.g. AirBnB). Both of these scenarios would limit the establishment of a clean, baseline data set. Similar to the issue

with estimated energy bills, this type of analysis is not likely to be needed in a larger program. Recent or planned renovations, recent installation of solar panels, and other home improvements that impact energy use would also not likely limit a homeowner's participation in a future program.

Two of the reasons that prevented Pratt Center from selecting a home to move forward from assessment to retrofit that would remain if a future program maintained the same scope of work was the presence of adequate existing attic insulation and insufficient access to the attic cavity to install insulation. Twenty-one percent of homes that had an assessment were ultimately deemed ineligible because of adequate existing insulation. Six percent needed insulation, but there was not a cost-effective way to install it within the Pilot's budget due to the limited access points. Seventy-three percent of homes that received the assessment needed attic insulation and had sufficient attic access, demonstrating the value in including attic insulation in the standard package.

* Pratt Center and NYS Energy Audits attempted to identify a reputable asbestos removal contractor to confirm the presence of asbestos in certain homes where asbestos-like material was found, but were not successful in the limited timeframe available for the retrofits to be completed. Future programs that wish to include blower door tests would likely need to have an asbestos contractor on retainer to perform asbestos abatements in a timely manner.

Pilot Outcomes

Through Pratt Center's multi-pronged recruitment approach, a large number of NYC homeowners received information on EnergyFit NYC and energy efficiency in general. In the end, Pratt Center connected with 730 interested homeowners, conducted 414 intakes and 89 assessments and completed 32 retrofits within the first six months of 2016.

The 89 assessed homes were located in Brooklyn, Queens, and Manhattan. All 32 retrofitted homes were one- or two-family, attached, masonry, gas-heated buildings built before 1930.

One of the EnergyFit NYC Pilot goals was to test this approach specifically with LMI homeowners. Pratt Center tailored many of its outreach and recruitment strategies to this demographic in this effort but due to the Pilot's funding deadline,¹⁴ we expanded recruitment to all homeowners regardless of income level. Ultimately, just under half of the homeowners that received a retrofit self-reported annual household incomes of below \$80,000 (see **Figure 4**).

The pre- and post-retrofit blower door tests conducted on all 32 homes demonstrates that the package was able to significantly reduce air infiltration in the homes. The average air infiltration reduction was 29%, with four homes achieving reductions of 50% or more. Only four homes had reductions less than 20%, but all homes had at least an 8% reduction. The blower door tests were conducted at CFM 50, a measure of the amount of air entering/leaving a home (i.e. cool air entering

during the winter requiring greater use of the heating system to maintain a set temperature or the reverse for air conditioning). Air infiltration reductions do not precisely correlate to energy use reductions, but they are an indicator for tightening a building's envelope and reducing the need for heating in the winter and cooling in the summer. **Figure 6** shows the blower door results for each of the retrofitted homes. Blower door results were not impacted by building volume, despite the range in building size across the 32 homes (see **Figure 7**).

Statistical t-tests were analyzed to determine if any of the installed air sealing measures had more measurable impacts on air sealing results than others. While the sample size of each measure type was not sufficient to conclusively show the impact of most of the measures, Attic (Cockloft) Air Sealing and Sealing General Penetrations to the Attic Cavity were found to have had a significant impact on CFM reduction. Houses with these measures installed had over a 1000 CFM greater reduction than those that did not. This is especially important because these are the measures that complement attic insulation. When a contractor installs insulation, they typically must create an access hole to the attic cavity. While this may not make sense when doing simple air sealing work, the air sealing that can be done while that cavity is open has now been shown to have a significant impact on the overall achievable infiltration reductions. Therefore, when pairing air sealing and insulation work together in these buildings, the overall impact is greater than what one would see by doing only one or the other.

14. The EnergyFit NYC Pilot was generously funded by the New York City Council and as such, all funding had to be deployed within the fiscal year.

From the Homeowners

Homeowner Feedback

Pratt Center conducted follow-up interviews with each of the 32 homeowners that received a retrofit. Sixty-nine percent of homeowners reported in post-retrofit interviews that they or their tenants immediately noticed differences in their comfort level in their home. These included mentions of the building's temperature level feeling more comfortable without the need for interventions such as AC or heating, a reduction in draftiness and even at times smells from neighboring buildings no longer bothering them.

“We noticed how much less frequently we used our AC this summer than last.”

“The Pilot has made me start thinking about other ways I can green my life. It's easy to talk about energy efficiency but it is hard to know how it will really impact you until you do a project like this.”

“There was a big drop in my energy usage this summer, despite it being hotter than last summer.”

“I didn't realize how much cold air was coming in from the attic space. I had replaced my windows thinking that would do the trick but it didn't. This project really helped and my tenants are not complaining anymore!”

“I learned so much about my home. I had no idea there was even an attic space that could be insulated.”

Figures 4 - 7

FIGURE 4
Just under half of retrofit recipients reported annual incomes of below \$80K

HOMEOWNER INCOME*	ASSESSMENTS	RETROFITS
\$0-\$20,000 (\$20 fee)	6	1
\$20,001-\$40,000 (\$40 fee)	7	3
\$40,001-\$55,000 (\$75 fee)	7	3
\$55,001-\$65,000 (\$150 fee)	5	3
\$65,001-\$80,000 (\$200 fee)	5	2
\$80,001+ (\$250 fee)	49	19
Prefer not to say (\$250 fee)	10	1
TOTAL	89	32

*Income was self-reported during the intake stage and was not calibrated with the number of household occupants as is typically done to calculate LMI households.

FIGURE 5
Installed measures by prevalence

MEASURES	NO. OF HOMES
Exterior door weatherstripping***	32
Insulate attic hatch	32
Insulate attic	30
Attic (Cockloft) air sealing*	30
Seal attic hatch	30
Skylight sealing*	30
Seal general penetrations to attic cavity*	29
Seal small openings between basement & conditioned space**	18
Weather-stripping basement door**	18
Seal baseboard trim/molding of 1st floor**	18
Seal any other observed leakage pathways***	11
Seal around basement windows**	10
Seal pipe & wire penetrations (top floor)*	7
Seal visible rim joist**	6
Seal recessed light fixtures (top floor)*	5
Seal exterior basement doors/coal chutes**	5
Seal pipe penetrations from 1st floor to basement**	4
Fireplace sealing*	3
Wall sealing (top floor)*	3
Seal pipe & wire penetrations (middle floors)***	3
Install skylight plexiglass*	2
Seal chimney flues and vents**	1
Wall air sealing (middle floors)***	1

*Measures with an asterisk indicate that it was part of the three-tiered air sealing approach, with the number of asterisks representing the specific tier.

FIGURE 6

Blower door test results

HOME-OWNER	BLOWER DOOR TEST IN (CFM 50)	BLOWER DOOR TEST OUT (CFM 50)	CFM 50 REDUCTION	% CHANGE IN AIR INFILTRATION
1	4,467	4,094	373	-8.4%
2	6,080	5,166	914	-15.0%
3	4,344	3,643	701	-16.1%
4	4,824	4,039	785	-16.3%
5	10,546	8,686	1,860	-17.6%
6	6,478	5,057	1,421	-21.9%
7	7,015	5,460	1,555	-22.2%
8	5,975	4,646	1,329	-22.2%
9	3,303	2,560	743	-22.5%
10	6,688	5,144	1,544	-23.1%
11	6,903	5,287	1,616	-23.4%
12	9,058	6,865	2,193	-24.2%
13	7,070	5,320	1,750	-24.8%
14	9,430	7,039	2,391	-25.4%
15	7,876	5,789	2,087	-26.5%
16	5,426	3,986	1,440	-26.5%
17	9,998	7,202	2,796	-28.0%
18	7,338	5,277	2,061	-28.1%
19	7,170	5,150	2,020	-28.2%
20	8,025	5,760	2,265	-28.2%
21	10,089	7,230	2,859	-28.3%
22	8,404	5,992	2,412	-28.7%
23	3,580	2,464	1,116	-31.2%
24	15,547	10,577	4,970	-32.0%
25	9,561	6,502	3,059	-32.0%
26	8,915	5,783	3,132	-35.1%
27	8,222	5,212	3,010	-36.6%
28	12,170	6,144	6,026	-49.5%
29	7,818	3,907	3,911	-50.0%
30	12,904	6,201	6,703	-51.9%
31	13,277	6,178	7,099	-53.5%
32	12,062	4,805	7,257	-60.2%

FIGURE 7

Blower Door Test Results by Building Volume

BUILDING VOLUME (CUBIC FEET)	RETROFITS	AVERAGE CFM 50 REDUCTION	AVERAGE CFM 50 % REDUCTION
10,000-15,000	1	1,116.00	31%
15,000-20,000	5	1,495.60	24%
20,000-25,000	18	2,579.50	29%
25,000-30,000	3	3,481.33	34%
30,000-35,000	4	3,767.50	32%
35,000-40,000	1	2,859.00	28%
TOTAL	32	2,606.19	29%



The Pratt Center for Community Development has worked for over fifty years for a more just, equitable, and sustainable city for all New Yorkers by empowering communities to plan for and realize their futures. As part of Pratt Institute, we leverage professional skills—especially planning, policy analysis, and advocacy—to support community-based organizations in their efforts to improve neighborhood quality of life, attack the causes of poverty and inequality, and advance sustainable development.

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