Unlocking Equitable Energy Transition with Inclusive Utility Investments: Implementation in Massachusetts

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Abstract

One of the more daunting aspects of the building energy transition is that it relies on millions of individual property owners to make elective investments in their dwellings. Utilities, program administrators, climate advocates, and other stakeholders have limited control over how fast and far these decision makers go with decarbonization. But what if utilities could help accelerate these investments by giving their customers an offer that's too good to turn down?

Enter Inclusive Utility Investment (IUI) programs, where utilities invest in energy efficiency, electrification, and renewable energy improvements to a home, and recover their cost through a tariff tied to the meter. For occupants, this means no or limited upfront costs, no debt, no credit check—and a monthly payment that is guaranteed to be less than or equal to their historic energy costs. Best of all, if the occupant moves, the tariff transfers to the next occupant until the cost-saving investment is paid off.

This paper presents the Year 1 results of ReSource ReInvest, Massachusetts' first IUI program, and one of the first IUI programs explicitly designed to accelerate fuel switching and electrification. ReSource ReInvest is sponsored by the Ipswich Electric Light Department and administered by the Center for EcoTechnology (CET). The paper concludes with next steps for expanding the offering to other utilities across the state and realizing the potential for IUI to accelerate an equitable energy transition that ensures participation and benefits to all, including renters and low-income homeowners.

Introduction

According to the IPCC's Sixth Assessment Report published in March 2023, limiting warming to 1.5°C involves rapid, deep, and immediate greenhouse gas emissions reductions in all sectors *this decade*. The report further states that every increment of global warming will increase concurrent hazards, which include human mortality, diseases, mental health challenges, flooding, biodiversity loss, and decreased food production among others (IPCC 2023).

One of the most daunting challenges of the work ahead (and there are many!) is that success meeting U.S. federal targets depends on our country's 120 million households making the voluntary decision to adopt low-carbon solutions—as soon as possible. In Massachusetts, where the state has adopted the goals of achieving carbon neutrality by 2050 and 50% emission reductions by 2030, meeting the near-term 2030 target demands electrification of heating systems in 1 million households—over one-third of the Commonwealth's households—between now and then (MA EOEEA 2020). That's over 400 installations per day, every day, until 2030.

While utilities can't make the decision for their customers, we contend that Inclusive Utility Investments (IUI) can do the next best thing: make the decision to adopt low-carbon solutions too good to turn down. In other words, IUI can transform the pace of adoption, catalyzing the steep S-curve trajectory required to meet state and federal goals.

How can IUI have such a transformative impact? Imagine your utility told you they wanted to *invest in* state-of-the-art technology for your home. No taking on debt, no credit

checks, no matter if you're a renter, and no matter if you plan to move soon. Your obligation? Paying a monthly tariff that sums to no more than the savings in energy costs afforded by the new measures. The tariff, tied to your electric meter, would extend for as long as it takes for the utility to recover its investment, and if you move, would simply transfer to the next occupant. This is Inclusive Utility Investments (IUI – or sometimes referred to as tariff on-bill financing/TOB).

Unlike traditional on-bill financing, where a utility *makes a loan* to a property owner, thus requiring adequate credit history, willingness to take on debt, etc., IUI decouples capital improvements from the individual resident or business. It is a financing mechanism that enables upgrading properties with measures that reduce operating costs and improve the comfort, health, and environmental footprint of the building. Importantly, if the cost of the improvements cannot be comfortably recovered from the energy cost savings that the measure affords, the occupant would pay that balance as an upfront cost. As further discussed below, upfront cost could be paid out of pocket, through traditional debt financing, or by accessing additional utility support. For consumer protection purposes, the financed portion of an IUI offer must result in cost savings, so increasing the amount or tenure of the tariff would not be an option for mitigating upfront cost.

Following a comprehensive feasibility study, Ipswich Electric Light Department (IELD) and CET ran a pilot-scale IUI program in 2023 as a precursor to launching a program open to all customers in 2024. CET documented the program development process in the form of an IUI Municipal Utility Toolkit. Those steps, key outcomes from the Ipswich pilot "ReSource ReInvest", and next steps for expanding IUI in Massachusetts are detailed herein.

Building on the Lessons and Successes of Others

Today, utilities that pilot and launch IUI programs have a growing number of peers and support networks to turn to for lessons and advice. As of 2022, Energy Star documented 19 programs in 12 states (Energy Star 2024), all of which have emerged since the Energy Efficiency Institute introduced the concept in 1999 under their trademarked, Pay As You Save® (PAYS®) program (Cillo and Lachman 1999). Today's programs span electric cooperatives, municipal light plants (MLPs), and investor-owned utilities. Our team used two key hubs for information. One was an EPA website, Inclusive Utility Investments: Tariffed On-Bill Programs, which houses examples from the field, program characteristics, guidance for reaching underserved communities, and roles and responsibilities (EPA 2024). The other was the Inclusive Utility Investments Task Force, hosted by the Smart Electric Power Alliance and Clean Energy Works, with the objectives of raising awareness about the model, creating a forum for utilities and industry stakeholders, and creating resources to enhance knowledge and program development (SEPA 2024).

The inclusivity of this financing model was a key part of the appeal for Ipswich and is perhaps why it is gaining traction nationwide. Proponents of IUI often tout the design and protections that make it inherently accessible to and beneficial for low-income customers and renters as compared to traditional on-bill financing. Hummel and Hachman (2018) describe key differences in terms of program attributes and customer experience. In an IUI program, essential attributes are that there is no credit score check and no building ownership requirement for participants (although landlords do need to approve building upgrades). There are also several important ways the customer experience diverges from traditional on-bill financing, including

that savings must exceed cost recovery, and that payments stay with the building, meaning a participant's payments end when they move and transfer to the next occupant.

Strong program results also pave the way for the model's expanding uptake. Although the characteristics that make IUI inherently inclusive may also make it sound inherently risky from the point of view of a utility, the data demonstrate otherwise. Results reported through 2021 by 16 program operators show a 99.9% overall collection rate (Dunlap 2022). Some of these programs have been in existence since as early as 2002 and in sum have deployed well over $50 million and across 4.2 million participating buildings.

Equipped with lessons, results, and transferrable program materials from other IUI programs, the Ipswich team undertook a pilot program.

Going from Zero to Pilot to Scale: Methods

The program implementation team kept careful documentation of each step of their process—from the discovery phase of learning about IUI to running a pilot-scale program—with the aim of aiding transferability and easing adoption by future utilities. Key milestones in the lead up to launching a full-scale program were a feasibility study and a pilot.

The feasibility study comprised three components: 1) Quantifying the impact that IUI has on improving the affordability of efficiency and electrification measures given existing incentives and the utility territory's housing stock; 2) Gauging customer interest in IUI and likely uptake; and 3) Verifying the business case, investment cost, and estimated ROI for the utility. Quantifying the impact of IUI on measure affordability was done by first characterizing the town's housing stock according to three representative archetypes based on data from the building department (Muspratt and Blair 2022). For each housing type, CET modeled assumed capital costs and savings estimates for efficiency and electrification measures (weatherization, heat pumps, heat pump hot water heaters, induction stove, solar PV and batteries) compared to a building's baseline condition (i.e., uninsulated building, fossil gas or oil for heating and cooking, no solar). The conventional rules for IUI programs were employed, such that on an annual basis, the tariff was held at a maximum 80% of the estimated savings and the duration of the tariff was limited to a maximum 80% of the measure life (Energy Efficiency Institute, Inc. 2021). The utility's existing incentives were accounted for and model results indicated, on average for each housing type, the size of upfront cost, if any. Ipswich hired third-party firms, Great Blue Research and Clean Energy Works, to respectively, run a customer survey and conduct a business case analysis using a proprietary model.

Following positive results of the feasibility study, a pilot was designed to demonstrate the impact and viability of IUI for different customer segments and to test program processes, procedures, and tools prior to opening up to the utility's entire customer base. The pilot was designed with a capital investment ceiling of $100,000 and targeted serving 4-5 customers that represented different customer segments needing a combination of weatherization and heat pumps. In particular, the implementation team aimed to serve a multifamily property with one or more renters, a homeowner with oil (i.e., only eligible for IELD's incentives), a homeowner with natural gas (i.e., eligible for both IELD's and the investor-owned utility program's incentives), and a low-income customer. Because the program was not yet being advertised, customers meeting these criteria were identified from the pool of recent energy audit recipients. The utility

contacted short-listed candidates and if they were interested, CET followed up to begin the process. During the pilot, eligible measures included weatherization, heat pumps, and heat pump hot water heaters.

Results & Discussion

As part of developing a repeatable and scalable program for municipal utilities in Massachusetts, CET kept a process document for all steps in developing the program, from feasibility study to launching the pilot. The team converted the process document into an IUI Municipal Utility Toolkit, aimed at illuminating key tasks and providing a roadmap for utilities to launch IUI programs (CET 2024). Key program development tasks, description of work undertaken by or for IELD, and timelines are shown in Table 1.

Table 1. Key tasks for a utility launching an Inclusive Utility Investment program, sample approach, and timeline.

Program Development Task	Ipswich Electric Light Department Purpose and Approach	Timeline
Conduct feasibility study	IELD used the feasibility study to confirm customer interest, program impact on easing access to decarbonization solutions, and estimated costs and benefits for the utility. Results of the feasibility study were valuable for garnering stakeholder support.	Months 1-3
Secure stakeholder support	To move forward with an IUI program, IELD management secured support from their governing body, i.e., commissioners and advisory board. They also promoted the program among local influencers, including climate advocacy groups, and the local paper to help raise general awareness about what makes IUI unique and how it will deliver benefits to customers.	Months 1-3
Secure regulatory approval	In Massachusetts, municipal light departments are regulated at the city and town level and approval for an IUI program is granted by the utility's Board of Commissioners. However, MLPs are required to file their tariff for IUI with the MA Department of Public Utilities (DPU), which is the regulatory body for investor-own utilities. Instead of filing the unique tariff amount for each individual customer (as the amount is calculated for each home), IELD will make one filing documenting the formulaic approach they are taking toward calculating tariffs once the program is running at scale.	Months 1-6
Define program terms and conditions	Proponents of the founding IUI program trademarked, Pay-As-You-Save or (PAYS), have made program	Months 1-6

	documentation freely accessible, including terms and conditions. ELD used open-source terms and conditions developed by Energy Efficiency Institute, Inc. (EEI), and worked with their legal counsel to adapt them for the Ipswich context (EEI 2019).	
Secure capital	As a utility serving a population less than 20,000, IELD qualifies for the U.S. Department of Agriculture's Energy Efficiency and Conservation Loan Program, which offers zero interest loans to rural utilities. Ipswich went through the application process for the $5M loan threshold.	Months 1-12
Develop program operation plans	IELD and CET worked together to determine the division of roles and responsibilities between the organizations. As the program administrator, CET is responsible for day-to-day implementation, from conducting audits to developing IUI offers and tariff schedules, to quality assurance checks of installations, and IELD is responsible for approving projects, paying contractors, and adding tariffs to participants' utility bills.	Months 4-6
Program marketing & communications	IELD branded their IUI program ReSource ReInvest, an extension of ReSource Ipswich, which is the name of their existing decarbonization focused residential energy audit and incentives program.	Months 6-8
Run pilot	IELD and CET benefitted from testing and refining program tools, systems, and operating procedures prior to taking the offering to scale.	Months 6-12

Key learnings from the feasibility study

Each of the three components of the feasibility study yielded favorable results that fully supported advancement to a pilot program and ultimately, full-scale offering.

Lesson #1: Building Electrification is Expensive but IUI Helps Defray Upfront Cost. Results from the technical analysis showed that weatherization could be readily financed with no upfront cost to the customer and heating electrification would require a modest upfront cost by the customer to replace fossil fuel heating in an average home in Ipswich. While the ideal is to have no upfront cost, whole-home heat pump systems are costly to install, especially in cold climates. To limit upfront costs, maintaining and potentially increasing existing incentives is important for keeping the recoverable expense less than or equal to the savings achieved by the measure. Given the multiple value streams that a participating customer provides to the utility (quantified in Lesson #3 below), a utility may consider offering an incentive for customers to accept an IUI offer. The incentive could be tailored to cover or reduce the co-pay up to a certain amount. In the case of MA MLPs, it also helps that MLP electricity rates are on average 40-50%

lower than those of investor-owned utilities, and MLP customers converting to heat pumps from natural gas or oil save an average 13% and 40% in heating costs, respectively.

Lesson #2: Customers Overwhelmingly Want IUI as an Option. Results of the customer survey showed high customer interest in IUI, with 75.1% of respondents indicating that they would be interested in enrolling in IUI, another 5.8% neutral about enrolling, 7.1% needing more information, and only 12% of the sample stating that they were not interested. A total of 325 residential surveys were collected, yielding results with a 5.4% margin or error and 95% CI.

Lesson #3: IUI is a Smart Investment for Utilities. Results of the Clean Energy Works analysis quantified a 29% return on investment for the utility and an average value of nearly $10,000 per participating customer as a result of multiple value streams, including avoided demand costs and increased electricity sales. The costs and benefits that Clean Energy Works included in their analysis are shown in the Table 2.

Table 2. Costs and benefits included in the analysis Inclusive Utility Investment program return on investment for utilities.

Cost/Benefit	Benefit	Cost
Avoided wholesale energy costs		✓
Avoided wholesale demand costs	✓	
Inclusive Utility Investment utility investment		✓
Inclusive Utility Investment program service charges and new kWh charges	✓	
Utility rebates and incentives		✓
Program fees and administrative costs		✓
Deferred T&D investment	✓	

In their analysis, Clean Energy Works concluded that over the life of the upgrades installed for the first 3,600 participants in the first five years, Ipswich would benefit from increased sales of approximately $36 million NPV due to electrification and a marginal cost increase of $216,419 NPV due to efficiency. To realize these benefits, the utility would need to supply approximately $34.5 million NPV in capital for the investments, though this capital would be recovered over time through monthly Program Service Charges paid by program participants. When Ipswich launches their full-scale program, they will aim to validate this value proposition.

Key lessons from securing capital

Securing capital has proven to be the most time-consuming of all steps. In the case of Ipswich, the utility's bylaws required a favorable town vote before they could access a line of credit. This was not immediately known to the implementation team, and it meant the town's meeting and voting calendar would dictate the timeline for applying for the USDA's Energy Efficiency and Conservation Loan, setting the production-scale implementation timeline back approximately 9 months. Utilities can save time by researching and understanding governance around accessing credit at the very early stages of their IUI journey.

For small utilities that require external financing, it is crucial to identify a source of long-term, low-cost capital to operate the program. Low interest rates are critical to minimizing

upfront costs for participants (assuming the interest cost is passed on to the customer) and being able to realize the potential of IUI to unlock access for low-income and renter populations. As noted in Table 1, utilities with less than 20,000 customers are eligible for a loan from the USDA's Rural Energy Savings Program. In our experience, this takes over a year to access, including the pre-application and full application review period. Alternative options that we are exploring include program related investments (PRIs) from foundations and financing from green (climate) banks.

Key learnings from preparing and running the pilot

The pilot was a critical opportunity for testing tools, processes, and procedures in a lower pressure, lower volume context. Customers were told they were the first in a program still under development, helping set expectations for an imperfect process. The pilot helped demonstrate the potential of IUI to accelerate deployment of decarbonization measures. The program enabled electrification of heating systems in all participating homes, eliminated 83% of upfront costs for customers, and maintained 20% savings for customers after the tariff compared to historic energy costs, and provided IELD with the confidence to move forward with a full-scale program.

The total average gross project cost was $35,370 (Figure 1). The data show that the average upfront customer cost was $6,217, the average utility incentive was $6,112, and the average IUI financed cost was $23,041. Table 3 details the measures installed for each participant, the total installed cost, and estimated annual savings. In all three instances, the heat pump was the primary contributor to upfront cost (Table 3), because the cost could not be recovered within 80% of the measure life and within 80% of the estimated savings, the IUI financing ceiling described above in Methods. Projects yielded average estimated annual therm savings of 1,171 and an estimated average annual carbon savings of 7.8 tons or 141 tons over the lifetime of the measures.

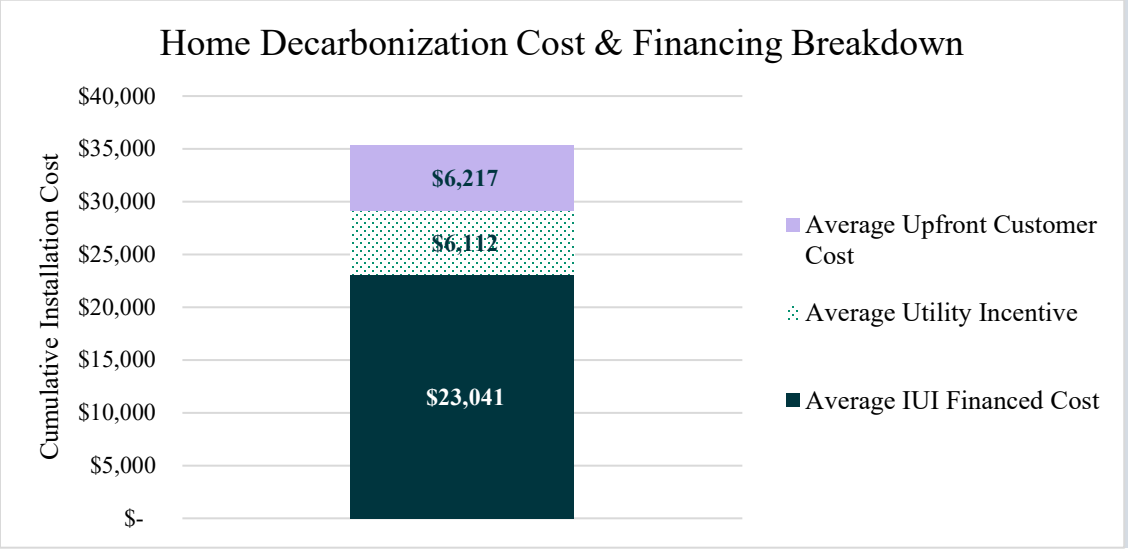

Figure 1. Home decarbonization cost and financing breakdown for the IUI pilot program in Ipswich, MA.

The following are key lessons learned from the pilot program.

Lesson #1: Some customer segments are easier to serve. Of six projects initiated during the pilot, three projects completed at the time of submittal (Table 3). Single family, oil heat customers, were relatively straightforward to serve, bolstered by collaboration between a single decision maker and single incentive/investment provider (IELD). The pilot team was challenged to move renter and natural gas customers past the early stages of the service, and as a result, two projects dropped out before installation could occur. As shown in Table 3, the annual estimated savings for the natural gas to heat pump conversions was less than half that for oil customers, hence the larger upfront cost of approximately $12,000 per unit. This was the key factor in the multi-family building dropping out. An added complication was that to access investor-owned utility incentives for their natural gas to heat pump conversion (i.e., through the Mass Save program in Massachusetts) the customer would have needed an additional audit from that program's provider, which they found too burdensome.

The takeaway from our participant attrition is that programs striving to serve historically under-represented customer segments will need to be strategic and intentional about reaching these customers and supporting them throughout the service delivery process. IELD was not prepared to offer additional incentives for accepting the IUI offer during the pilot, but it is something they are considering in light of this experience. The team has also developed relationships with the Mass Save provider and will be able to streamline participation in the dual programs for future customers who qualify for incentives from IELD and their investor-owned utility.

Table 3. Pilot customer characterization.

House Type	Customer Type	Measures Installed	Total Installed Cost	Estimated Annual Savings
Single family, oil heat; 1782 ft^2	First-time homebuyer	Weatherization Whole-home heat pump	$35,033 Heat pump: $24,000	$2,648
Single family, oil heat; 2,200 ft^2	Low-income customer	Weatherization Whole-home heat pump Heat pump water heater	$45,150 Heat pump: $32,821	$2,672
Single family, oil heat; 3,200 ft^2	Heating system end of life	Weatherization Partial-home heat pump	$25,925 Heat pump: $22,225	$2,342
Customers who received an assessment and IUI offer but did not move forward				
Duplex/Multifamily, natural gas; 960 ft^2 (Unit #1)	Renter	Weatherization Whole-home heat pump	$25,160	$958

		Heat pump water heater *None installed*		
Duplex/Multifamily, natural gas; 960 ft^2 (Unit #2)	Owner-occupant	Weatherization Whole-home heat pump Heat pump water heater *None installed*	$25,133	$958
Single Family, mixed heat; 1,694 ft^2	Heating system end of life	Weatherization Rejected: no heat pump opportunity	$6,538	$998

Lesson #2: Measure installation timelines vary widely. Projects took an average of 6 months to complete (Table 4). The longest activity was in measure installation and invoicing (2-3 months) where contractor installation timelines are impacted by fluctuating demand, heating seasonality, and scheduling constraints. Customer and contractor coordination also contributed to timeline delays. Moving forward, the team anticipates efficiency increases by establishing a pool of preferred contractors trained in the program and prepared to collaborate with the customers, CET, and the utility.

Table 4. Project implementation workflow and timeline during the IUI pilot.

Service	Description	Timeline
Customer intake, audit, and issue Preliminary Offer	Perform audit and model results, generate the IUI Preliminary offer for review and submittal to the utility and customer.	1-2 months
Contractor quotes and issue Final Offer	Perform customer follow up, review contractor quotes, and remodel the project with actual costs, generate and submit the IUI Final Offer for utility and customer approvals.	1-2 months
Measure installation and invoicing	Install measures, verification, and submit invoices.	2-3 months

Lesson #3: Disaggregating tariffs by measure lends transparency and accommodates differences in installation timelines. Initial versions of CET's IUI model generated an aggregate tariff that reduced over time as individual measures were repaid. The implementation team learned that when installing multiple measures, showing each measure, the applicable tariff, and term, on the offer and on the bill is preferred by customers and the utility.

Additionally, this disaggregation allows the utility to add tariffs as measures are installed. This improves the timeline for cost recovery, and better accommodates measures installed on varying timelines.

Conclusions & Next Steps

IELD plans to launch their full-scale program in the Spring 2024, as soon as they secure capital. Meanwhile, CET is working with the next cohort of Massachusetts municipal utilities that are seeking to offer IUI. CET will be embarking on feasibility studies and program development with three to five utilities in 2024. As programs take off, CET and partner utilities aim to introduce additional decarbonization measures, in particular solar PV and batteries. Effectively reaching renters remains a major priority, since IUI makes it uniquely feasible to serve this customer segment. CET and their partners are continuing to experiment with different marketing and outreach schemes to serve these customers.

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