Utility investment vs. consumer loans:

Getting to yes on energy efficiency through inclusive financing for all

Holmes Hummel, PhD, Clean Energy Works

*Max Toth, Clean Energy Works**

**Corresponding author: Max.Toth@CleanEnergyWorks.org*

ABSTRACT

Since 2001, eighteen utilities in eight states have received approval from their utility regulators or oversight boards to offer tariffed on-bill programs for energy efficiency upgrades. Tariffed on-bill programs facilitate site-specific investment with site-specific cost recovery, and they are accessible to all residential customers, regardless of credit score, income, or renter status of the customer. Although most of these utilities serve relatively small service areas in rural regions, they have deployed more than $40 million for thousands of cost effective energy efficiency upgrades with a cost recovery rate averaging above 99.9%, even in persistent poverty areas. This utility business model has produced key performance indicators that diverge from loan-based on-bill financing programs. Factors such as doubling the eligible population, higher offer acceptance rates, and deeper savings have a compounding effect resulting in much higher growth in investment compared to programs that depend on unsecured consumer credit products. These results produce a striking picture of consumer choice when customers are faced with options between taking out a loan and accepting an offer of utility investment, which does not entail a means test for participation and assignment of a personal debt obligation. Because tariffed on-bill programs have succeeded in multiple areas of persistent poverty, the high velocity of investment observed would contradict the notion that certain customer segments are "hard to reach" or "difficult to serve." Instead, tariffed on-bill programs are generating data that show the customer response is robustly positive when utilities are able to make investments and provide a pathway to ownership for customers based on the cost effectiveness of efficiency upgrades rather than the credit of individual consumers.

Introduction

The American Recovery and Reinvestment Act ("Recovery Act") of 2009 supported a historic level of spending on energy efficiency and renewable energy through the Department of Energy more than $30 billion in federal funding was deployed to battle the recession started in 2008.[1] Through the low-income Weatherization Assistance Program, more than $6 billion was spent on approximately 1 million energy efficiency upgrades to existing buildings. Because low-income households have proven to be difficult to reach with traditional financing programs, the surge in federal funding was game-changing, but it was also short-lived.

[1] Department of Energy. Retrieved: Nov. 1, 2019, from: http://www.energy.gov/recovery-act

As the expiration date for spending the time-limited Recovery Act funding approached, the Department of Energy worked actively with many state and local agencies to seek financing solutions that could sustain the pace of investment and continue to support the jobs created by the funding programs. This search for financing solutions also surfaced a set of persistent structural barriers embedded in debt-based financing approaches for overcoming first-cost barriers to energy efficiency upgrades and other clean energy solutions.

"How will we create jobs and promote both energy efficiency and renewable energy long after American Recovery and Reinvestment Act money is gone?"[2] This question, posed by Claire Broido Johnson, Energy Efficiency Advisor to the Office of the Secretary in the U.S. Department of Energy, motivated the search for financing solutions that could open the clean energy economy to all. In the search, one key DOE report[3] attracted attention to Midwest Energy, a utility in Kansas, that has successfully offered a tariffed on-bill program free of the limitations of loan underwriting criteria.

Today, 18 utilities in eight states have already produced results from inclusive financing using tariffed on-bill programs. Despite serving relatively small service areas in rural regions, these utilities have deployed more than $40 million for five thousand cost effective energy efficiency upgrades for customers, regardless of their income, credit score, or renter status. Rather than making loans, a utility makes a site-specific investment through a service agreement defined in a tariff and recovers its costs through a fixed charge on the utility bill that is significantly less than the estimated savings from the upgrades at that location. This utility business model has produced results that diverge from debt-based on-bill financing programs in ways that have compounding effects, including doubling the eligible population, high offer acceptance rates, and deeper savings.

This review paper surveys literature and examines recent program performance data to explore the behavioral impact of clearing pervasive and persistent structural barriers to energy efficiency upgrades for existing buildings, particularly those occupied by low- and moderate-income (LMI) households. Tariffed on-bill programs produce a striking picture of consumer choice when faced with options between taking out a loan and accepting an offer of investment with no means test for participation and no debt obligation.

Persistent Barriers

Solving the problem of scale for energy efficiency upgrades requires solving barriers to participation and economic inclusion.

When LMI households are offered utility programs for energy efficiency, they often face persistent barriers that are structural. High upfront costs are out of reach for LMI families who lack access to capital or credit. The Federal Reserve Board reports that 40% of adults in the U.S. do not have the

[2] US Department of Energy EERE. (Producer). (2009). *Innovative Energy Efficiency Financing Approaches.* [Powerpoint from video webinar]. Retrieved from https://www1.eere.energy.gov/wip/solutioncenter/pdfs/EECBG_Innovative_EE_Financing_Approaches_Webcast_060109.pdf

[3] State and Local Energy Efficiency Action Network. (2014). *Financing Energy Improvements on Utility Bills: Market Updates and Key Program Design Considerations for Policymakers and Administrators*. Prepared by: Mark Zimring, Greg Leventis, Merrian Borgeson, Peter Thompson, Ian Hoffman and Charles Goldman of Lawrence Berkeley National Laboratory.

means to pay for an emergency expenditure of $400.[4] Most low-income households are renters, and renters and landlords face split incentives regarding the benefits and costs of upgrades. Renters and those with little access to credit or capital account for two-thirds of the population in the U.S. – Renters account for 36% of US residents[5], and 51% of US residents have insufficient credit scores to be considered for consumer debt-based financial products.[6]

A separate 2014 report exploring models of on-bill energy efficiency programs found that:

> "A variety of barriers lead consumers to under-invest in energy efficiency, including the fact that some energy efficiency investments have "high first costs" compared to conventional measures (IEA 2008; Jaffe and Stavins 1994). While these up-front costs are often recouped over the lifetime of the efficiency measures through energy savings, some consumers lack the financial means or the willingness to use their existing resources to make the initial purchase of high-efficiency measures. On-bill programs are one of several forms of program-supported financing that have been deployed across the country to help consumers pay for energy-related improvements.[7]"

New York State Energy Research and Development Authority (NYSERDA) reported that roughly 48% of the potential remaining savings for energy efficiency in the state are in single or multi-family homes, and yet persistent barriers remain, even in a state with advanced and substantial energy efficiency programs[8]:

> "…barriers to adoption such as capital constraints for homeowners and affordable building owners, missed opportunities,[44] and unclear value propositions to third-party capital providers and building owners serve as primary impediments to scale energy efficiency in this important market segment. Over the last 12 years, the primary energy efficiency and weatherization programs targeted at the LMI[45] market segment have reached only 12% of eligible households across building types and ownership status.[46] Additional strategies and interventions are therefore necessary to increase access to energy efficiency and its multiple co-benefits for LMI residents across the State."

NYSERDA's study cited a common barrier of "lack of capital/financing to cover up-front costs, even if energy efficiency investments are attractive, as owners have multiple, more familiar uses for their capital budgets/financing proceeds" faced by both homeowners and renters. Renters and building owners additionally face split incentives in buildings where tenants pay for their energy use as

---

[4] United States. Federal Reserve Board. (2018, May). *Report on the Economic Well-Being of U.S. Households in 2017; May, 2018 report.* Retrieved from: https://www.federalreserve.gov/publications/files/2017-report-economic-well-being-us-households-201805.pdf

[5] U.S. Census Bureau, *2013-2017 American Community Survey 5-Year Estimates.* Retrieved from: https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_17_5YR_DP04&src=pt

[6] Sullivan, B. (2018, January 11). *Experian State of Credit*. Retrieved from: https://www.experian.com/blogs/ask-experian/state-of-credit/

[7] State and Local Energy Efficiency Action Network. (2014). *Financing Energy Improvements on Utility Bills: Market Updates and Key Program Design Considerations for Policymakers and Administrators.* Prepared by: Mark Zimring, Greg Leventis, Merrian Borgeson, Peter Thompson, Ian Hoffman and Charles Goldman of Lawrence Berkeley National Laboratory.

[8] New Efficiency: New York. (2018, April). Retrieved October 20, 2019, from: https://www.nyserda.ny.gov/About/Publications/New-Efficiency

building owners/managers cannot count on pay-off from energy efficiency investments as well as challenges due to investment time horizon.

LMI households typically live in less energy efficient buildings with less efficient appliances, and therefore, those buildings represent one of the best opportunities for efficiency gains when these barriers are removed. However, the limited choices LMI households face when considering energy efficiency programs drastically inhibit the scale of investment required to address pervasive and persistent concerns about both equity and environmental pollution, including carbon emissions.

When the passage of California Senate Bill 350 required the California Energy Commission to study barriers to participation in the clean energy economy, the agency reported barriers that include low homeownership rates and the challenge of split incentives, building stock age requiring health & safety remediation prior to efficiency measure installation, lack of capital and credit, complex building ownership and systems in the case of multifamily housing, and challenges specific to remote and underserved communities.

Options are even more limited for those who either do not meet the income eligibility requirements of the Weatherization Assistance Program (WAP) or who would not choose to participate. Eligibility for the program requires annual income to be less than 200% of the federal poverty level, which implies that the household must undergo a test of its means, also called a means test. It is well-established that means-tested programs are undersubscribed:

> Depending on the program, between one and two-thirds of eligible Americans forego participation in means-tested government programs for which they are eligible (Blank & Ruggles, 1996; Moffitt, 1987)[9].

WAP does provide relief to hundreds of thousands of people annually, reducing energy burden for low-income eligible members fortunate enough to receive upgrades. From 1977 to present, WAP operators have upgraded millions of homes. Nonetheless, 38.6 million[10] homes were eligible for WAP upgrades in 2015. Despite the Recovery Act's expansion of the number of homes upgraded -- from 95,678 per year in 2008 to 340,156 homes per year in 2010 -- it would take more than 110 years to upgrade the majority of these buildings.

Does Clearing Barriers Drive Demand?

Low rates of participation in debt-based financing among LMI customers is unsurprising given the effects of the barriers referenced above. Because tariffed on-bill programs are designed to resolve these barriers, it should be possible to observe the effects of those differences by examining the rate at which prospective participants accept an offer to capitalize cost effective energy efficiency upgrades. That interest frames the line of inquiry in this paper.

---

[9] Stuber, J., & Schlesinger, M. (2006). *Sources of stigma for means-tested government programs*. Social Science & Medicine, 63 (2006), pp. 933–945,

[10] Oak Ridge National Laboratory. 2015, July. *Weatherization Works II – Summary of Findings From the ARRA Period Evaluation of the U.S. Department of Energy's Weatherization Assistance Program.* Prepared by: Bruce Tonn, David Carroll, Erin Rose, Beth Hawkins, Scott Pigg, Daniel Bausch, Greg Dalhoff, Michael Blasnik, Joel Eisenberg, Claire Cowan, Brian Conlon

Energy Efficiency Institute, Inc. developed a tariffed on-bill program design called Pay As You Save (PAYS), with the intention to address all of these barriers. EEI has also helped add consumer protections to address risk while restructuring "the energy efficiency market and releas[ing] the pent-up demand of American consumers for energy efficiency in their homes and businesses."[11]

The 2014 DOE study examining on-bill programs, the majority of which are debt-based programs, found that the "... market penetration rates for on-bill programs tend to be low. Ten of 17 residential on-bill programs report market penetration rates of less than 1 percent over their program lifetime while two long-running programs (12-13 years in the field) served 12-15% of their target market."

Almost all the tariffed on-bill programs have used the PAYS system. PAYS programs have produced results that diverge from debt-based on-bill financing programs in ways that have compounding effects, including doubling the eligible population, higher offer acceptance rates, and deeper savings.

Performance data from inclusive financing programs based on PAYS produces a striking picture of consumer choice when faced with options between taking out a loan and accepting an offer of investment, which includes no means test for participation and no debt obligation. Additional benefits from high offer acceptance include the reduction of marketing costs and operations costs due to a lower number of customer contacts required from assessment through offer acceptance.

Data from tariffed on-bill programs shows that customer response is robustly positive when utilities are able to make investments and provide a pathway to ownership for customers based on the cost effectiveness of efficiency upgrades rather than relying on the pocketbooks or credit rating of consumers.

Customer eligibility under a PAYS® model

PAYS has no eligibility requirements other than being a customer of a utility offering the program. Some utilities define eligibility requirements by referring to bill payment history (e.g., no more than two disconnections for nonpayment in 12 months). Eligibility is constrained by placing requirements on the location (e.g., no structural repairs needed). The market will also constrain eligibility because not all locations will have sufficiently cost effective energy efficiency upgrades to provide sufficient savings to qualify a project.

Participants in programs based on the PAYS system see an immediate decrease in their utility bills and a reduction in their overall energy burden – even with the additional on-bill charges - because the system requires that estimated annual savings significantly exceed estimated annual charges. Net savings provide enough financial benefits to encourage participation and offer a sufficient margin for error in savings estimates.

[11] Cillo, P. A. and H. Lachman. 1999. Pay-As-You-Save Energy Efficiency Products: Restructuring Energy Efficiency. National Association of Regulatory Utility Commissioners Committee on Energy Resources & the Environment. www.eeivt.com/EEI_Pays_1st_paper.pdf

The calculation of cost effectiveness for an energy efficiency upgrade in a PAYS programs includes the requirement for net savings. For example, the tariffed charge for cost recovery is capped at a fraction (e.g. 80%) of the estimated savings and the total period for the cost recovery is capped at a fraction of the useful life of the upgrade (e.g. 80%). Use of this "80% rule" results in tariffed charges for cost recovery that are 64% (i.e. 80% x 80%) of the total estimated savings from the upgrade. The estimated savings figures are calculated based on an on-site assessment, actual upgrade costs, and current rates, without assuming rate increases.

Changing offers from loans to PAYS: Customer response at Ouachita Electric

Ouachita Electric Cooperative, a rural electric cooperative in Camden, Arkansas, had faced the challenge of offering energy efficiency upgrades in a service area where member-owners faced high energy burdens and other economic challenges. Ouachita Electric's service area had a median household income of approximately $28,800 and 33% unemployment among 16–64 year olds in 2015, exceeding the national unemployment average of 25.1% for the same demographic. In the lowest income bracket, households were paying more than $2,000 per year for electricity, an energy burden of 25-30% for either homeowners or renters.[12]

To meet customers' needs for energy efficiency upgrades, Ouachita Electric first established an on-bill loan program called Home Energy Loan Program (HELP). While the HELP program featured a number of best practice design attributes for on-bill loan programs, it still was not able to reach renters, multifamily dwellings or support investments that could achieve deep savings.

Ouachita Electric's program operator for HELP is a benefit corporation called EEtility, and EEtility learned of the PAYS approach through the DOE Better Buildings Summit in 2015. Within six months, the utility had filed its PAYS tariff with the utility commission, and in February 2016, the Arkansas Public Service Commission approved it unanimously.

Once Ouachita Electric offered a tariffed on-bill program for energy efficiency based on the PAYS system (HELP PAYS®), two things happened. First, the largest possible share of the addressable market of utility ratepayers (e.g., all locations in Ouachita's service territories) became eligible for upgrades. These upgrades were assessed on the basis of the cost-effectiveness of efficiency upgrades to generate savings, not on the ability of a given household or individual to take on debt. Also, structural barriers to participation were removed, such as the prerequisite of home ownership, income verification, and credit score acceptability. Second, the opt-in rates for participants who had been offered a tariffed program produced a response in the first few months that quadrupled pace of the investment size over the loan program's previous entire year.

At the Better Buildings Summit in 2016, EEtility presented a preliminary report[13] on the performance of HELP PAYS®, highlighting the differences with HELP. In 2015, the first full year of

[12] Lin, J. (2018). The Pay As You Save program in rural Arkansas: An opportunity for rural distribution cooperative profits. *The Electricity Journal*, 31, 33-39.

[13] Better Buildings Solutions Center (Producer). Agard, T. (2015) *Energy Efficiency Financing for Low Income Communities* [Powerpoint from video webinar]. Retreived from: https://www.google.com/url?q=https://betterbuildingssolutioncenter.energy.gov/sites/default/files/Energy_Efficiency_Financing_for_Low_Income_Communities_Finance%2520WED.pdf&sa=D&ust=1572376986424000&usg=AFQjCNFN7OO9kwVv8i45ufhGJV_FByn8JQ

HELP, 300 retrofits were completed ($225,000 invested overall[14]), of which approximately 80% were low-income homeowners. For HELP PAYS®, Ouachita reported more than $1 million in energy efficiency investments with little marketing beyond a newsletter bulletin. During those initial months, more than two-thirds of the HVAC upgrades in the program were for multi-family and single family renters, customers that had been virtually shut out of Ouachita Electric's HELP loan program.

An independent researcher subsequently published a case study on this field experience:

> "Comparing the best four months of the HELP loan program to the first four months of HELP PAYS®, double the number of customers sought assessments, and more than one-third were multi-family (compared to zero previously). Among customers that received assessments, HELP PAYS® realized 100% opt-in for multi-family rental units and more than 80% for single-family rentals. The size of capital improvements doubled from $3000 to $6000 for deeper energy savings of approximately 30% of the average customers heating and cooling bills. The investments quadrupled from $225,000 through HELP loans to $1 million for HELP PAYS® improvements."[15]

The DOE case study included interviews with member-owners on their experience with HELP PAYS®:

> "A part-time daycare worker in a church who lived in the community all her life and who made approximately $10,000 per year, or 30–50% of AMI, was paying $400-500 per month for electricity in her mobile home before participating in HELP PAYS®. After HELP PAYS®, she has not paid more than $250 per month for electricity, inclusive of program costs. Participation in HELP PAYS® has given relief to this consumer's budget so that she is not confronted with the choice of heating her home or eating each month. This customer had an issue with her initial HVAC installation, but it was resolved at no cost to her. At Ouachita, the first year of HVAC maintenance is also included with HELP PAYS®."[16]
>
> "A retired, median income teacher, and head of a household of three, owns her own home. She decided to participate in HELP PAYS® because her electrically heated home had monthly bills approaching $900. Typical energy bills in the winter ranged from $600-700/month, in part because her old HVAC did not have a heat pump. She used to keep her home at a lower temperature in the winter to decrease costs, but even before the upgrades, she did not continue this practice because the cold home exacerbated medical issues such as her arthritis. HELP PAYS® upgraded her HVAC, duct work, insulation for windows and doors, replaced light bulbs, and advised her to replace or not use the older, inefficient basement freezer. After these improvements, her usage in kWh halved from 4434kW h to 2201 kWh, lowering her bills to an average of $330 per month, inclusive of the upgrade repayment."[17]

---

[14] Ibid.

[15] Lin, J. (2018). The Pay As You Save program in rural Arkansas: An opportunity for rural distribution cooperative profits. The Electricity Journal, 31, 33–39.

[16] Ibid.

[17] Ibid.

Green Jobs Green New York: Loan participation rates

Green Jobs Green New York (GJGNY) offers one of the most transparent energy efficiency on-bill loan programs in the country, providing the most extensive datasets on program field performance. Additionally, GJ/GNY has focused on addressing barriers to inclusion, convening an LMI Working Group in 2014, reporting publicly on work to adopt recommendations put forth by the Working Group. During our research we did not find such high-resolution field performance data for On Bill Repayment (OBR) programs that outperformed the program offered by GJGNY, and therefore consider it an excellent example of OBR loan programs.

Despite nearly a decade of program development and more than $100 million in program expenditures, barriers persist in New York's GJGNY OBR program, much as elsewhere. The homeowner rate is 54% for the 7.3 million households[18], disqualifying almost half of the state's potential eligible households. Considering only households with 1 to 4 units[19], ~30% of the 3.3 million owner-occupied units are disqualified on due to renter status. The annual assessment rate, which is the total number of energy assessment conducted within the residential 1-4 unit housing stock, for GJGNY efficiency projects for fiscal year 2019 was ~0.7%, and a conversion rate derived from completed projects vs. assessments yields 35-40%. Not all participants opted for financing, but for those who did, the loan approval rate was 55-60%. On Bill Repayment loans numbered 623 during the report period. The average FICO score for loan participants was 742, reinforcing a view that few households with lower credit scores are taking on consumer debt for energy efficiency upgrades.

PAYS offer acceptance across the US

In the Ouachita Electric case, the observation of higher participation in the HELP PAYS® program than the HELP program is consistent with a view that LMI customers will choose to implement cost effective energy efficiency upgrades when the offers they receive are not subject to barriers that have often discouraged or disqualified LMI customers. That includes not making prospective participants prove their income, immigration, or homeownership status at all.

> "...PAYS is not a low-income or rental-specific program, it makes energy efficiency programs open and accessible to low-income customers."[20]

Program data from utilities with a tariffed on-bill program based on the PAYS system indicates that the majority of customers who receive a bona fide offer for upgrades capitalized by the utility will accept the terms, regardless of conditions of persistent poverty in the utility service area. Below is a table of program adoption rates from utility data provided to Energy Efficiency Institute Inc. from the date the program began through mid-June 2019, where available. See Appendix for full field program results tables by program.

---

[18] U.S. Census Bureau, *2013-2017 American Community Survey 5-Year Estimates.* Retrieved from: https://factfinder.census.gov/bkmk/table/1.0/en/DEC/10_DP/DPDP1/0400000US36

[19] NYSERDA, *Green Jobs - Green New York 2019 Annual Report*. (2019, October). Retrieved October 30, 2019, from: https://www.nyserda.ny.gov/-/media/Files/EDPPP/GJGNY/Annual-Report-GJGNY/2019-gjgny-annual-report.pdf

[20] Ibid.

Table 1. Offer acceptance rates for residential tariffed on-bill energy efficiency programs

Utility program	Persistent poverty counties in service area[21]	Offer acceptance rate
Midwest Energy How$mart	0	70%
Ouachita Electric Co-op HELP PAYS®	2	90%
Roanoke Electric Upgrade to $ave	3	70%
How$mart KY	27	78%
Appalachian Electric U-Save Advantage	0	86%

Conclusion

Although LMI households are frequently described in energy efficiency literature as hard to reach or difficult to serve, tariffed on-bill programs for energy efficiency upgrades have succeeded even in areas of persistent poverty, with unprecedented customer acceptance rates. Inclusive financing programs are generating data that show the customer response is robustly positive when utilities make offers for energy efficiency upgrades on terms that resolve barriers faced by LMI households considering loan-based financing programs. Based on program results to date, utilities that offer to make tariffed on-bill investments in cost effective energy efficiency can get to yes with their customers and unleash opportunity for large-scale development of energy efficiency resources.

[21] US Dept of Treasury, Community Development Financial Institutions Fund. (2017) Retrieved from: https://www.cdfifund.gov/Documents/PPC%20updated%20Oct.2017.xlsx cross-referenced with utilities service territories and descriptions of counties served from respective utility documents.

Appendix: Results from PAYS® programs across the United States

The data tables below were originally published within *What is inclusive financing for energy efficiency, and why are some of the largest states in the country calling for it now?*, which was presented at the ACEEE Summer Study, 2018.[22] The updated tables below provide the most recent data reported by utilities with active programs.

There are 18 programs based on PAYS that are or have been operating in eight states – Arkansas, California, Hawaii, Kansas, Kentucky, New Hampshire, North Carolina and Tennessee. Investor owned utilities (IOUs), rural electric co-ops, and municipal utilities have implemented PAYS programs in commercial buildings, single-family homes (SF), and multifamily housing (MF). The majority of programs have been implemented by cooperative and municipal utilities.

Four factors have contributed to accelerated investment through PAYS programs:

(1) larger addressable market due to fewer barriers to eligibility,
(2) higher adoption rates (i.e., the portion of customers who receive an assessment of cost effective energy upgrades that actually accept the utility's offer to pay for them on PAYS terms),
(3) a willingness of both utilities and customers to undertake larger projects that achieve deeper savings and
(4) the involvement of program operators experienced with implementing PAYS programs.

These four factors have a compounding effect. For example, a doubling in each of the first three factors compared to a debt-based financing program would result in eight times faster capital deployment. The adoption rate in 16 of the 17 programs for which utilities have reported that data is above 50%, which is very high compared to the prevailing rate for programs that market loans and related debt products. While the raw numbers of customers installing upgrades and the total dollars invested may appear to be small relative to some nationally recognized programs, the per capita numbers are high. For example, Ouachita Electric Cooperative's HELP PAYS® and Midwest Energy's How$mart® programs have provided comprehensive weatherization services to 4% of their residential customers.

Utilities that offer tariffed on-bill programs also keep track of how much of their portfolio has been deemed uncollectable, at which point it is charged-off from their accounts receivable. This is the same practice that a utility applies to their mainline business of electricity sales, and the charge-off rate for a utility is calculated annually as the total amount of charges billed to customers that were unpaid divided by the total amount of revenue that was expected from the bills sent to customers. In the tables below, however, the "uncollectable %" data is reported as a *cumulative* figure across the entire portfolio and all years. When converted to metric akin to average annual charge off rate,

[22] Hummel, PhD, Holmes, and Harlan Lachman. "What Is Inclusive Financing for Energy Efficiency, and Why Are Some of the Largest States in the Country Calling for It Now?" *ACEEE Summer Study*, 2018, pp. 8–12, Retrieves from: aceee.org/files/proceedings/2018/node_modules/pdfjs-dist-viewer-min/build/minified/web/viewer.html?file=../../../../../assets/attachments/0194_0286_000158.pdf#search=%22hummel%22

the data on uncollectable billed charges shows that the portfolio of PAYS investments have a lower risk profile than the utility's mainline business.

PAYS® programs offered by investor-owned utilities

Table 2 shows the results from the programs implemented by investor owned utilities (IOUs), three of which are subsidiaries of Hawaii Electric Company.

Table 2. Results from PAYS® programs implemented by IOUs

Program	**Solar Saver Pilot**			**Smart Start**
Utility	Hawaiian Electric	Hawai'i Electric Light	Maui Electric	Eversource
State	HI			NH
Number of customers	304,261	85,029	70,872	513,304
Inception (yr)	2007			2002
Active (Y/N)	N			Y
Source of capital	Ratepayer funded conservation budget			Ratepayer funded conservation budget & repayments
Program operator	Utility			Utility
Project type	Single Family (SF)			Municipal
Projects completed	484			274
Percent of customers	NA			NA
Investment total ($)	≅ $2,900,000			≅ $10,950,000
Adoption rate (%)	NR (not reported)			NR
Avg. project size ($)	≅5,990			NR
Cost recovery period (yr)	≅10			≅ 8
Uncollectables (%)	<0.1%			0.0%
Data reported through	12/31/2008 (ended)			10/2/2019

Source: Katherine Peters, Supervisor, Energy Efficiency and reporting updated numbers from Tom Fuller Eversource, email, October 2, 2019. Johnson Consulting Group 2009.

PAYS® programs offered by electric cooperatives

In 2002, New Hampshire Electric Cooperative (NHEC), the first co-op to implement a program based on the PAYS system, provided weatherization services to members who heated their homes with electricity and with energy sources other than electricity (e.g., propane). NHEC decided that customers who heated with electricity and wanted to participate in the PAYS pilot would be ineligible for NHEC's rebates funded by all customers through their electric bills. That effectively discouraged investment by customers who heated with electricity with none participating. Several propane-heated homes did weatherize their homes using PAYS. In 2007, Midwest Energy, the second cooperative to implement a program based on the PAYS system, targeted single-family, rental housing, and ground water heat source HVAC systems. Table 3 shows these two programs.

Table 3. Results from the first two PAYS programs implemented by electric cooperatives

Program	**PAYS Pilot**	**How$mart®**	
Utility	New Hampshire Electric Coop	Midwest Energy	
State	NH	KS	
Number of customers	≅84,000	≅ 50,000	
Inception (yr)	2002	2008	
Active (Y/N)	N	Y	
Source of capital	Conservation Budget & NRECA	Various	
Program operator	Utility	Utility	
Project type	SF, Commercial, Retail	Residential	
Projects completed	21 (excluding retail CFLs)	2,139 (≅15% are rental units)	
Percent of customers	NA	4.4%	
Investment total ($)	$157,000	≅ $16,437,006	Recovered from Tariff $12,257,670
Adoption rate (%)	NR	≅ 70%	
Avg. project size ($)	NR	$7,684	$5,730
Cost recovery period	5-10	10-15	25%
Uncollectables (%)	<0.1%	<0.1%	
Data reported	12/31/2004	6/30/2019	

through		

Source: GDS Associates, Inc. 2003. Brian Dreiling, Manager of Energy Services, Midwest Energy, email, July 24, 2019.

Roanoke Electric Cooperative, Ouachita Electric Cooperative Corporation, and electric cooperatives served by the Mountain Association for Community Economic Development (MACED) all serve counties that are recognized for persistent poverty. Ouachita initially focused on multifamily tenants who pay their own energy bills, and it reached 100% of these customers in the first 18 months of its program. Table 4a and 4b show the results from programs at Ouachita Electric, Roanoke Electric, and Appalachian Electric, all of which are electric cooperatives. Table 5 shows data for the PAYS program operated by MACED on behalf of six electric cooperatives.

Table 4a. Results from PAYS programs offered by two utilities with same program operator

Program	**HELP PAYS®**				**Upgrade to $ave**
Utility	Ouachita Electric				Roanoke Electric
State	AR				NC
Number of customers	6,920				14,262
Inception (yr)	2016				2015
Active (Y/N)	Y				Y
Source of capital	CFC				USDA EECLP
Program operator	EEtility				EEtility
Project type	Total	MF	SF	Comm.	Residential
Projects completed	283	81	197	5	638
Percent of customers	4%				4.5%
Investment total ($)	$2,031,095	$465,410	$913,918	$651,767	≅$3,303,000 Utility Fees $762,000 Copays $84,000
Adoption rate (%)	90%				75%
Avg. project size ($)		$5,746	$4,639	$130,353	$7,232
Cost recovery period		12	12	7	Varied (4-12)
Uncollectables (%)	NR				< .1%
Data reported through	6/30/2019				6/30/2019

Source: Tammy Agard, EEtility, July 25, 2019. Marshall Cherry, Roanoke Electric, email, July 25, 2019.

Table 4b. Results from PAYS programs offered by a th utilities with same program operator

Program	**U-Save Advantage**
Utility	Appalachian Electric Co-op
State	TN
Number of customers	40,233
Inception (yr)	2019
Active (Y/N)	Y
Source of capital	USDA RESP
Program operator	Eetility
Project type	Residential SF
Projects completed	30 under contract
Percent of customers	4.5%
Investment total ($)	≅$179380
Adoption rate (%)	86%
Avg. project size ($)	$8,153
Cost recovery period	12
Uncollectables (%)	NA
Data reported through	6/30/19

Source: Tammy Agard, EEtility, email July 25, 2019

Table 5. Results from PAYS programs in Kentucky operated by MACED

Program	**How$mart® KY**					
Utility	Big Sandy RECC	Grayson Electric Co-op	Fleming-Mason Energy	Jackson Energy Co-op	Farmers RECC	Licking Valley RECC
State	KY					
Number of customers	139,230					
Inception (yr)	2011					
Active (Y/N)	Y					
Source of capital	Various					
Program operator	MACED					
Project type	Residential, Commercial					
Projects completed	320					
Percent of customers	0.2%					
Investment total ($)	$4,129,630					
Adoption rate (%)	78%					
Avg. project size ($)	$7,743					
Cost recovery period	Varied					
Uncollectables (%)	2% during pilot; 0.4% post pilot					
Data reported through	6/30/2019					

Source: Chris Woolery, Residential Energy Coordinator, How$martKY Program Coordinator, MACED, email, 10/4/2019.

PAYS® programs offered by municipal water utilities

The Town of Windsor and the City of Hayward each operate municipal water utilities in California. They targeted water saving and energy improvements in multifamily buildings. Table 6 shows these programs as well as the East Bay Municipal Utility District WaterSmart Pilot.

Table 6. Results from PAYS® programs offered by municipal water utilities in California

Program	**Windsor Efficiency PAYS®**		**Green Hayward PAYS®**	**EBMUD WaterSmart Pilot**
Utility	Town of Windsor Water Utility		City of Hayward	East Bay Municipal Utility District
State	CA		CA	CA
Number of customers	7,846 SF	615 MF	13,439 MF	
Inception (yr)	2012		2015	
Active (Y/N)	Suspended		Suspended	
Source of capital	Utility Operations		Utility Operations	Utility Operations
Program operator	Sonoma County Energy Independence		Frontier Energy	Utility
Project type	SF	MF	MF	MF
Projects completed	242 SF	233 MF	162 MF	53 MF
Percent of customers	3% SF	38% MF	1.2%	<1%
Investment total ($)	$561,704		$173,115	$22,634
Adoption rate (%)	NR		23%	NR
Avg. project size ($)	$460 SF	$19,220 MF	$28,852	$7,545
Cost recovery period	10-15		3-10	3-5
Uncollectables (%)	<0.1%		NR	NR
Data reported through	SF 2014	MF 2016	3/9/18	11/2/17

Source: Chris Bradt, Quashaun Vallery, and Tatiana Gefter, pers. comm., March 9, 2018.