

An Integrated Approach to Low-Income Energy Affordability For a Restructured World

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ABSTRACT

In the context of retail electric competition, various mechanisms have been proposed to address threats to low-income energy affordability. Most proposals include the use of ratepayer for (a) low-income bill payment support (e.g., rate discounts) and/or (b) energy efficiency programs specifically designated for low-income customers. An integrated approach to both energy efficiency *and* low-income bill payment is being tested in New Jersey. The program specifically targets payment-troubled customers and those with the lowest incomes. It combines a three-part approach to energy affordability: (1) deep and comprehensive gas and electric efficiency measures; (2) extensive customer energy education, with the goals of both a) empowering participants with the skills and knowledge to gain control of their energy situation and b) securing “action commitment” that the customer carries out as a “partner” to save energy and lower their utility bills; and (3) an affordable payment plan which includes extended payment of arrearages, partial arrearage forgiveness, and a bill discount for those in the lowest income tier who maintain their partnership obligations. This paper describes the E-Team Partners program design, presents preliminary impact evaluation results for the first 7,000 participants, and discusses the attributes of this model in a restructured environment.

Introduction: The Problem of Low-Income Energy Affordability

Low-income households face three main problems in securing and maintaining energy services. First, many low-income households spend a disproportionately high percentage of their income paying residential energy bills. Second, many low-income households have inconsistent income and/or expenses that make it difficult for them to pay their energy bills consistently. Seasonal fluctuation of energy bills further exacerbates the affordability problem. Third, once behind in paying their bills, it is difficult for low-income households to find the resources to pay outstanding debts.

In order to have a meaningful impact on low-income households’ ability to meet their energy needs, a program must address these three problems. It must *lower the household’s energy burden* by reducing both the amount of energy the household consumes and the price they pay for energy services. It must *increase the predictability* of the energy bills to allow low-income households to better manage their limited resources. It must *incorporate a remediation mechanism* that allows low-income households to resolve both pre-program debts and debt incurred during program participation.

Low-Income Energy Affordability and Restructuring: Risks and Opportunities

The primary risk for low-income households in a restructured environment is the potential difficulty of securing and maintaining energy services. Low-income customers are unlikely to attract

much interest from competitive energy suppliers, due to their low total energy expenditures and their higher credit risk. Historically, regulation and ratepayer subsidies have helped energy suppliers recover losses due to nonpayment by low-income customers and suppliers have been able to serve the low-income market segment with little or no risk to profitability. If subsidies that have supported nonpayment are reduced through restructuring, energy suppliers may decide either to simply forfeit low-income market share or increase their efforts to reduce and manage non-payment risks. Programs that increase the predictability of the usage patterns and payment performance can substantially reduce credit and non-payment risks for both competitive energy suppliers and for regulated suppliers of last resort.

E-Team Partners Program Design

The E-Team Partners Program is an evolutionary culmination of many prior DSM and low-income program designs. It builds on the best prior program experience and combines a variety of program components appropriate for both the current regulated utility environment and a restructured future. While results of previous low-income energy efficiency and weatherization programs vary widely, it is well established that the better-designed and -implemented low-income DSM and weatherization programs have achieved substantial savings. Based in part on the attributes of those programs with the highest savings, the program design team identified the following features as the most important potential ingredients for deep and persistent savings:

- comprehensive treatment, addressing all end uses
- custom assessment (one size does not fit all)
- easy-to-use protocols for complex decision-making in the field
- availability of a wide range of retrofit measures, devices and materials
- use of state-of-the-art diagnostic equipment to guide retrofit treatment
- high levels of implementation staff skills
- success definitions and compensation/management structures which support quality and depth of treatment
- customer energy education and counseling.

A fundamental hypothesis in this program design is that energy affordability for the neediest low-income customers cannot be achieved by energy efficiency alone; some type of payment assistance is also required. However, many payment assistance programs have little or no connection to efficiency programs, and relatively few utility DSM programs have been designed to target payment-troubled customers or been closely tied to payment assistance plans. A key intent of the E-Team Partners approach is to determine whether a more integrated approach can better address both the energy affordability needs of low-income, payment-troubled customers and the utility collections and bad-debt write-off problems associated with these customers, all within the constraints of cost-effectiveness.

Target Population

The program was designed to serve a broad range of low-income customers, but is targeted to prioritized sub-groups where it is most *needed* and most *likely* to make a difference in energy affordability. While energy affordability is certainly an issue for all low-income households, on the order of 50% of them still manage to routinely pay their bills and maintain utility service. There is

another small group of low-income customers (estimated to be in the range of 10%) whose situation is so desperate that they are unlikely to be able to pay their bills, regardless of program intervention. In between these two groups is a segment of low-income households who *want* to pay their bills and maintain utility service, but for a variety of reasons do not have the financial resources to do so. For these households, estimated to be approximately 40% of low-income customers, participation in the E-Team Partners program has the potential to move them away from payment troubles and threats of discontinued service to some level of energy affordability. It is this group that the program seeks to recruit and serve as its highest priority.

Program Components

The program is based on a three-part strategy, combining (1) Comprehensive, In-depth DSM Measures, (2) Customer Energy Education and Counseling, and (3) an Affordable Payment Plan.

Comprehensive, In-depth DSM. In order to achieve maximum gas and electric savings with each participant, the range of energy efficiency measures, which can be delivered through the program, is extremely broad, bound only by societal cost-effectiveness, available technology, and the skill and knowledge of program contractors. Measures routinely installed include attic and side-wall insulation, blower-door-guided air sealing, a wide variety of screw-in lamp retrofits and lighting fixture replacements, programmable thermostats, duct sealing, hot water conservation measures, and refrigerator replacement. The program recognizes that the cost-effectiveness of most measures varies situationally and therefore makes use of “smart protocol” (Hamilton, et. al., 1994) look-up tables, decision trees and calculation templates to guide on-site screening and installation of retrofit measures. The program also uses extensive testing procedures to address a range of health and safety threats, including combustion appliance backdrafting and spillage, flue leaks, electrical safety and ventilation.

Customer Education and Counseling. A fundamental precept of the program design is that extensive customer energy education, counseling and involvement is critical to securing the savings of installed measures. The program works with participants to identify potential actions they would be willing to take to lower their bills, and then secures customer “action commitments” to implement these behavioral measures. Further, it provides utility bill and payment counseling to participants, as appropriate and where needed.

The “partnership” concept guides the approach to customer involvement. If customers want to participate in the program, and receive its considerable benefits, they have to agree to become “partners,” accepting certain responsibilities and doing their part by making and keeping action commitments. This is formalized in a written participation agreement and personal action plan, signed by each participant and a program representative.

Affordable Payment Plan. Recognizing that efficiency measures and participant actions are still insufficient to close the affordability gap for most target participants, the third component of the program design is an affordable payment plan. This plan addresses both bill arrearages and future bills, and is available only to E-Team participants who agree to, *and fulfill*, their partnership responsibilities. The payment component of the program is designed as follows:

- Customers not already on an equal monthly payment plan move to that arrangement.
- Future equal payment plan amounts are reduced by 10% to account for the minimum

anticipated savings from efficiency measures.

- The program both helps customers identify all energy assistance benefits for which they are eligible and further reduces the future payment plan amount based on any payments they expect to receive (e.g., fuel assistance).
- Current arrearages are spread over a 24-month payment period, with 50% arrearage forgiveness earned for participants who maintain participation and payments.
- Customers receiving welfare benefits, deemed to be in the greatest need and with the greatest bill-payment difficulty are offered a 25% reduction on net equal payments if they agree to a “Voluntary Restricted Payment” (VRP) whereby their net monthly payments are made directly from the State to the utility.

The payment plan was developed jointly by the utility DSM and collections units, reflecting both DSM objectives and the goal of addressing the high costs to the utility associated with credit, collections, connection/disconnection, and account write-offs.

Program Implementation Strategy

Program implementation began in late 1996, using a highly personalized on-site delivery process. Each participant receives two separate site visits from a two-person technician/educator crew. The first visit typically includes establishment of the partnership agreement, installation of screw-in lighting and thermostat measures, health & safety testing, affordable payment plan enrollment, a preliminary blower door test, identification of insulation retrofit opportunities, an initial consumer education session, refrigerator metering and collection of data to support off-site billing disaggregation.

The second standard site visit is scheduled after any subcontracted major measures (including attic/wall insulation and hard-wired lighting retrofits) have been completed. This second visit can last from half a day to as much as two full days. Crews concentrate on air sealing, further consumer education, and implementation of all remaining pre-defined or custom measures to secure maximum cost-effective savings. Health & safety test-in/test-out procedures are conducted before and after any work, including a backdraft test under worst-case depressurization conditions. A carbon monoxide detector is also routinely installed.

The program has been implemented to date by a competitively selected contractor who employs 28 two-person field crews, supported by supervisors, schedulers, administration, and payment plan counselors. In addition, low-income Weatherization Assistance Program agencies have been contracted to deliver E-Team Program services, integrated with their own program service delivery. Even with efforts to recruit implementation contractors and personnel with high-level skills, the complexity and sophistication of this program made extensive staff training essential, followed up by establishment of a system of “coach-mentors” for ongoing, in-the-field training.

Program participants come from both referral and recruitment. Referrals are generated by the utility collections process, the welfare system, community agencies, and utility customer service centers. Recruitment mechanisms include mail and telephone recruitment from lists of fuel assistance recipients and households on a senior “lifeline” rate, as well canvassing in targeted neighborhoods with a high probability of income eligibility.

Preliminary Results

Ongoing evaluation is an integral element of the E-Team Partners Program. Evaluation components include a market assessment, mail-in participant feedback questionnaires, recommendation memos from an “outside expert”, direct observation of service delivery, staff and administrator interviews, customer focus groups, participant interviews, “modeled” impact evaluation of services delivered (based on engineering and financial models), and “measured” impact evaluation of the program (based on actual billing and payment data). The results reported in this paper are limited to 1) program participation statistics, 2) engineering estimates of energy savings and 3) payment impact findings as of June 1998. Other impact and process evaluation activities are ongoing.

Program Participation Statistics

In this analysis, participation is characterized by enrollment date (i.e., the date of Site Visit #1 and completion date (i.e., the delivery date for the last service received by the customer). Because of the many steps involved in the program, the amount of time required to complete the program can be significant. Table 1 shows the number of customers enrolling in and completing the program by calendar quarter. The median time between program enrollment and program completion is 58 days. As can be seen from the table, this program has very ambitious participation goals. Enrollment moved rapidly to about 1,200 cases per quarter in 1997 expanding to about 1,600 cases per quarter in 1998. Completions took more time to reach targeted levels, in part affected by contracting procedures with insulation contractors and continued enhancements to the site visit protocols. Of the 1,907 that are categorized as not yet complete, a significant number have health and safety issues that must be resolved outside the program before treatment can continue.

Table 1. Program Enrollment by Quarter

Quarter	Enrollment	Completions
Q4/96	348	39
Q1/97	930	371
Q2/97	1,263	925
Q3/97	1,232	981
Q4/97	1,204	1,209
Q1/98	1,593	1,301
Q2/98 (partial)	574	411
Not yet complete	NA	1,907
TOTAL	7,144	7,144

In this analysis, customers are segmented by the types of treatments that they received. Under the program design, most participants would receive two site visits, and many would receive insulation treatments and refrigerator replacements. However, some customers choose to discontinue

participation or move. For others, participation is limited by unresolved health and safety issues. Table 2 shows the service delivery patterns for by program quarter.

Statistics for the customers who enrolled in Q3/97 and Q4/97 are probably the most informative with respect to the long term program percentages. Those customers enrolled after service delivery protocols had been completed and have been in the program long enough to have received all of the program components available to them. Of the 2,436 participants who enrolled in the program during this time period, about 27% were able to take advantage of all of the services offered, while 66% received at least insulation or air sealing work (Site Visit #2). About 15% of the participants are considered to be complete after Site Visit #1. The remaining 19% of the participants are eligible for follow-up visits, but are on hold for some reason. After more than six months waiting for additional treatments, it seems unlikely that very many of these participants will actually receive the additional services.

Table 2. Program Treatment Group by Enrollment Quarter

Quarter	Site Visit #1 Only	SV#1 & Insulation	SV#1 & SV#2	All Services	Not Complete	All Participants
Q4/96	42	27	139	133	7	348
Q1/97	176	52	416	251	35	930
Q2/97	264	90	507	274	128	1,263
Q3/97	198	112	375	342	205	1,232
Q4/97	177	84	376	311	256	1,204
Q1/98	257	12	156	118	850	1,593
Q2/98 (partial)	127	13	9	0	425	574
TOTAL	1,241	1,429	1,978	1,429	1,906	7,144

Refrigerator replacements are a significant new component of the program. Table 3 shows the number refrigerator replacement commitments. As of the date of the database download, only 330 of these commitments had been coded as complete.

Table 3. Refrigerator Replacement Commitments by Enrollment Quarter

Quarter	Commitments
Q4/96	18
Q1/97	65
Q2/97	157
Q3/97	327
Q4/97	272
Q1/98	288
Q2/98 (partial)	38
TOTAL	1,165

The low-income payment plan was not added to the program until March 1997. Table 4 shows payment plan participation by program enrollment quarter. The statistics for payment program enrollment are affected by a number of different factors, including the willingness of public assistance program staff to sign customers up for VRP arrangements and utility collection activities. Though public assistance households are a primary target of the program, the complex administrative procedure required to obtain a VRP arrangement has limited the number of VRP agreements. Non-welfare payment plans, however, have been made available to a significant number of customers. About 38% of customers enrolling in the second quarter of 1997 were enrolled in a payment plan, as were about 29% of the customers enrolling in the first quarter of 1998.

Table 4. Payment Plan Participation by Program Enrollment Quarter

Enrollment Quarter	Payment Plan	VRP	No Plan	Total
Q4/96	13	0	335	348
Q1/97	123	17	790	930
Q2/97	478	87	698	1,263
Q3/97	165	38	1,029	1,232
Q4/97	214	37	953	1,204
Q1/98	476	36	1,081	1,593
Q2/98	114	8	452	574
Total	1,583	223	5,338	7,144

Usage Impact Findings

The usage impact analysis addresses three issues. First, what is the overall estimate of energy savings for the program? Second, what are the components of savings? Third, what additional savings might be realized through program enhancements?

Impact evaluation results reported in this paper are engineering estimates of energy savings for the installed measures, identification of some areas of additional energy savings potential, and estimates of baseline unadjusted usage from billing analysis. Further usage impact analysis will be conducted in mid-1998 based on pre- and post-treatment billing analysis.

Engineering estimates for customers who have completed the program show that mean savings were **976 kWh** and **197 therms**. The range for savings was -1,468 to 9,914 kWh and -235 to 1,565 therms. Ignoring the top 10% and bottom 10% of savings, the range for savings was 166 to 2,154 kWh and 10 to 438 therms.

Tables 5, 6, and 7 furnish details that help us to better understand the sources of energy savings. Table 5 presents estimated savings by program completion quarter. Table 6 presents estimated savings by treatment group. Table 7 presents estimated savings by source of savings.

Table 5 shows the average savings for all participants who completed the program in a specific program quarter. As such, it represents the program potential for all households, not just those that were able to take advantage of the full range of program services. The table shows that the program savings potential has reached a plateau of about 225 therms and 1,116 kWh in the three most recent program quarters.

Table 5. Estimated Savings by Program Completion Quarter

Completion Quarter	Mean Gas Savings (Therms)	Mean Electric Savings (kWh)
Q4/96	34	274
Q1/97	105	619
Q2/97	150	775
Q3/97	197	900
Q4/97	226	1,106
Q1/98	229	1,135
Q2/98	218	1,107
TOTAL	197	976

When all available program services are delivered to customers, the savings potential increases significantly from the overall averages. Table 6 shows the estimated savings by treatment group. For customers receiving only Site Visit #1, the gas savings are very modest, while a significant part of the electric savings are realized. When customers receive insulation and Site Visit #2 (dominated by air sealing), they achieve gas savings that are estimated to be 80% higher than from any of the partial treatment groups.

Table 6. Mean Estimated Savings by Treatment Group

Treatment Group	Mean Gas Savings (Therms)	Mean Electric Savings (kWh)
Site Visit #1 Only	52	719
SV#1 and Insulation	190	930
SV#1 and SV#2	188	1039
All Services	339	1,130
TOTAL	197	976

There are a number of different sources of savings. Table 7 presents the components of savings in terms of specific measures. The categories for the sources of savings in Table 7 are based on the amount of participant commitment that was required to realize the savings. The first group, “pure hardware” savings, includes treatments such as insulation, which require very little participant involvement. The second group, “behavior-dependent measures,” includes treatments such as low-flow showerheads that require commitment by the participant to keep the measure in place. The third group, “behavioral measures,” includes actions such as using cold water for laundry that are primarily a result of participant behavior.

Table 7. Mean Estimated Savings by Source

Measure Category	Gas		Electric	
	% Performed	Savings (ccf.)	% Performed	Savings (kWh)
Insulation	30%	41	0.3%	5
Air Sealing	59%	76	1.2%	20
Refrigerator Replace	N/A	N/A	20%	244
Hot Water Tank Insulation	5%	1	0.1%	0
Total Pure Hardware Measures	72%	119	21%	270
Lighting	N/A	N/A	95%	655
Hot Water Flow Reduction and/or Tank Temperature Setback	85%	18	2.9%	9
Thermostat Setback	47%	46	0.4%	4
Total Behavior Dependent Measures	88%	64	95%	668
Behavioral Measures	39%	14	6%	38
TOTAL Savings	95%	197	96%	976

Table 7 shows that about 60% of the estimated gas savings in the program (119 therms out of 197 therms) accrue directly from the “pure hardware” measures with a significant part of that from air sealing. (Average pre-treatment infiltration was 5,116 CFM50 and average post-treatment infiltration was 3,733 CFM50, a reduction of 1,383 CFM50. An average 7.7 hours was spent on air sealing.) Thermostat setbacks are estimated to account for about one-fourth of the projected total savings. Seven percent (7%, 14 therms out of 197 therms) of savings are estimated to result from purely behavioral measures. Among the gas measures, the most commonly implemented measures were hot water flow reduction and/or tank temperature setback (85%).

Most of the electric savings in the program accrue from two activities; lighting measures and refrigerator replacements account for 92% of the estimated electric savings from program participation. About 95% of the customers received CFLs and about 20% received refrigerator replacements. On average, 7.7 CFLs were installed in each of the homes that received CFLs.

The program data available are not adequate to conduct a comprehensive assessment of the unrealized potential from the program. However, on-site inspections of service delivery have highlighted a number of additional savings opportunities. In particular, the on-site visit identified additional air sealing and duct sealing opportunities.

Preliminary billing analysis furnishes information on unadjusted preprogram usage. The mean usage for participants was 5,184 kWh and 1,222 therms. Mean estimates of savings are 19% of pre-program kWh and 16% of pre-program therms.

Table 8 shows the distribution of unadjusted preprogram usage, estimated savings, and percent savings by treatment group. (Note: This table is limited to those cases with baseline usage data available.)

Table 8. Mean Estimated Savings by Treatment Group

Treatment Group	Mean Gas Usage (Therms)	Mean Gas Savings (Therms)	Mean Percent Savings	Mean Electric Usage (kWh)	Mean Electric Savings (kWh)	Mean Percent Savings
Site Visit #1 Only	1,178	55	5%	5,508	772	14%
SV#1 and Insulation	1,286	202	16%	5,499	912	17%
SV#1 and SV#2	1,139	193	17%	5,684	1,019	18%
All Services	1,254	348	28%	5,792	1,122	19%
TOTAL	1,195	207	17%	5,656	982	17%

Program Impact on Customer Ability to Pay

There are three ways in which this program can contribute to a customer’s ability to pay his/her energy bills. First, program energy-saving measures reduce total energy expenditures, thereby making the total energy bill more affordable. Second, the payment plan for non-welfare households includes an arrearage forgiveness component that helps a customer to resolve outstanding payment problems. Third, the payment option for welfare households gives the household a bill discount in exchange for direct payment of the bill by the social welfare agency.

The first of several payment impact evaluations for the E-Team Program has estimated the potential impact of program participation through each of these three impact mechanisms. Pre-

participation consumption and payment records for all program participants were combined with program participation data and engineering estimates of program energy savings to model potential impacts on participant payment problems. This modeling estimates the extent to which program participation has provided participants with increased ability to meet their energy payment needs. The realization rate of predicted savings and actual changes in payment behavior of participants will be evaluated as adequate post-participation billing data becomes available, including evaluation of the persistence of program savings and payment impacts over time.

The pre-program billing analysis yields information about the payment problems faced by program participants at the time of program enrollment. Mean pre-program expenditures for program participants were \$1,583. Forty-two (42) percent of program participants had a payment shortfall during the pre-participation period (i.e., total bills minus total payments is greater than \$0 and ending balance is greater than \$0). The mean payment shortfall for customers with a payment shortfall was \$329 (20% of the total bill). The mean balance for these customers was \$593 (36% of the total bill).

Table 9 shows mean expenditures, the percent of customers with a payment shortfall, the average payment shortfall and average pre-participation balance for program participants by payment plan group.

Table 9. Pre-Participation Payment Characteristics by Payment Plan Group

Payment Plan Group	Number	Mean Expenditures	% With Shortfall	Mean Shortfall
Payment Plan	1,583	\$1,643	57%	\$393
VRP	223	\$1,419	60%	\$530
No Plan	5,338	\$1,530	35%	\$240
TOTAL	7,144	\$1,550	41%	\$303

The first source of expected payment improvement is the reduction in bill amounts resulting from electric and gas savings. Based on the estimates of per-participant gas and electric consumption reduction reported earlier in this paper, the mean per-participant electric savings is \$123 per year (976 kWh @ \$0.1264) and the mean estimated gas savings is \$121 per year (197 therms @ \$0.614 per therm), for a total of \$244. As discussed previously, 42% of participants had a payment shortfall. For 54% of these participants, the average estimated bill reductions exceed the mean payment shortfall amount.

The second source of expected payment improvement is the arrearage forgiveness component of the program. While the usage reduction resolves the payment shortfall for 54% of customers with a payment shortfall, these customers still must retire the balance accrued from previous payment problems. With the liberal repayment terms (24 months), 95% of these customers would find that the average energy savings is adequate to both eliminate the payment shortfall and allow the customer to pay at least one prior year of shortfall over a 24-month period. The percent of customers who would be able to meet this goal increases to 97% when the arrears are cut in half by the arrearage forgiveness component of the program.

The third source of payment improvement is in the bill discount component of the program for welfare recipients. Comparing pre-program payments to the targeted VRP amount, 28% of customers increase payments under this plan and 72% decrease their total payments. At this payment level,

however, the customer is made “whole” with respect to their bills over a two-year period (i.e., past arrears are retired and no new arrears are accrued).

The impact of program participation on ability to pay is also indicated, to some extent, by the extent to which program payment plan participants maintain deferred payment agreements. Of the cumulative 1,398 E-Team Program participants who had entered into payment plans as of November 1997, 10.7% had dropped out by that date. While the reasons for drop-out have not been determined (and can include non-program reasons like moving), this is a significantly lower early drop-out rate for deferred payment agreements than is commonly experienced among other payment-troubled customer groups. Further analysis over time will confirm just how significant this impact may be.

Conclusions

Over 50,000 customers in the service territory of the utility implementing the program described in this paper are both low-income and have utility payment difficulties. Nationally, the number of such customers is in the millions. Under utility restructuring, this customer segment will tend to be increasingly at risk in terms of maintaining energy service. With restructuring, this segment of customers will also present a problematic arrearage and collections issue for utilities. While many restructuring plans have addressed low-income energy affordability under restructuring through either (1) proposals for rate discounts or other bill payment assistance and/or (2) funding of efficiency programs for low-income households, few have proposed programs which fully integrate these two approaches to energy affordability. The E-Team Partners experience to date suggests that this is a model well worth consideration in a restructured environment.

To be sure, the E-Team program has not been without its own peculiar set of difficulties. Experience to date, however, suggests that these difficulties can be overcome and resulting program benefits are substantial.

Although evaluation of the E-Team Partners program is still in its preliminary stages, the initial results suggest that the intensity of effort and investment in consumption reduction measures is effective, yielding deep energy savings and meaningful utility bill savings for participants. Evaluation also suggests there may be significant value to the utility in reduced collections and uncollectables costs. Finally, it appears that for those most in need, the integrated approach of the E-Team Partners Program can move significant numbers of customers from chronic payment problems over the line to some minimal level of sustainable energy affordability.

References

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