Comprehensive and Cost-Effective: A Natural Gas Utility's Approach to Deep Natural Gas Retrofits for Low Income Customers

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ABSTRACT

At the beginning of 2011, Philadelphia Gas Works (PGW), a municipally owned natural gas utility serving Philadelphia, Pennsylvania, began rollout of its new portfolio of energy efficiency programs. The core program is an ambitious direct install retrofit program called the Enhanced Low Income Retrofit Program (ELIRP). ELIRP targets customers in the utility's low-income bill assistance program. This program aims to reduce participants' natural gas usage by an average of 20% by maximizing the cost-effective savings for each project. This paper discusses how the program was designed to help conservation service providers (CSPs) identify high-potential savings opportunities and then provide these contractors with the flexibility to go as deep as possible in each home while still maintaining overall cost-effectiveness requirements. In addition, the paper describes the competitive funding model implemented among the CSPs to reward the best performers with additional funding reallocated from the other CSPs. This model provides continuous improvement via both short-term immediate reallocations and an ongoing incentive mechanism to drive all CSPs to achieve better long-term results. The paper also explores the ways in which the program maintains quality control and the mechanisms in place for constantly enhancing service delivery. Finally, it contains a brief discussion of the preliminary results and early lessons learned as the program began its ramp up.

Introduction

Much attention has been focused on energy efficiency through electric utility mandated conservation. In Pennsylvania, Act 129 was passed in 2008, primarily for the purpose of mitigating the significant price increases that were expected as a result of utility deregulation. However, far less attention has been paid, both nationally and regionally, to natural gas utilities' conservation. For example, Pennsylvania Public Utility Commission (PA PUC) regulated utilities, including natural gas utilities, must provide a Low-Income usage Reduction Program (LIURP), per PA PUC requirements, but natural gas utilities are not subject to the larger Act 129 mandate.

At the start of the program described by this paper, Philadelphia Gas Works (PGW) was already providing one of the largest LIURP programs in the Commonwealth. The existing program, in place for over 20 years, was allocating approximately $2 million per year by 2009 to provide fairly simple energy conservation measures in as many homes as possible. In 2009, the utility, of its own volition, sought PUC approval to launch what would be the Commonwealth's largest natural gas natural gas demand-side management ("DSM") plan. This plan would both significantly increase the existing LIURP to over three times the previous annual spending levels, and introduce new energy efficiency programs to assist all of the utility's ratepayers in saving energy and money. Preliminary results from PGW's most recent implementation plan

show the program has provided incremental annual savings of 57.4 BBtus of natural gas across 2,577 homes (PGW 2012).

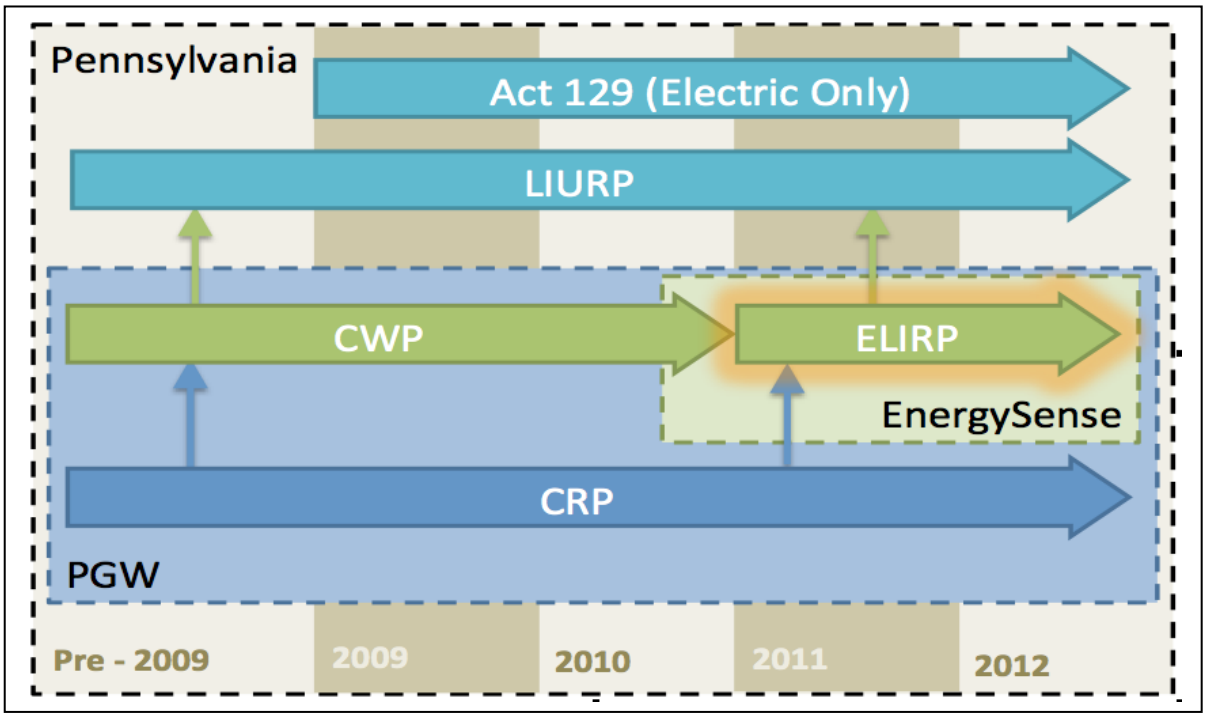
Background

Starting in 1990, PGW, a municipal natural gas utility serving Philadelphia, Pennsylvania, ran its Conservation Works Program (CWP), starting with a single CSP, and expanded to a second CSP in 1997. The CWP, which became part of Pennsylvania's Statewide LIURP, served participants in PGW's low-income bill assistance program, the Customer Responsibility Program (CRP). Under CRP, which continues to this day, PGW customers with an income at or below 150% of the federal poverty level can pay a percentage of their income for natural gas service, regardless of the amount of gas used. All other PGW ratepayers shoulder the remaining costs of the gas used by participants in the CRP. Philadelphia has a large percentage of low-income households and, as a result, a large percentage of PGW's residential customers are enrolled in CRP. In addition to high enrollment, the nature of much of the low-income housing stock in Philadelphia results in disproportionately high average CRP usage, which increases the size of the CRP subsidy funded by other PGW ratepayers.

As part of exploring additional gas conservation opportunities, PGW began to consider options for expanding the CWP, and, in 2006, launched a pilot program that increased the range of services offered and allowed more money to be spent in each home. Around the same time, the Pennsylvania legislature passed Act 129, which required certain electric distribution companies (EDCs) to establish and provide energy efficiency and conservation programs starting in 2009. Armed with initial results from its CWP pilot program and observant of the electric efficiency portfolios, PGW began the process to set up its own portfolio of natural gas energy efficiency programs.

As part of its 2009 rate case (Docket Nos. R-2009-2139884 and P-2009-2097639), PGW petitioned the PA PUC to approve a portfolio of natural gas programs to be rolled out over five years. The portfolio was predicted to cost $58 million and provide $54 million (2009 dollars) in net benefits, reduce CO2 by 1.3 million short tons, and create over 900 net new jobs. The cornerstone program was a greatly expanded and overhauled version of PGW's CWP, now called the Enhanced Low Income Retrofit Program (ELIRP). $20 million of the portfolio's budget was allocated for ELIRP, making it the largest program in the portfolio, and the first to get off the ground (PGW 5 Year Plan, 2009). The full group of programs was incorporated into a rate case settlement petition that was ultimately approved by the PA PUC on July 29, 2010, and launched on September 1, 2011. Figure 1 is an overview of the relevant programs leading up to the start of ELIRP and going forward.

Figure 1. Overview of Program History



Program Design

ELIRP has two main goals: (1) To provide cost-effective energy savings to low-income customers who participate in PGW's CRP; and (2) To reduce the overall long-term cost of the CRP as paid by all firm customers. These goals put the program's focus on volume of cost-effective savings, rather than on achieving maximum penetrations – in other words, ELIRP does not exist to transform the market, but to provide the most cost-effective energy savings it can from each home visited. PGW can focus on getting the maximum amount savings in each project – "going deep" – targeting only the customers with the highest opportunities, while maintaining a cost-effective program.

Going Deep

In addition to the two primary goals described above, PGW established a sub-goal of achieving average savings of 20% per home. This was a very aggressive savings target, considering that the past CWP results showed average savings of less than half this amount. Another concern was the nature of structural issues in the targeted housing stock, such as significant moisture problems and the presence of asbestos and knob-tube wiring, issues that can impede the efforts of CSPs to get high savings cost-effectively. On the other hand, the average CRP participant uses over 130 Mcf annually. To achieve the savings level target, PGW needed to empower contractors to shift their thinking away from the customary prescriptive approach and towards developing a customized and comprehensive measure package for each home based on that home's specific opportunities.

To assist contractors in making the necessary judgments, a contractor tool was developed to calculate gas savings and a cost-effectiveness cost threshold based on input of a package of

measures and their characteristics. The tool was designed to allow a user to first enter basic characteristics of a premise and then enter available opportunities. The tool would then show results for different packages of the measures entered. The tool is thereby intended as a diagnostic resource to encourage the CSPs to continue identifying further and deeper opportunities to save energy usage up to the point at which no additional spending can result in commensurate energy savings. As a spreadsheet-based tool, it is readily usable in the field by auditors although, to date, CSPs appear more comfortable treating it as a "back-office" function. Ultimately, this tool is intended as the on-the-ground backbone of the program's guiding philosophy. By providing updatable calculated benefits, based on pre-conditions and work proposed, the tool serves to continually encourage contractors to pursue further, deeper savings up the point of break-even cost-effectiveness. While information on other modeling tools and software was requested from CSPs during the RFP process, it is this tool, developed by the Company's implementation consultants specifically for this program design, that is intended to guide all in-home work decisions.

Another way in which CSPs were empowered to go deeper was that PGW did not establish a cap for spending on a single home. If cost-effective opportunities still existed, PGW wanted CSPs to pursue them. After a certain level of spending is reached, $14,000, a contractor must seek additional approval from PGW. As of yet, no CSP has reached the level of spending in a single home that would require them to seek additional approval.

This newly redesigned approach to low-income weatherization was vastly different than the prescriptive approach that PGW and its CSPs had been administering for the past 20 years. To facilitate this transition, PGW provided a weeklong CSP training session in January 2011, and has provided multiple tools and manuals for ongoing guidance, including a constantly evolving protocols document. PGW also required CSPs to have staff with certification from the Building Performance Institute (BPI)[1]. Lastly, PGW hired a third-party firm to inspect approximately 10% of all homes treated (a figure which would be increased shortly thereafter) and provide ongoing mentoring sessions with the CSPs' workforce.

Through the use of objective goals, clear guidelines, and ongoing quality control, PGW developed a system that allows the CSPs, as the on-site technical experts, to apply a flexible and customized approach to going as deep as possible in treating each home individually.

Targeting High Users

As mentioned above, the nature of much of the low-income housing stock in Philadelphia results in disproportionately high average CRP usage. The average PGW residential customer uses approximately 89 Mcf annually, while the average annual usage for PGW CRP customers climbs to 131 Mcf per year. To have the greatest impact on total energy savings, per the new program's goal of an average 20% reduction, ELIRP initially targeted CRP customers in the top usage quintile. These targeted high-usage CRP customers were found to use approximately 198 Mcf annually. Selected customers are sorted by high usage, and then assigned to CSPs in a manner to ensure equal geographic and usage distribution throughout the service territory to

[1] Field staff responsible for developing site work scopes must hold at least BPI Building Analyst or Energy Auditor certifications. Air sealing and/or insulation installers must hold either or both an Air Sealer or Insulation Installer BPI certification, as applicable. Field staff supervisors must hold at least three BPI certifications. On each job site at least one person with BPI Building Analyst or Energy Auditor certification must be present.

each. Due to the nature of CRP participation, the Company is able to provide CSPs with customers contact information and weather-normalized pre-treatment usage.

Competing CSPs

PGW established an implementation approach that utilizes multiple CSPs that compete for program funds. All CSPs are evaluated on the same performance metrics, primarily: overall energy reductions and cost-effectiveness. These two metrics drive each contractor towards the optimal balance of achieving the greatest overall savings as ambitiously as possible at the best value possible. Inspection report scores are also incorporated into the evaluation model, along with a few other considerations. These metrics are compiled in a "scorecard" which is used in evaluations of CSPs. Funding is then allocated based upon the results of these evaluations to reward the best performing CSPs. The end results include both immediate short-term improvements, by providing additional funding to those who have proven most capable of effectively implementing the program, as well as an ongoing incentive to drive longer-term incremental improvements across all CSPs. This model allows the Company to refrain from establishing specific front-end price points for each unit installed, and to instead evaluate, and reward, CSPs on back-end total performance outputs. Greater performance results in increased work.

Quality Control

Central to the success of any program is the way in which a program administrator ensures that guidelines are followed and program goals are achieved. PGW established a three-pronged approach to ensuring the quality of its CSPs' work, namely: (1) Providing training to contractors as the program launched; (2) Hiring a third-party inspector to check completed work and provide mentoring on active jobsites; and (3) Designing and building a database management system to track contractor actions in real time.

PGW performed a series of training sessions at the start of the program that focused on the new program design and how it differs from typical approaches. This training was crucial given that two of the three contractors essentially only had prescriptive program experience while the third was new to the U.S. retrofit program market.

To ensure that CSPs followed program protocols, it was essential to hire a third-party inspector. The selected quality control contractor was issued an inspection form that scores job performance by subtracting points from the default, rather than adding points from zero, in an attempt to recognize that not all sites have the same opportunities. Initially, the inspector was tasked with visiting each of the first ten homes treated by each CSP, and then approximately 10% of all homes going forward. Due to early implementation issues, the inspection and mentoring rate has been increased for the time being.

PGW also must know what is happening on the ground as it is occurring so that adjustments can be made as quickly as possible to respond to developing situations. Such real-time revisions are important in any program, but particularly during the launch of a newly redesigned and re-launched program. To these ends, PGW is constructing a new data management system as a central repository for all program data, and a connected web interface that captures the contractor inputs and provides all parties with real-time performance outputs.

The data management system continues to be refined through the addition of error-checking routines to prevent bad data inputs and missing data.

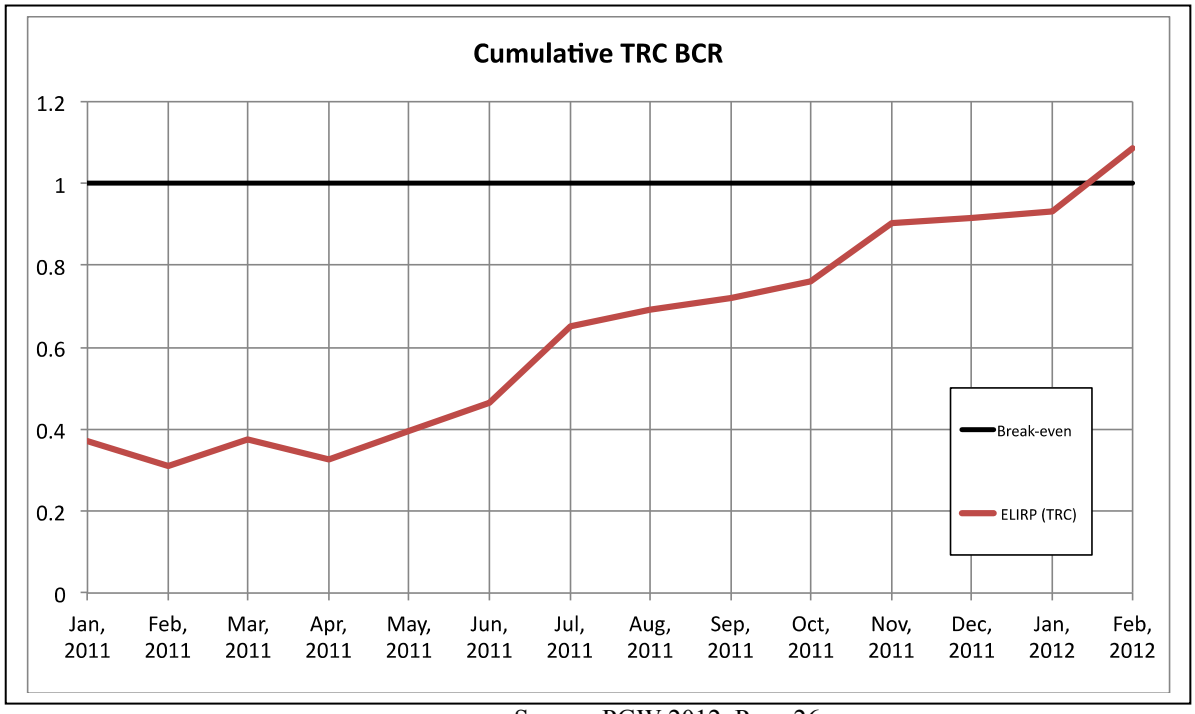
PGW is taking a more hands on approach to quality control and is closely monitoring the performance of the CSPs. Numerous program adjustments have already been made to reflect the realities of implementation as identified by the ongoing CSP training, mentoring, data analysis, and through sample site visits by program personnel.

Preliminary Results

ELIRP was designed to focus on the average savings per home treated, with a goal of 20% based on the results of the previous CWP pilot program. Through the end of this reporting period, ELIRP had achieved an average savings of 15.5% in homes that received a full treatment and an average of 4.7% savings per home for those that received only a partial treatment. The average across all completed homes was 12.0% savings. ELIRP realized incremental annual savings of 57.4 BBtus of natural gas from all activity from inception, in January of 2011, through the end of February 2012 (PGW 2012).

PGW uses a Total Resource Cost (TRC) test for cost-effectiveness. For ELIRP, this means PGW counts the benefits from the avoided supply cost of natural gas, electricity (both baseload and peak demand), and water against the costs to deliver the program. PGW does not include any benefits from externalities or a percentage adder for addressing low-income market. For results reported from January 2011 through the end of February 2012, ELIRP had a present value of benefits of $8.4 million against a present value of costs of $7.7 million, for a present value of net benefits of over $670 thousand. Figure 2 shows how the how the cumulative TRC benefit-to-cost ratio (BCR) changed over time.

Figure 2. Cumulative TRC BCR of Program Since Inception



Source: PGW 2012, Page 26

Figure 2 shows how the program has steadily increased its cost-effectiveness over time as program delivery has been refined and improved. This is particularly impressive considering that avoided costs for natural gas have fallen sharply since the plan was originally designed.

Early Issues and Lessons Learned

Infrastructure Development

A great deal of time and effort was spent on the front-end, developing the necessary controls that would allow PGW to feel comfortable empowering the CSPs to employ a flexible program with significant levels of spending. The first step from a basic design perspective was the development of a program workbook tying budgets and savings projections for ELIRP to the larger portfolio of programs deployed by PGW. This workbook also incorporates calculation of PGW's avoided cost benefits, providing administrators with timely performance information. The next focus was the development of the data management system, the contractor cost-effectiveness tool, the quality control forms and protocols, and a variety of other mechanisms to ensure that proper program controls were established.

However, all of the steps described above encompass only the infrastructure development efforts undertaken by PGW and their implementation consultants. The development needed by the selected CSPs, both to both ramp up to the new program's activity levels and to become adequately trained in the new program's customized approach, was greater than anticipated, and played a factor in a somewhat extended implementation phase. These activities included increased hiring, training, and certification of workforces; sub-contracting with other firms to provide specific functions; and overall program education. Though the new program launched on September 1, 2010, full program weatherization services did not begin in earnest until late February year.

Customer Rejections

Several issues resulted in inflated rejection rates in the program's first year, ranging from on-site conditions to CSP misunderstandings. Rejections primarily occur when the CSPs are unable to contact and engage customers to initiate the scheduling process. CSPs initially rejected cases if they received no response after calling a customer twice and sending a letter. This pattern is typical of similar programs in which participants do not volunteer but are selected without prior notice. Customers rejected for inability to make contact are currently placed back in future assignments as long as they continue to meet the primary program eligibility criteria. To address this issue in the second round of assignments, PGW first sent individual letters to all selected customers. The letter notified them of their selection, explained the program and the potential treatments they could receive, and reminded them they were required to accept the treatments as part of their CRP enrollment. Additionally, their assigned CSPs contact information was provided so customers could pro-actively schedule an appointment. These letters significantly decreased rejections due to inability to contact and customers' refusals to participate.

The second primary cause of rejections is related to the pre-existing conditions that CSPs find in many of the homes. Water leaks, sewage leaks, health and safety concerns, and structural issues are common in CRP customers' properties. As ELIRP is dedicated to cost-effective gas

usage reducing measures, correcting these pre-existing conditions is often too expensive to be included in the weatherization package, but the weatherization cannot proceed until they are first remediated. This factor is exacerbated by the fact that PGW's focus on the highest tier of energy users also results in a focus on the homes most likely prone to structural issues as well as the health and safety concerns that can preclude weatherization work.

The pre-existing conditions rejection rate was also inflated because CSPs were strictly focusing on comprehensive treatments and would entirely reject properties where thoroughly comprehensive jobs were not possible. In response, PGW instructed the CSPs that once a premise was entered, any and all feasible cost-effective work should be performed, regardless of whether a full comprehensive treatment was possible, in order to avoid lost energy saving opportunities. The core measures installed in these cases are typically programmable thermostats, pipe wrapping, and other lower cost measures.

A better understanding of the program design has allowed for many previously rejected sites to be treated, and CSPs are now able to complete at least some work in most homes entered. The contractors now understand that the presence of a water leak, for example, does not automatically disqualify treatment. Further, they understand that the savings percentage target of 20% was an average value, meaning that some homes would have lower savings and some would have higher. However, there still remain many homes in which these pre-existing conditions will prevent any work from being performed. PGW is capturing these data, and intends to pursue potential future funding opportunities to address pre-treatments that would allow comprehensive weatherization work to be performed.

Generating Understanding of the Program

ELIRP is different from other weatherization programs the CSPs had previously implemented, since PGW's program emphasizes a customized, diagnostic whole-home approach rather than the installation of a prescriptive list of weatherization measures. Perhaps the greatest challenge has been to overcome deep-seated CSP habits regarding the delivery of energy-efficiency to the target housing stock and previously held notions that it is sufficient to install measures, which, in general, are known to be cost-effective without regard for developing home-specific, comprehensive cost-effective packages.

The resistance to "going deep" has been surprising, even though the benefits are clear. However, it is clear that these attitudes are changing. A review of the first full year of implementation indicates clear improvement in everything from data collection and input accuracy, to greater aggressiveness in addressing clear opportunities, to improving delivery efficiency. The program staff has also learned numerous lessons in identifying and addressing the root causes of any disappointing contractor performance. The contractor tool format, for example, has been adjusted on various occasions to make it easier for the typical contractor to use and to encourage optimal decisions and measure packages.

PGW is continuing to work with the CSPs to ensure that they fully understand and implement the new comprehensive, diagnostic program design. Additional emphasis has been placed on inspections and mentoring sessions to stress the importance of identifying all cost-effective energy-saving opportunities in a home, and to communicate that PGW expects thorough results.

Conclusion

In ELIRP, PGW has designed and implemented an aggressive natural gas low-income retrofit program. The program gives CSPs flexibility to "go deep" in each home while providing a feedback loop that rewards good performance. Additionally, PGW has set up an infrastructure of data collection and hands-on mentoring through which it can continue to examine the effectiveness of the program's design and make adjustments accordingly. However, as with many programs, ELIRP has experienced some growing pains in its first year of existence, from which some important lessons can be learned:

- Clear goals, guidelines, and controls can allow programs to empower CSPs with greater tactical flexibility in applying a customized approach and go as deep as possible in treating each home individually and cost-effectively. The importance of clear communication between all parties cannot be stressed enough.
- A strong infrastructure must be in place to support both contractors and program staff. Ideally, this structure would be in place instead of being developed concurrently with the program, as was the case with ELIRP.
- Using multiple contractors and allowing resources to be allocated among them provides a positive motivation for contractors to continuously improve over both the short- and long-term.
- Continued training and mentoring are critical to quality control and program success, particularly for supervisory and management staff of implementation contractors.
- While deep savings can be cost-effectively achieved by targeting high users within a low-income population, extensive re-programming of typical implementation contractor mind-sets is necessary, as prescriptive measure programs are the norm, and their typical designs are deeply ingrained in the minds of key contractor staff.

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