
Duquesne Light Company Smart Comfort Program

Profile #123

Principal investigators: Barb Hogan and Ted Flanigan

Executive Summary	2
Program Manager's Perspective	3
Program Context	4
Program Design & Delivery	6
Monitoring and Evaluation	12
Program Savings	14
Cost of the Program	16
Additional Program Benefits	18
Lessons Learned	20
Transferability	24
References	26
Appendix: The Profile Library	27

Smart Comfort is one of North America's leading low-income energy assistance programs and serves as a powerful model for the future and thus was selected by The Results Center Board of Advisors for inclusion in the Series 4 Profiles. The Results Center salutes Duquesne Light Company for its innovative program design and in particular for its success in delivering enhanced yet highly cost-effective energy services to customers most in need of utility bill relief.

In particular, The Results Center wishes to acknowledge Joe Flynn for his vision, creativity, and commitment to low-income assistance; and Barry Kukovich for his dedication and enthusiasm, so critical to transforming the program concept into an impressive reality. Their guidance was essential to the development of this Profile.

This Profile is part of a collection of Profiles researched and published by The Results Center over the past four years. It is intended to provide a thorough understanding of the program and its unique elements. This Profile can also be used to compare this program with other programs documented by The Results Center. For a complete listing of the Profile Library see the Appendix. For additional information please contact The Results Center.

Executive Summary

Duquesne Light Company's Smart Comfort program is an exciting low-income program model for significantly reducing participants' bills and minimizing bill arrearages. The program's evolution and results are indicative of the increasing sophistication of Duquesne staff's delivery of energy services. Smart Comfort provides rich lessons for utilities facing increasing competition and thus keen on devising valuable wrap-around services using customized approaches for maximum customer benefit at low cost.

When Duquesne began Smart Comfort in 1988 the program was driven by prescriptive measures intended to cut electricity use in homes with electric space and/or water heating. Thanks to the vision of its early architect, Joe Flynn, and the program's primary driver, Barry Kukovich, the program was significantly redesigned to encompass a comprehensive custom approach that has cost effectively delivered impressive levels of savings. In the most recent program year Duquesne projected savings of up to 40% for each participating home's total electricity consumption at a cost of saved energy less than 3¢/kWh.

Smart Comfort was launched to fulfill the low-income program mandate established for investor-owned utilities by the Pennsylvania Public Utilities Commission. The program initially provided weatherization services for electric heating customers through the "Heating approach." After a few years, Duquesne Light staff recognized that because customers did not use electric resistance heating, the program was targeting a relatively small subset of its low-income customers who live primarily in multifamily apartment buildings. Thus the Heating approach was replaced by the "End-Use approach," a broader orientation that allowed Duquesne to provide services to many more low-income customers.

Perhaps the most exciting aspect of Smart Comfort is the role played by its Energy Managers. These program staff have been given license to "eek out" energy savings in a host of creative ways from program participants. By empowering Energy Managers to provide one-stop comprehensive services for low-income customers, Duquesne hit upon a winning formula. Highly motivated Energy Managers provide participants with a number of no-cost services, increasing their awareness of their energy use, providing tips on reducing their bills, installing technologies such as compact fluorescent lamps on the spot, and even arranging for waterbed and refrigerator replacements. Through this customized, hands-on approach coordinated with the three local gas utilities, Duquesne has at once served its customers most in need of bill relief while providing the utility with a return on its program investment, stemming bill arrearages through energy efficiency improvements.

DUQUESNE LIGHT COMPANY Smart Comfort Program

Sector: *Low-income residential*

Measures: *Energy efficiency measures for any and all end-uses including: lightbulb replacement, refrigerator and appliance replacement, waterbed replacement, water heater wraps, low-flow showerheads and faucet aerators, weatherization*

Mechanism: *Walk-through audits identify needed measures and provide education to residents; all installations and services are provided free to customers*

History: *Launched in 1988; End-Use approach piloted in 1992*

1994 PROJECTED PROGRAM DATA

Energy savings: 2,171 MWh

Lifecycle energy savings: 32,564 MWh

Nominal cost: \$717,024

Levelized cost: \$629,685

CONVENTIONS

All Series 4 Profiles will report nominal dollar values except where expressly stated as levelized. Levelized figures, used for comparative purposes, are based on 1990 U.S. dollars. Inflation and exchange rates were derived from the U.S. Department of Labor's Consumer Price Index and the U.S. Federal Reserve's foreign exchange rates.

The Results Center uses three conventions for presenting program savings. **ANNUALSAVINGS** refer to the annualized value of increments of energy and capacity installed in a given year, or what might be best described as the first full-year effect of the measures installed in a given year. **CUMULATIVE SAVINGS** represent the savings in a given year for all measures installed to date. **LIFECYCLE SAVINGS** are calculated by multiplying the annual savings by the assumed average measure lifetime. **CAUTION:** cumulative and lifecycle savings are theoretical values that usually represent only the technical measure lifetimes and are not adjusted for attrition unless specifically stated.

Program Manager's Perspective

JOE FLYNN, PROGRAM LEADER

In seven years, Smart Comfort has evolved from a typical weatherization approach focused on reducing heat loss to a customer-focused, end-use reduction program. We have gone from targeting electrically heated multifamily complexes to providing full service to single-family customers. And, we have more than doubled energy savings with a simple payback of less than four years. This successful transition has been the result of breaking past paradigms, creating partnerships, developing an organizational structure with a common mission and vision at the center, and creating a climate of trust which permitted a team of trustworthy individuals to flourish.

Since the late 1970s residential energy conservation has generally been discussed in terms of insulation, weather-stripping, and caulk. Lately, ducts have been added to the conversation. At Duquesne, we went beyond this approach to recognize that customers have energy bills because they use both electric and gas for a myriad of reasons. Through Smart Comfort, our goal has been to reduce energy use, and as a natural consequence, the customer's bill.

To design a program that could effectively address all aspects of customers' energy use, we spent time up-front with our utility commission staff to explain the concept, demonstrate its theoretical potential savings, and ensure its thorough evaluation. We spent time with several divisions within the Public Utility Commission, notably the Bureaus of Consumer Services and Conservation, Energy, and Economic Planning, discussing the pilot's design, potential savings, and evaluation methods. Through these meetings we were able to agree upon a program "score keeping" method in advance so there were no surprises in the outcome.

We brought our program contractors into the process as well. For the most part they were state weatherization providers and we had to show them that our focus was on savings measured by the customer's bill, not by barrels of oil equivalents. We invited them to join us in the preliminary phase too as we fleshed out the pilot's design and trained potential Energy Managers, a new position encompassing the skills and talents of an energy auditor, educator, installer, inspector, and evaluator. In return for learning new skills, we were offering select Energy Managers an opportunity for skill development, job satisfaction, and autonomy in job performance.

Throughout the program's evolution we have implemented Smart Comfort primarily through contractor organizations. In the program's early years a customer typically received at least

three in-home visits for us to complete our work. Because these visits were by different people and organizations, the customer was regularly confused as to who had done what and why.

Recognizing that all people's time is valuable, we restructured the program to maximize the use of time by finishing jobs in one visit. Energy Managers were essential to this goal. Because we selected individual Energy Managers from various contractor organizations and wanted them committed to Smart Comfort, we worked with each organization to arrive at a common salary and benefits package. We established common working conditions and housed the Energy Managers in one location.

We then took the time to train, develop, and empower the Energy Managers through regular staff contact and exchange of lessons learned. We also introduced the leadership/management concepts embodied in Steven Covey's "Principle-Centered Leadership" and "Seven Habits of Highly Effective People." We took time to involve all staff in developing a mission statement, containing values and principles, and focused on end results.

And most importantly, we backed-up our commitments by empowering our staff to act to achieve to program's mission. Since the initial program pilot, I'm proud to report that the Energy Managers have independently made all decisions regarding the services provided to the customer. The Energy Manager views each customer contact as an opportunity to form a partnership aimed at reducing the customer's bill and increasing the percentage they pay of their current bill. Because they have demonstrated the character and competence to perform the task they face, they have earned the trust to focus on meeting the customer's needs.

It is this management approach and the quality of the staff which makes Smart Comfort succeed. Contrary to common beliefs, we are not a refrigerator replacement or waterbed conversion program, although we do both. We are not a lighting retrofit program, though we install compact fluorescent lamps.

In the words of our mission statement, "We are proactive managers of Duquesne Light's Smart Comfort Program who are customer focused, quality driven, and results oriented... As industry pioneers, we will maximize our ability to provide this service... by using all available resources effectively and efficiently." The success of this program truly lies in the people who deliver it. In closing, I'd like to acknowledge and thank my friend Barry Kukovich who has worked with and supported me throughout the transition and who today leads the Smart Comfort TEAM.

Program Context

DUQUESNE LIGHT COMPANY

Since 1880, Duquesne Light Company (Duquesne) has met the electricity needs of Pittsburgh and surrounding portions of Allegheny and Beaver Counties, a service territory covering 800 square miles in southwestern Pennsylvania. Serving approximately 1.5 million people, Duquesne sold 12,122 GWh of power to over 580,000 electric customers in 1994, earning \$1,145 million in revenue. Duquesne is the core business of its holding company, DQE.[R#1]

The Pittsburgh area typically has muggy summers and damp cold winters with average summer highs of 83 degrees F and average winter lows of 19 degrees. Much of the area consists of buildings and homes constructed during the pre- or early post-World War II eras. Buildings of these vintages characteristically tend to be good weatherization candidates. Within the Pittsburgh area approximately 95% of homes are gas-heated.

In 1994, the utility had a total generating capacity of 2,834 MW and a summer peak demand of 2,585 MW. Duquesne has an additional 540 megawatt of generating capacity in cold-reserve, creating a total reserve margin of 33.1%. Coal is the primary fuel source for Duquesne's power and accounted for 74.3% of its generation in 1994. The balance was derived from nuclear (23.4%) and oil (2.3%). The commercial sector accounted for the greatest portion of electric sales in 1994 with 46% of Duquesne's total sales with the residential and industrial sectors splitting the balance for 27% of each.[R#1,12]

Like its neighbor in Philadelphia, PECO Energy, and many other utilities in the region, Duquesne has made significant investments in nuclear power. The utility wholly owns Beaver Valley Units 1 and 2 and has a 13.74% share of the Perry nuclear plant in Ohio. These nuclear investments along with other factors such as the contracting steel industry, contribute to the fact that Duquesne has the second highest rates in Pennsylvania after PECO Energy; rates that are among the highest in the country. In April 1994, Duquesne was able to lower its average residential rate from 12.75¢/kWh to 11.59¢/kWh. Commercial rates for 1994 averaged 8.5¢/kWh while industrials paid an average 5.93¢/kWh. In preparation for the industry's turn toward competition, Duquesne announced on December 1, 1995 a five-year rate freeze.[R#16]

Steel has been a dominant component of the area's economic base. Since 1979 steel-related electricity sales have dropped over 50% contributing to Duquesne's overall decrease in sales of 10% through the same time frame. Despite serious decline,

steel still comprised 13% of the utility's total sales in 1994. Recently there has been a form of renaissance of new businesses and industry within Duquesne's service territory, particularly within the health care industry.

PENNSYLVANIA'S MACROECONOMIC SITUATION

For a century the steel industry brought prosperity to Pennsylvania. Its demise, however, has left Pennsylvania without adequate employment opportunities, an aging population, and a surplus of services. For electric utilities this macroeconomic downturn has translated directly into excess capacity, a situation that has put upward pressure on rates. The steel industry collapse has also significantly shaped the demographic complexion of the state. Besides Miami, Florida, Pennsylvania has the highest concentration of elderly in the country and the highest growth rate of elderly residents. In 1990, 41% of the State's population was 75 or older; a level that is expected to increase to 50% by the year 2000. Since this population segment is generally on a fixed income between 110% and 200% of the national poverty level, the economic implications of the situation for Pennsylvania are profound.[R#21]

Pennsylvania's economic and demographic trends have made a significant portion of the State's populous dependent on social services. Even with assistance from as many as four or five programs, low-income workers often are at the poverty line and worse yet, now many social programs are drying up. The Low-Income Heating Energy Assistance Program (LIHEAP), for example, provided up to \$200 of federal assistance on utility bills to help customers at 110% of the poverty level out of arrears. This funding has been cut along with a 50% cut in the federal Weatherization Program. One of the last rays of hope has been a local fuel fund called The Dollar Energy Fund, which Duquesne Light had a key role in starting. Through this fund ratepayers make voluntary contributions which are matched by utility contributions.

STATE MANDATED PROGRAMS

Given excess capacity, high rates, and a rather bleak economic outlook, there has been little or no demand-side management in Pennsylvania. While the Pennsylvania Public Utility Commission (PPUC) has been working for years to mandate customer energy services, orders to do so have been challenged and held in court by industrial interests seeking lower rates. Now as electric utility competition penetrates the market, utilities are concentrating on lowering their rates and selling excess capacity. What Pennsylvania lacks for DSM programs,

however, it makes up in low-income programs. For the State's electric and gas utilities, low-income regulations are presented in the Low-Income Usage Reduction Program or LIURP.

LOW-INCOME USAGE REDUCTION PLAN

Pennsylvania's Low-Income Usage Reduction Program (LIURP) was launched in 1988 and mandated the establishment of an energy reduction program by each of the State's seven investor-owned gas utilities and eight investor-owned electric utilities. The regulation was intended to lower the occurrences of bill arrearages and to assist payment-troubled customers lower their energy bills by reducing their consumption. LIURP requires utilities to deliver a usage reduction strategy to low-income customers, both renters and owners in all housing types who are at or below 150% of the national poverty level. Additionally, the regulation includes an educational component on safety and efficiency to be included when cost effective. For many utilities which made a separate visit to extend conservation education to customers, this component was determined cost ineffective and dropped. However, it has become an essential element of Smart Comfort.

The Commission's original intent for LIURP was to cut energy used for space and water heating, the greatest opportunities for residential energy savings. The regulation was originally established as a weatherization program and only expanded to cover all household energy use in 1992 when LIURP was extended through 1997. The modification followed the lead of Duquesne's Smart Comfort program and has broadened the program scope to include measures for non-heating end-uses

such as refrigerator and waterbed replacements. There is no LIURP spending cap for individual jobs, however, all measures must have a simple payback period of seven years or less except sidewall and attic insulation which must be 12 years or less.

The PPUC also specified that utilities had to expend 0.2% of their gross revenues for mandated LIURP programs. The total expenditure from 1988 to 1995 for all fifteen regulated utilities in Pennsylvania has been approximately \$110 million; 98,000 retrofits were completed in the same time frame.[R#7]

DUQUESNE'S ENERGY EFFICIENCY INITIATIVES

Duquesne has never had a formal DSM program nor has it filed a comprehensive integrated resource plan. Nevertheless, Duquesne has operated a highly successful low-income energy efficiency program in compliance with LIURP. The program, called Smart Comfort, is operated by the Consumer Programs Section and is documented herein because of its unique approach and impressive results.

In addition to Smart Comfort, Duquesne has provided educational programs for both the residential and commercial/industrial customers known as the "Energy Conservation" and "Informational Personal Contact" programs. Duquesne also offers its customers the Customer Assistance Program following Commission guidelines which enables payment-troubled, low-income customers to make partial payments of their electric bills. Duquesne's overall conservation expenditure for 1994 totaled \$806,224, energy savings totaled 1,511 MWh, with capacity savings of 3.42 MW.[R#17]

DSM OVERVIEW	ANNUAL ENERGY SAVINGS (GWh)	ANNUAL SUMMER CAPACITY SAVINGS (MW)	ANNUAL DSM EXPENDITURE (x1,000) Nominal	ANNUAL DSM EXPENDITURE (x1,000) Levelized
1988	NA	NA	\$1,096	\$1,211
1989	NA	NA	\$861	\$908
1990	NA	NA	\$933	\$933
1991	NA	NA	\$1,021	\$978
1992	0.93	1.97	\$898	\$834
1993	1.28	1.96	\$913	\$823
1994	1.51	3.40	\$806	\$708
Total	3.72	7.33	\$6,528	\$6,394

Program Design and Delivery

PROGRAM OVERVIEW

Through its Smart Comfort program Duquesne Light Company has demonstrated that success can be achieved by exercising flexibility and creativity. The utility set out to deliver a low-income program following the PPUC's mandate for reducing energy use for heating. While the initial program design was successful, program managers realized that something wasn't quite right about the approach. After taking a closer look, Duquesne proposed to try something different. Rather than walking into the customer's house with a preconceived notion of its energy savings potentials, the utility chose to enter customers' homes with an open mind. By doing so, staff would first determine how and where energy was being used and would then craft custom solutions for addressing these end-uses. Through this new approach to low-income energy use, Duquesne converted its weatherization program into a groundbreaking customized program that has since set the standard for low-income energy usage reduction in Pennsylvania.

PROGRAM HISTORY

The Heating approach: Duquesne's response to the Pennsylvania Public Utilities Commission LIURP regulation was the Smart Comfort program which was launched in 1988 and which targeted customers with electric water and/or space heating. In Duquesne's service territory, many of these customers lived predominantly in multifamily apartments. The early program delivered major weatherization measures, including attic insulation, as well as low-cost measures such as high performance showerheads. Compact fluorescent lamps were also installed. All program services were and continue to be provided at no cost to customers. In the first program year Duquesne's LIURP provided service to 39 homes.[R#2]

During the first full year of the program, Duquesne hired Joe Flynn, the former Director of the U.S. Department of Energy's Weatherization Assistance Program to lead its LIURP efforts. Continuing to target heating customers and focusing on multifamily units, Duquesne's Smart Comfort produced good results and was honored with two awards: the Edison Electric Institute's Common Goals Special Recognition Award and the Pennsylvania Governor's Energy Award.

At that time a performance evaluation of Smart Comfort identified some significant factors regarding the effectiveness of the program's structure. A key finding of the study was that as a heating-based program, Smart Comfort's penetration was severely limited. Within Duquesne's service territory, only 5%

of the customer base used electric resistance heating. Furthermore, those that did received a declining block heating rate, lessening their cost for electricity and thus reducing their incentive to conserve electricity use for heating. Thus Joe Flynn and his colleagues believed that the early program was fundamentally misdirected: The program effectively saved the cheapest energy while overlooking Duquesne's basic residential kilowatt-hour – energy used for non-heating purposes.[R#2]

The End-Use approach: Given the program's original parameters, Program Leader Joe Flynn and his team suggested restructuring the program to encompass households' entire electricity load. (In fact, later by coupling activities with local gas companies, the program effectively took on total household energy consumption.) Flynn and his colleagues believed that expanding its scope would likely improve participation while similarly broadening opportunities for savings. Thus in 1992 Duquesne piloted Smart Comfort's End-Use program to address each and every electric use in eligible households. Through this program enhancement, referred to herein as "the End-Use approach," Smart Comfort did not simply install weatherization measures and compact fluorescent lamps but "threw the doors open" to any solution which would reduce energy use, including appliances and education. This program proved very effective both in terms of participation and cost, earning it another Governor's Energy Award and a National Energy Award from the U.S. DOE.[R#2]

THE SMART COMFORT PROGRAM MISSION STATEMENT

We are proactive managers of Duquesne Light's Smart Comfort Program who are customer focused, quality driven, and results oriented. Our goal is to decrease program participants' electric use and increase the percentage paid of their current bill. We are open to new ideas and ways of engaging our customers in meeting this goal.

As industry pioneers, we seek personal and team growth to make knowledgeable decisions and take responsible actions. We will maximize our ability to provide this service to all who qualify and join us in a "win-win partnership" to meet the Program's objectives by using all available resources effectively and efficiently. In carrying out our mission, we will treat all stakeholders, including each other, with respect and dignity.

PROGRAM DESIGN

In addition to addressing all electricity uses within homes, the End-Use approach also radically differed from the original Smart Comfort program design and other LIURP program designs in that it neither focused on water or space heating, nor presented prescribed technical measures to its customers in a “cookie-cutter” fashion, but rather determined an energy reduction strategy based on customers’ consumption habits. Savings opportunities at the participant level were identified through a walk-through audit of the home and discussion with the customer. This “customer focused” approach not only added an educational tool to inform the customer of energy-saving practices, but created a foundation for partnership between the customer and the utility.

Staff training: The first step in developing the End-Use approach for Smart Comfort was training potential program staff. This was a very important step in the program because Duquesne attributes the program’s success to its highly qualified and well-trained staff. Prior to launching the End-Use pilot, Duquesne conducted a comprehensive training for and evaluation of program staff candidates. Candidates were selected from contractors who had worked previously on the Smart Comfort program. The training session concentrated on developing skills in the following areas: energy efficiency education; energy auditing; measure installation; bill analysis; customer interactions; and cost-effective decision-making. The session began with an overview of the end-use philosophy and the program’s goals.

All program staff candidates were required to attend the training session regardless of the position for which they were considered. Soliciting all potentially interested candidates for the training session provided a surplus of qualified candidates in the event that one of the selected trainees did not work out. The surplus also helped to foster a wider acceptance of a new way of doing business in the energy efficiency field. Approximately 20 candidates attended the two-week training process for selection to the program.[R#2]

Energy Managers: Program Managers selected the top performers from the training session to be contracted as the program’s Energy Managers. Their role has been considered essential to Smart Comfort’s End-Use approach. (For this reason, the “End-Use” approach is also known as the “Energy Manager” approach.) Energy Managers serve as “energy case-workers” for the customers. Their role is to evaluate customers’ energy use and provide tailored solutions which include energy and water conserving installations, appliance replace-

ment, and awareness building. Energy Managers are subcontracted from three independent firms: Conservation Consultants, Kinetechs, and Steel Valley OIC. Conservation Consultants serves as the primary contract administrator for Smart Comfort.

Energy Managers not only conduct walk-through audits of customers’ home but ask participants questions about their daily habits. For instance, how many hours per day does a customer’s family watch television? Is the living room light usually on when they watch it? How many loads of laundry do they do a week? Do they check the dryer to see when the clothes are dry or simply turn it on for an hour? By investigating customers’ energy uses, Energy Managers are able to identify and flush out unnecessary energy use. In order to accomplish this, the Energy Managers must be effective communicators while at the same time technically qualified.[R#2,5]

Program leaders and staff believe that a primary ingredient in the success of the End-Use approach has been the latitude given to Energy Managers. They have been given full flexibility and responsibility for deciding what measures Duquesne will provide to help the customer reduce his or her energy use. This creative freedom and decision-making license, along with intensive training, have proven essential ingredients for empowering and motivating the Energy Managers to save the most energy at the lowest cost. It also requires that the Energy Manager has good judgement, sound decision-making skills, and is dedicated to the program’s mission of cost-effectively reducing customers’ energy bills.

The Scheduler: The Smart Comfort program staff also includes a Scheduler who reviews the database of program candidates, decides which customers will be selected for participation, and monitors participants’ progress through the program.

Smart Comfort team members meet weekly on Fridays to discuss the week’s results and activities and review the status of current projects. These staff meetings provide a routine forum in which program management can address program bottlenecks and explore further program refinements. Joe Flynn suggests that Smart Comfort’s success continues to be refined by a program staff that is continually learning and improving, and whose feedback serves to incrementally improve the program design.

DELIVERY: THE STEP BY STEP PROCESS

Program eligibility requirements: In order to qualify for Smart Comfort customers must meet the following require-

Program Design and Delivery (continued)

ments: They must have an average daily electricity use of 20-27 kWh; they must have been Duquesne customers at the current address for the past twelve months; participants must have made at least three bill payments in the past twelve months; participants' income must not exceed 150% of the national poverty level; and they must either rent or own a single-family or one-to-four family unit structure. (Two additional prerequisites were applied during the pilot program: Participants' non-heating energy consumption had to fall within the 65-85 percentile; their energy consumption between heating season (October through March) and cooling season (June through September) could not differ by more than 20%. In addition, the household consumption threshold for the pilot program was 15 kWh per day.)

Duquesne maintains a database of solicited and referred customers which includes details on program participation using the DISCuS Management Information System, the utility's customer service database on the company's mainframe. Customers meeting these prerequisites are then forwarded to the TERMS database which was developed for the program by an outside contractor and used for scheduling Smart Comfort participants. [R#2]

Scheduling participants: Selecting customers from the TERMS database and scheduling their retrofits is based on several parameters. For instance, the Scheduler considers which customers have been on the waiting list the longest, which have the highest usage, and which customers have the highest arrearages. Based on these factors, the Scheduler chooses suitable customers and contacts each one to verify that the customer has been at the current residence for at least one year; that the customer is at the appropriate income level; and that the customer plans to remain at that residence for at least another year. Once a customer's eligibility has been verified, additional data regarding the customer's billing and usage information is transferred from DISCuS to TERMS. If the customer is a tenant, the landlord must sign a release acknowledging and supporting program participation. The participant is then assigned to an Energy Manager based on location and scheduled for an in-home visit.

Prescreening participants: The Energy Manager's first action on a specific residence is to review the customer's billing, usage and payment history and any other available information. Prior to visiting the customer's home, the Energy Manager calls to confirm the appointment and to conduct a pre-visit interview. Information on the household's appliances, number of occupants, other energy fuels which may be used,

type of dwelling or any other helpful or relevant information which can be gathered prior to the visit is collected. From this the Energy Manager can disaggregate the customer's electric bill by end-use and formulate a preliminary reduction strategy.

Customer education: The Energy Manager generally begins the site visit by connecting a watt-hour meter to the refrigerator – a highly insightful exercise in isolation – and by explaining the program thoroughly to the customer. After reviewing the program's eligibility requirements with the customer (known as the "Documentation of Eligibility"), the customer must sign a "Program Release" which authorizes the utility to work within the home and which indemnifies the utility for its actions. The Energy Manager then reviews the home's most recent bill with the customer and discusses his or her electricity usage. This awareness building exercise, simple as it may seem, is reportedly a major function of program success and responsible for behavioral changes within homes that have led to significant energy and dollar savings. Customer education continues throughout the in-home visit as opportunities to identify efficiency improvements arise.

The walk-through audit: After the initial discussion a walk-through audit is conducted during which the Energy Manager educates the customer about energy-saving practices. At the same time, simple hardware installations are made and appropriate retrofits are identified. The hours of operation of certain lighting fixtures are discussed and where appropriate the Energy Manager installs compact fluorescent lamps on the spot at no charge to the customer. Each appliance's energy use is reviewed so that replacement or use modification can be discussed with the customer. Because the refrigerator is usually the largest electricity user in the home after any resistance heating, it is a common candidate for replacement and at the conclusion of the walk-through audit the Energy Manager takes a watt-hour reading of the refrigerator to determine its consumption and whether the customer is eligible for a no-cost replacement refrigerator. Another appliance of specific program importance are waterbeds that are disproportionately common in low-income households due to their low first cost. Given their energy intensity and large contribution to monthly electric bills, Energy Managers focus on waterbeds, discuss their operating costs with customers, and in many cases recommend their removal and replacement with foam mattresses.

Tracking customers' energy consumption: Customer demographic information is collected by the Energy Manager during field visits and logged into a hand-held computer called Sharp Wizard. The reading of the diagnostic meter on the re-

frigerator is also recorded. This information is then later downloaded into TERMS, the program's management, information, and tracking system.

Estimating savings and scheduling follow-up visits: Before leaving the residence the Energy Manager develops an estimated savings goal with the customer, making him or her an active participant in the process, and discusses the procedures for upcoming events such as appliance deliveries and follow-up phone calls. Participation in the program also requires the customer to sign a "Partnership Contract" which provides a legal basis for subsequent appliance replacement or home retrofits and repairs. The entire site visit usually lasts two hours or less.

Arranging appliance replacements: If the audit reveals that an appliance needs to be replaced (typically a refrigerator or waterbed), the customer signs a "Replacement Contract." Not only does the contract fulfill a legal obligation but it serves as a tracking mechanism. It is forwarded to the Scheduler who in turn faxes it to the appropriate vendor. It is the Scheduler's responsibility to see that these replacements are made in a timely manner. Once the appliance has been replaced a copy of the invoice signed by the customer is faxed back to the Scheduler.

Scheduling retrofits and repairs: For retrofits and repairs recommended during the audit, a contract is again signed. Arranging a subcontractor and coordinating the installation is the Energy Manager's duty. The Energy Manager must make the appointments and verify that the work has been done to program standards. By enabling the Energy Manager to broker the services required by the walk-through audit, he is able to limit himself to one visit to the customer's house, keep program costs in check and allow the program's services to be spread to as many eligible customers as possible.[R#5]

Property manager contributions: As with the site visit, all measures resulting from the Smart Comfort audit are free to the customer, including new appliances. In the case of multi-family units with property managers, a cost-sharing agreement for appliance replacements and retrofits is usually negotiated with the property manager. On various occasions property managers have purchased half and sometimes all of the replacement units.

Follow-up contact requirements: A year of post-installation tracking begins once appliance replacements and retrofits have been completed. As stipulated by the program, the customer is required to call his or her Energy Manager each month fol-

lowing the receipt of the monthly electric bill. This is done to track the customer's post-installation consumption and to give the customer the opportunity to ask questions about problems he or she may have with installed measures. This post-installation contact also gives the Energy Manager the opportunity to determine if the customer is following through with both the technical and behavioral energy-saving modifications identified during the visit.

Quarterly phone calls from Energy Managers: Each program participant is also supposed to receive a quarterly follow-up call from his or her Energy Manager in the year following the in-home visit to discuss changes in energy bills to ensure expected savings. Site visits were also conducted for 20% of the households serviced during the pilot year to determine that installed measures such as compact fluorescent lamps were still in place and functioning, and to meter the consumption of replacement refrigerators.

Final post-participation survey: After twelve months the Energy Manager is required to conduct a post-work survey to identify reasons for pre/post consumption variation such as changes in appliances and changes in family size. Once the survey is completed the customer exits the program.

These post-installation actions depict yet another role of the Energy Manager, this time as the point person regarding monitoring participants' results. Duquesne's success in delivering Smart Comfort cost-effectively lies largely in the consolidation of several tasks into one person's job descriptions. Energy Managers are complete caseworkers. They collect the necessary information on participants; conduct audits; identify appropriate measures; arrange installations; provide energy efficiency education; and conduct post-installation tracking. This reduces the need for duplicate work and additional employees thus keeping program costs down.

MARKETING

Information on potential participants regarding customer history, payment history, income and energy consumption is gathered using a variety of means. Referrals to the program are made by Duquesne's Customer Service Department, other utilities such as the three cooperating gas utilities, other weatherization programs, social service agencies, low-income building owners or managers, LIHEAP lists, and customer phone-in inquiries. Direct marketing efforts to customers include bill stuffers, direct mailing, and door-to-door canvassing of targeted neighborhoods.[R#2]

Program Design and Delivery (continued)

In targeting low-income customers, certain considerations for customer relations have been important. In some cases, customers reside in gang-populated neighborhoods. For areas where gang activity is prevalent, a gang liaison is used to provide safe passage for the Energy Manager.[R#2]

A promising marketing strategy involves inter-utility cooperation. In order to better serve its customers and meet its goals for improving energy use within its territory, Duquesne has cultivated a cooperative relationship with the three gas utilities (Columbia Gas, Equitable, and People's) that share its service territory. Because these utilities have similar mandates, Duquesne staff have been able to reinforce their program's wrap-around services thanks to cooperation with the gas utilities. Just as the gas utilities notify Duquesne of potential gas program participants, Duquesne contacts the gas utilities and notifies them of qualified program participants.[R#22]

Inter-utility cooperation is mandated by LIURP although it has not always achieved the level of cooperation seen in Pittsburgh. Information regarding service visits by the gas utilities is shared with the Scheduler so that Duquesne can include the customer in the Smart Comfort program and audits can be scheduled to coincide with the gas company's appointment. In fact, in most cases, Duquesne's Energy Managers will perform the audit for the gas company, including blower door analysis. In doing so, disruption for the customer is minimized and customer services from both utilities is heightened. This creates a win-win situation, benefitting all parties involved; the gas utilities are relieved of performing the audits but cover their portion of the cost; Duquesne gets referrals for Smart Comfort; and the customer receives LIURP services from both utilities with only one audit.

MEASURES INSTALLED

Under its original Heating approach Smart Comfort delivered a range of measures from water heater insulating wraps to pipe wrap, to aerators and low-flow shower heads, heating plant tune-ups, air sealing measures, retrofit insulation, and compact fluorescent lamps.[R#2]

From the start, Smart Comfort attempted to set and maintain high performance standards. Perhaps one of the most impressive of these standards is the requirement that installed measures have a maximum simple payback of four years rather than

the LIURP standard of seven years. As such the list of measures installed ranges from low-cost measures to direct installation of compact fluorescent lamps to replacement of major appliances to full home weatherization based on cost-effectiveness.

Updating Smart Comfort's design to include all End-Use measures encompassed virtually everything which affected the household's energy use. This involved some detective work on the part of the Energy Manager. For example, televisions are not commonly regarded as major energy users. However, if a customer has as many as three or even four televisions on all day, they become a factor well worth addressing. The appropriate measure for this appliance is obviously not technical, but educational: Teach the customer to lower his energy bill by turning televisions off. This exemplifies the sensitivity that the Energy Manager must employ, suggesting not only technical solutions but behavioral ones as well.

Commonly installed measures for various end-uses are discussed below:

Waterbeds: Waterbeds can use from 500 to 1,600 kWh annually, making them nearly as significant a contributor to a household's energy consumption as the refrigerator. Smart Comfort's End-Use approach was the first program in the United States to address this unique load. The program provides customers with the opportunity to either replace the waterbed mattress with a foam mattress thereby eliminating its electric use, or to install foam pads on existing waterbeds, cutting heat loss and reducing its electric use. Because waterbed frames are not the same size as conventional mattresses, replacement foam mattresses are specially manufactured and available from Serta through the program.[R#6]

<i>BED SIZE</i>	<i>NUMBER OF BEDS</i>	<i>NUMBER REPLACED</i>	<i>PERCENT REPLACED</i>
<i>King</i>	32	17	53%
<i>Queen</i>	28	13	46%
<i>Super Single</i>	11	5	45%
<i>Don't Know</i>	7	0	0%
<i>Total</i>	78	35	45%

The evaluation of Smart Comfort's End-Use approach revealed that 39% of participating customers owned waterbeds, compared to 10% for the general population. The size and replacement ratio of these beds is shown in the accompanying chart. Duquesne replaced 35 beds or 45% of the total number possible during the End-Use Pilot program.

Refrigerators: Midway through the End-Use Pilot it was decided that any refrigerator with a daily use of 5 kWh or more was a candidate for replacement. This threshold was raised to 6 kWh when Duquesne lowered its residential rates in 1994. During the pilot program the 184 serviced households owned a total of 230 refrigerators and 97 freezers. Some of these customers agreed to a "2-for-1" replacement through which Duquesne would replace both the refrigerator and freezer with a larger, more efficient refrigerator/freezer. Program Managers view this 2-for-1 exchange as one of Smart Comfort's biggest "gold mines" for savings. Basic maintenance for the refrigerator, such as cleaning its coils and checking its temperature setting is also administered through the program.

Lightbulbs: Replacing incandescent lightbulbs with compact fluorescent lamps is considered for any fixture which is used four hours or more per day. For instance, during the 1992 End-Use Pilot the average number of installed bulbs per household was 5.2.

Water Heaters: Smart Comfort reduces the electricity consumption of customers' water heaters by lowering the temperature to 120 degrees F, installing water heater blankets and pipe insulation, and installing high performance, water-saving showerheads and faucet aerators. Further measures such as timers, element replacements, and change-outs have also been installed as necessary. For the End-Use Pilot year only 13% of the serviced dwellings heated their water electrically.

Other Measures: Smart Comfort also installs other energy savings measures if they are determined necessary after the walk-through audit. These include weatherization installation, appliance upgrades such as installing clothes dryers with moisture sensors, or whatever else may be recommended by the Energy Manager. In some cases, clothes lines have even been installed! Other appliances which received upgrades, adjustments, repairs, or retrofits have included washing machines, electric ranges, dishwashers, window or house A/C units, gas furnaces, dehumidifiers, water pumps, fans, aquariums, space

heaters, and pumps for above ground swimming pools. Furthermore, and as evidence of the customized nature of the End-Use approach and creativity of the Energy Managers, Duquesne has recommended measures such as additional blankets on waterbeds, elevating dehumidifiers, and using toaster ovens as alternatives to electric ranges.

Addressing these less prevalent and demanding appliances has required some investigation. Linda Wigington, a consultant for Smart Comfort, provided the example of how a survey of the fan market was necessary in order to determine which models were most efficient. (Metering various fans verified their nameplate consumption.) Duquesne staff discovered that fans on rotating pedestals provide better circulation and use less electricity than box fans, making pedestal fans three times more efficient. Barry Kukovich has been active in exploring even broader energy-saving possibilities. While these options have been found inappropriate for the program to date, the door remains open to new options. Program staff maintain awareness of developing technologies such as microwave dryers and horizontal axis washers. Through such an orientation, staff have made Smart Comfort a dynamic exercise and pursuit for its customers.

STAFFING REQUIREMENTS

The Smart Comfort program is implemented by a remarkably small internal staff. Joe Flynn serves as the Program Leader; Barry Kukovich is the Program Manager. Dedicated contractors – actually paid by independent firms under contract with Duquesne – include four Energy Managers and one Scheduler. All other supporting staff – for instance weatherization professionals and appliance repairmen – are contracted through Conservation Consultants Inc. (CCI) which has administered the program since its inception. However, thanks to the vision of Joe Flynn, external staff dedicated to the program are essentially Duquesne employees: Their hours, pay, vacation schedules, and holidays are set by Duquesne in order to instill a sense of loyalty between the utility and the field crew.

Monitoring and Evaluation

MONITORING

Monitoring of pre-installation and post-installation electricity consumption for Smart Comfort participants is conducted through billing analysis. Information on all participant's energy usage is maintained in a database using the TERMS program. All additional pertinent information regarding the job, such as number of occupants and types of appliances, is gathered by the Energy Manager and included in the database.

Post-installation phone calls made by the Energy Manager are scheduled to check the persistence of conservation behavior and use of installed measures. These follow-up contacts provide the opportunity to discuss savings persistence and what variables might be influencing persistence, such as changes in occupancy or the introduction of new appliances onto the premises. Because of time limitations, follow-up interviews have only been conducted about 20% of the time. As the program matures, a greater emphasis on this portion of the program is expected.

Watt-hour metering is performed on all refrigerators in the home during the Energy Manager's visit. A replacement is warranted if the refrigerator's usage is determined to be over 6 kWh a day, based on the one-hour reading. During the pilot of the End-Use approach, metering was conducted on the customer's primary refrigerator for 24 hours. This metering was used to determine the accuracy of the one-hour measurements as an indication of the unit's overall consumption. Duquesne compared 24-hour usage that had been metered and 24-hour usage calculated from a one-hour reading and found that calculated usage for primary refrigerators was only slightly lower than actual usage. Conversely, measurements taken from secondary units and freezers resulted in calculations which were slightly higher than metered consumption. Based on these results, Duquesne concluded that one-hour metering was sufficiently accurate for determining which units to replace.

EVALUATION

LIURP Evaluation: The Smart Comfort program was analyzed using the PPUC's annual performance evaluation criteria. This evaluation compared 12 months prior usage to 12 months of post-installation usage from a sampling of participants with weather adjustments. Evaluation findings are reported for all Pennsylvania utilities in the PPUC's annual LIURP evaluation. The report segments results by space heating, water heating, and End-Use jobs so that the performance of each method can be compared.

The evaluation of 1992's LIURP programs provides a good comparison of Duquesne's traditional design for the Smart Comfort program which targeted customers with electric heat and its End-Use approach pilot which targeted high End-Use customers. The table on the next page provides data for both programs for program year 1992 along with the mean figures for all LIURP programs statewide. It is evident from the information in the table that (1) both methods Duquesne employed were better than average for Pennsylvania electric companies, and that (2) the End-Use approach was more successful than the traditional prescribed approach targeting water heating customers. The PPUC's evaluation determined a normalized average electricity usage reduction of 27% among participants of Duquesne's End-Use pilot.

End-Use Pilot Program Evaluation: An extensive independent evaluation of Smart Comfort's End-Use Pilot was conducted to determine if targeting high end-use customers rather than heating customers was a viable alternative; if the level of projected savings were indeed achieved; the factors relating to savings such as measures installed and size of households; and the cost-effectiveness of the program. The evaluation was performed by Judith Gregory of Applied Energy Research.

PERFORMANCE OVERVIEW	DUQUESNE'S ELECTRIC WATER HEATER APPROACH	DUQUESNE'S END-USE APPROACH	PA'S MEAN ELECTRIC WATER HEATER PROGRAM	PA'S MEAN ELECTRIC HEATING PROGRAM
Type of unit	98% multi-family	97% single family	37% single family 28% mobile home	41%single family 33% multi-family
Mean year built	1976	1933	1957	1957
Mean # of occupants	2.7	3.9	2.8	2.8
Mean energy reduction	15.0%	27.0%	5.5%	7.3%
Average job costs	\$290	\$538	\$211	\$1,037
Est. annual bill savings	\$187	\$346	\$62	\$98
Average simple payback	1.6	1.6	5.3	14.1

The evaluation concluded that the End-Use approach was an effective alternative to a heating-based approach for energy savings. Data was collected on 134 of the 184 participants in the pilot year and revealed an average actual annual savings of 1,524 kWh, equivalent to an overall 17.5% electricity reduction. This value was adjusted against the average energy savings experienced by a control group of 100, for a net savings of 1,305 kWh, or a usage reduction of 14.9%. This overall savings value was significantly lower than the savings determined by the PPUC evaluation. Several methodological differences were responsible for this discrepancy. Most significantly, the PPUC analysis presented weather-normalized data but used no control group. Applied Energy Research used control-adjusted data but did not normalize for weather. Furthermore, preliminary baseline assumptions for annual electrical End-Use use differed by over 1,000 kWh per household. Because the PPUC presents a consistent method for calculating savings over a span of years, The Results Center presents PPUC data in the Savings section.

Other findings from the evaluation indicate that lighting, refrigerators, and waterbeds were the primary technical sources of savings. Households which only received lighting replacements had an average monthly savings of 59 kWh. Those with replaced refrigerators in addition saved an average of 175 kWh a month. For both waterbeds and lighting replacements the average savings was slightly better at 180 kWh per month. Finally, all three measures produced an average savings of 207 kWh monthly.

Evaluator Judith Gregory noted several cases which were inconsistent with these findings, indicative of two scenarios. One situation she found was savings that were much greater or lower than expected because of either an incidental change of occupancy or number of appliances. An example given was one of a son who had moved out of his family's home, taking his waterbed with him. The other occurrence was of a greater than expected savings as the result of the program's non-technical aspect, verifying the importance and potentials exhibited through the program's educational component.

Program Savings

Electricity savings for the first four years of Smart Comfort are not available. The Savings Overview table presents performance data for 1991 through 1994 which includes one year prior to the End-Use approach pilot. Total annual savings for these four years was 7,655 MWh for total cumulative savings of 18,930 MWh and lifecycle savings of 114,827 MWh. While a full year's worth of post-installation data has not yet been analyzed, preliminary calculations project a usage reduction as high as 40% for Smart Comfort in 1994. Based on this value, annual savings for 1994 will be 2,171 MWh, total cumulative savings will be 8,264 MWh, and lifecycle savings will reach 32,564 MWh.[R#14]

The total annual savings stated in the Savings Overview table have been disaggregated into Heating approach jobs and End-Use approach jobs in the tables on the next page. These tables give further explanation of the success of the End-Use approach and the evolution of the Smart Comfort program. End-Use jobs, which are performed on homes with no electric space or water heating, have increased steadily since this program design was piloted in 1992. Participation is expected to level out near the current rate of 650 homes per year. There has been a slight decline in the baseline usage of participants which reaffirms that the program targeted the highest users in the first year. Energy savings have risen significantly from 27% in the pilot year to an estimated 40% for 1994. This trend indicates Energy Managers' improved proficiency in identifying and achieving usage reduction.[R#14]

Inversely, the number of heating and water heating retrofits performed by Smart Comfort has dropped off. In 1991, there

were still electric heating customers eligible for the program. This is reflected in the notably higher baseline consumption per home of 11,484 kWh. The 27.3% savings which was produced in that year was primarily the result of a large multifamily project performed that year which had an extremely inefficient duct system. By 1992, a handful of electrically heated customers were serviced through the program's End-Use approach, not only to capture the added savings opportunities, but also because the heating systems in place were generally efficient enough that additional improvements could not be made cost effectively. Smart Comfort did, however, deliver basic water heating efficiency measures to 648 customers achieving a savings of 15%. This level of reduction is nearly half that of the End-Use approach underscoring the fact that the program is underperforming when addressing only space and water heating. By 1993, all Smart Comfort participants received the End-Use approach. The 174 participants listed separately under water heating jobs are simply the number of customers who had electrically heated water. The jump from 15% to 32% energy savings is the result of adding end-use measures to the program design.[R#14]

PARTICIPATION RATES

The participation level for Smart Comfort was 514 for its first full year and grew steadily until it reached a maximum of 832 in 1992 when the End-Use approach was piloted, 184 of these participated in the pilot program. Since then, with the program under its new design, between 625 and 656 customers have been serviced annually. Participation for 1995 is projected to be between 600 and 650.[R#14]

SAVINGS OVERVIEW	ANNUAL ENERGY SAVINGS (MWh)	CUMULATIVE ENERGY SAVINGS (MWh)	LIFECYCLE ENERGY SAVINGS (MWh)	PERCENT SAVINGS FROM BASELINE
1991	2,203	2,203	33,039	27.3%
1992	1,385	3,588	20,782	17.8%
1993	1,896	5,484	28,442	35.5%
1994 projected	2,171	7,655	32,564	40.0%
Total	7,655	18,930	114,827	28.8%

During its original heating-based approach, participation in Smart Comfort was comprised of approximately 80% multi-family units and 20% single family dwellings. This was a function of the high occurrence of space heating in multifamily units. These figures were reversed for End-Use participants with 80% single family and 20% multifamily. [R#3]

MEASURE LIFETIME

The Results Center and Duquesne staff have assigned a weighted average measure life of 15 years for measures delivered through this program to determine lifecycle savings and the cost of saved energy.

PROJECTED SAVINGS

The LIURP regulation is imposed on all Pennsylvania utilities by the PPUC through 1997. It is expected that Smart Comfort will continue to perform at or above its current level for the duration of the LIURP regulation, with participation between 600 and 650 annually, achieving a usage reduction of 40% or better.

<i>PARTICIPATION</i>	<i>PARTICIPANTS</i>	<i>SAVINGS PER PARTICIPANT (kWh)</i>
1988	39	NA
1989	514	NA
1990	629	NA
1991	703	3,133
1992	832	1,665
1993	625	3,034
1994	656	3,309
Total	3,998	

DATA ALERT: Energy savings estimations are based on pre- and post-installation analysis for a subset of program participants. The 1994 savings represent projections based on early results of post-installation monitoring.

<i>HEATING/WATER HEATING JOBS</i>	<i>NUMBER OF PARTICIPANTS</i>	<i>BASELINE ENERGY USE (kWh/home)</i>	<i>ANNUAL SAVINGS kWh/home)</i>	<i>PERCENT SAVINGS FROM BASELINE</i>
1991	703	11,484	3,133	27.3%
1992	648	9,214	1,382	15.0%
1993	174	9,287	2,972	32.0%
1994 projected	6	9,287	3,715	40.0%

<i>END-USE JOBS</i>	<i>NUMBER OF PARTICIPANTS</i>	<i>BASELINE ENERGY USE (kWh/home)</i>	<i>ANNUAL SAVINGS (kWh/home)</i>	<i>PERCENT SAVINGS FROM BASELINE</i>
1991	0	0	0	NA
1992	184	9,861	2,662	27.0%
1993	451	8,264	3,058	37.0%
1994 projected	650	8,264	3,306	40.0%

Cost of the Program

Program costs for Smart Comfort since its onset in 1988 through 1994 have totaled \$5,283,835. Under its original design as a heating-based program, annual costs ranged from \$557,020 to \$671,568. The total cost of the End-Use approach pilot in 1992 was \$191,435 while total program costs for that year were \$692,153. The balance of 1992's expenditure (\$500,718) was spent on Heating-based Smart Comfort activities. Starting in 1993, although heating was still addressed by Smart Comfort when it occurred, all jobs included an End-Use aspect and the program's first full year expenditure remained relatively level at \$674,257. Expenditures for 1994 totaled \$717,024. [R#14]

COST PER PARTICIPANT

The PPUC's LIURP evaluation found an average per home cost of installed measures for End-Use approach jobs of \$538 in 1992 and \$341 in 1993. (All dollar values stated in the Cost per Participant section have been leveled to 1990 US\$ equivalents for comparative purposes.) By comparison, the first-year bill savings for End-Use jobs was \$346 and \$321 for 1992 and 1993 respectively. Water heating jobs had an average installation cost of \$290 for 1992 and \$100 for 1993 producing annual bill savings of \$187 in 1992 and \$315 in 1993. This increase in billing savings implies the delivery of additional end-use measures.

The Results Center calculations for Smart Comfort's cost per participant, excluding 1988 which was primarily spent on program design rather than implementation, has ranged from \$773 to \$1,142. Cost per participant for 1992 and 1993 were calculated to be \$773 and \$973 respectively, considerably higher than the values reported by Duquesne. The figure for 1994 was \$960 which was also the mean value for the program's cost per participant for the history of Smart Comfort. For 1995, the cost per participant is projected to be between \$946 and \$1,025 based on 600-650 anticipated retrofits.

The average cost per customer dropped steadily from the program's first year until it hit a low in 1992 when the End-Use approach was piloted. This was also the record year for participation, with 832 participants, a value which had climbed steadily since the onset of the program. The End-Use portion of the program had an average cost of \$1,040. Beginning in 1993, the program was operated according to the End-Use design and a jump was seen in average costs with its corresponding dip in participation.

COST EFFECTIVENESS

The PPUC's evaluation of Smart Comfort's End-Use approach pilot presented an average simple payback based on the utility's costs and participants' savings of 1.6 years. This figure is well within the PPUC's requirement of 7 years and is well below the payback periods for any of the other LIURP programs implemented by other Pennsylvania utilities. However, it should be noted that this attractive payback figure is in part the function of Duquesne's high rates. This approach, if transferred to another territory, might not yield the same results in areas with rates more in line with the national average. (The Results Center has calculated a payback period of 2.2 years, based on the same savings value but the higher cost per participant discussed above.) Nonetheless, the End-Use approach is a much less labor-intensive means of achieving energy reduction and is better targeted for low-cost energy savings than traditional weatherization programs. Thus, Smart Comfort's new design enjoys improved cost-effectiveness. [R#2]

The cost of saved energy as calculated by The Results Center at a 5% real discount rate improves from 4.47¢/kWh during the pilot year for the End-Use approach to a projected 2.79¢/kWh for 1994. Note that the value of 4.47¢/kWh represents not only Smart Comfort's End-Use approach but its traditional heating approach as well.

COSTS OVERVIEW	ADMIN. COSTS	MEASURE COSTS	OTHER PROGRAM COSTS	TOTAL PROGRAM COST Nominal	TOTAL PROGRAM COST Levelized
1988	\$100,389	\$468,481	\$100,389	\$669,259	\$739,410
1989	\$83,553	\$389,914	\$83,553	\$557,020	\$587,117
1990	\$90,383	\$421,788	\$90,383	\$602,554	\$602,554
1991	\$100,735	\$470,098	\$100,735	\$671,568	\$643,308
1992	\$103,823	\$484,507	\$103,823	\$692,153	\$643,067
1993	\$101,139	\$471,980	\$101,139	\$674,257	\$607,688
1994	\$107,554	\$501,917	\$107,554	\$717,024	\$629,685
1995	\$105,000	\$490,000	\$105,000	\$700,000	\$614,735
Total	\$792,575	\$3,698,685	\$792,575	\$5,283,835	\$4,640,224

COST COMPONENTS

Program cost components are presented in the Costs Overview table and are based on program averages from PPUC calculations. In Pennsylvania an average of 70% of total pro-

gram costs is expended on measure installation. The table assumes that the program's administrative costs were equal to the Commission's 15% administrative cost cap. Barry Kukovich believes that the actual figure for Smart Comfort was closer to 10% and that the difference represents funds used for program marketing, tracking, and evaluation.

COST OF SAVED ENERGY (¢/kWh) Levelized	3%	4%	5%	6%	7%	8%	9%
1991	2.45	2.63	2.81	3.01	3.21	3.41	3.62
1992	3.89	4.17	4.47	4.78	5.10	5.42	5.76
1993	2.68	2.88	3.09	3.30	3.52	3.74	3.98
1994	2.43	2.61	2.79	2.99	3.18	3.39	3.60

Additional Program Benefits

Avoided emissions: Duquesne, like many other coal-burning utilities, has a strong incentive to cut sulfur emissions to comply with Clean Air Act requirements. Although Duquesne program staff have not calculated the specific avoided emissions resulting from Smart Comfort's energy savings to earn sulfur allowances, it will likely do so in the future. Currently Duquesne estimates a \$20 million expenditure to meet compliance through fuel switching, "scrubbing" existing capacity, flue-gas conditioning, and implementing low NOX burning technology. [R#1]

Energy savings without indoor air quality sacrifice: One of Smart Comfort's ancillary benefits is that it does not have the negative impact on indoor air quality associated with many residential efficiency programs. Weatherization programs tend to seal houses, reducing heat loss and ventilation in the process. Such practices can also trap indoor air pollutants in homes. Through its comprehensive approach, Smart Comfort has achieved impressive energy reductions without deteriorating homes' indoor air quality.

Lowering utility bills: Smart Comfort's number one purpose is to lower energy costs for low-income customers and never has this been more critical than today. While Pennsylvania's economy continues to be depressed, the problem has become more acute due to shrinking federal support. And just as eligible participants continue to increase, available aid has dropped. Thus the assistance offered through Smart Comfort fulfills a critical social function.

Stemming bill arrearages and collection costs: In turn, Smart Comfort has reduced the occurrence of bill arrearages, reducing not only the amount of uncollected revenue but also the associated costs of collection efforts. Program Leader Joe Flynn explains that when considering this unusual metric of success, the utility has enjoyed a return on its investment in Smart Comfort. In other words, for every program dollar spent in a given year, low-income customers pay a portion of their unpaid bills that would not have otherwise been repaid. [R#4]

Connecting the customer with other social programs: Smart Comfort places Energy Managers in the homes of Duquesne's neediest customers. Once in the homes they are able to observe much more than just the customer's energy use. From their vantage point, Energy Managers have been able to put customers in contact with other resources which may assist them with other needs. Extending beyond concerns related to energy, Smart Comfort staff have identified financial and social services for customers when appropriate, in some

cases directing program recipients to services deemed far more critical than saving energy.

Perhaps the consummate example of the far-reaching social aspect of the program, and the Energy Managers' conviction to serving their constituents, involved a family that had literally lost its farm and which was living in a dilapidated mobile home whose wiring was in dangerous disarray. The Energy Manager on the case, concerned about the family's safety, brought the situation to the attention of appropriate authorities. In the end, the local electricians union came forth and rewired the home for the family at no charge.

Aligning electricity savings with gas savings: Duquesne's program managers recognized and have exploited the opportunity to coordinate Smart Comfort with natural gas saving efforts by working closely with the three regional gas utilities. Energy Managers will either contact the appropriate gas utility on participants' behalf to coordinate retrofits and thus to minimize customer inconvenience or conduct an audit for the gas utility during their scheduled in-home visit. Through this collaboration, Smart Comfort has become a fuel-blind program, genuinely serving participants' critical needs to lower overall energy use to save money.

THE ENVIRONMENTAL BENEFIT STATEMENT:

The Environmental Benefit Statement is intended to provide approximations of avoided air emissions for the electricity savings from a particular program when applied to another region or service territory. To transfer Duquesne Light Company's program success to your own situation, first determine the representative marginal power plant for your situation by perusing the left hand column of the table. What type of generation will be avoided if you enjoy Duquesne's level of success with a similar program in your region or service territory? Once you have determined the proxy power plant based on fuel type, heat rate (the efficiency of the power plant), and sulfur content in the fuel, move to the right across the row selected to find approximations of avoided emissions should you achieve comparable savings. Note that the coefficients in each cell of the table contain a 10% credit for transmission and distribution losses avoided through energy efficiency.

* TSP = Total Suspended Particulates
NSPS = New Source Performance Standards
BACT = Best Available Control Technology

ENVIRONMENTAL BENEFIT STATEMENT

➔ **Avoided emissions based on 18,930,000 kWh saved 1991-1994**

<i>Marginal Power Plant</i>	<i>Heat Rate BTU/kWh</i>	<i>% Sulfur in Fuel</i>	<i>CO2 (lbs)</i>	<i>SO2 (lbs)</i>	<i>NOx (lbs)</i>	<i>TSP* (lbs)</i>
-----------------------------	--------------------------	-------------------------	------------------	------------------	------------------	-------------------

Coal	Uncontrolled Emissions					
A	9,400	2.50%	40,813,000	968,000	196,000	20,000
B	10,000	1.20%	43,520,000	375,000	126,000	94,000
Controlled Emissions						
A	9,400	2.50%	40,813,000	97,000	196,000	2,000
B	10,000	1.20%	43,520,000	37,000	126,000	6,000
C	10,000		43,520,000	250,000	125,000	6,000
Atmospheric Fluidized Bed Combustion						
A	10,000	1.10%	43,520,000	115,000	62,000	31,000
B	9,400	2.50%	40,813,000	97,000	78,000	6,000
Integrated Gasification Combined Cycle						
A	10,000	0.45%	43,520,000	77,000	12,000	31,000
B	9,010		39,147,000	28,000	9,000	2,000

Gas	Steam					
A	10,400		23,738,000	0	54,000	0
B	9,224		20,615,000	0	129,000	6,000
Combined Cycle						
1. Existing	9,000		20,615,000	0	79,000	0
2. NSPS*	9,000		20,615,000	0	37,000	0
3. BACT*	9,000		20,615,000	0	5,000	0

Oil	Steam--#6 Oil					
A	9,840	2.00%	34,358,000	521,000	61,000	58,000
B	10,400	2.20%	36,440,000	516,000	77,000	37,000
C	10,400	1.00%	36,440,000	74,000	62,000	20,000
D	10,400	0.50%	36,440,000	217,000	77,000	12,000
Combustion Turbine						
#2 Diesel	13,600	0.30%	45,602,000	91,000	141,000	8,000

Refuse Derived Fuel						
Conventional	15,000	0.20%	54,140,000	140,000	184,000	41,000

Lessons Learned

Identifying how low-income customers are using their electricity was the key to creating a successful program:

Although the LIURP was specifically instigated to improve the energy use for heating homes and water, it was evident that this approach was not best suited for Duquesne Light Company. After clarifying that only 5% of Duquesne's customer base would be served by a heating-based program, Program Managers decided to approach things not from a heating angle, but from an End-Use angle. This allowed the program to screen for the best-suited customers from the entire low-income customer base. Additionally, during the End-Use approach pilot, one of the criteria used for moving Smart Comfort participants into the pilot program was that there would be no more than a 20% difference between the summer and winter usage of electricity. This signified that the customer's electricity consumption went to non-heating end-uses, highlighting potential for savings which would have been previously untapped.

Screening for high-use customers ensured the best results:

The PPUC evaluation identified Duquesne's focus on high-use customers as the primary reason for Duquesne's success. Program staff were successful in getting right to the heart of the matter by asking, "Who is using the most electricity?" By doing so, the utility was able to identify its richest opportunities for energy savings and usage reduction. Using overall electricity use as a primary ranking criteria meant Duquesne could identify its biggest and most important targets first, leveraging savings for those customers most in need of bill relief. As the program has progressed there has been a broadening of this range as Energy Managers have become more proficient in creating energy savings within customers' homes. In doing so, Smart Comfort staff have been successful in tapping the potential savings for moderate and low-use customers.

Mitigating bill arrearages has been the utility's most attractive program spin-off:

One of Smart Comfort's primary goals has been to lessen utility bill arrearages. For this reason, the customer's income level and payment history are factored into his or her eligibility for the program. Both designs of the Smart Comfort program have been successful in enabling pay-

ment-troubled customers to pay their monthly bills. In addition, the program has helped some customers repay past arrearages. For 1992, the pilot year of the End-Use approach, participants had paid an average of 78% of their total billing prior to participation in the program. By contrast the post period showed an average payment of 106% percent. Customers were not only meeting their current bills but also paying off debt they had accumulated.[R#14]

Coupling technical solutions with education is Duquesne's winning strategy for the program:

Smart Comfort's Barry Kukovich remarks that by approaching the whole picture of electricity consumption in the home, Smart Comfort has enjoyed levels of success that other low-income programs have not. While there are other utilities which offer waterbed replacement programs and refrigerator replacement programs, they do not address the entirety of the customer's usage habits and circumstances and thus do not capture those "lost opportunities" for added savings. Education on energy-saving habits has been a big component of the program, proving to be "the ultimate low-cost, high-savings measure." Teaching customers how to use energy more efficiently is the most obvious extension beyond basic technical installations and a distinguishing characteristic of Smart Comfort. An evaluation of the End-Use approach reported documented energy savings prior to appliance replacements, indicating that the program's success was a function of both behavioral change, promoted through education, as well as technical retrofits. The value of this added effort is explained by one Energy Manager who recounted how a mother interrupted him as he was listing energy-saving tips and called her children in so that they could also learn how to save energy.

A customized approach has again proven to be a path to success:

The Energy Managers have certainly found some unusual demand for energy in their customers homes – end-uses which would definitely have been overlooked by a prescribed technical programs. One of the more notable experiences was with a customer who was raising tropical birds in his basement using heat lamps. Another customer

surprised an Energy Manager by having a tire changer in his living room! (Evidently the customer was operating a garage out of his home.) In one case an Energy Manager found high usage in a sparsely furnished home. The mystery was solved when he learned that the residence was a practice studio for a heavy metal band. While these are among the extreme cases uncovered by Energy Managers, they illustrate the point that electricity use is incredibly diverse and that it is consumed for all sorts of uses and not simply relegated to common household appliances such as water heaters, refrigerators, and lights. By looking at each household as a new and unique opportunity for usage reduction, the program has maximized savings at remarkably low cost. As Linda Wigington points out, the program's greatest application for customization – and one that involves relatively low cost – lies in customer education.

Thorough training of Energy Manager has been crucial to the program's success: During the design phase of the End-Use approach program managers took great care in selecting candidates for the program's Energy Managers, making sure that they not only had the technical qualifications needed for the job, but also strong communication skills and the ability to make decisions. Program designers carefully devised a training session so that Energy Managers would be sufficiently enabled to perform their new responsibilities. The training session began with a philosophical overview of the program's end-use approach. The session offered not only mechanical and technical training but customer services and conservation education training as well. Team building exercises were also included and considered a valuable part of the training. David Mick of the PPUC recognized the Energy Manager's training as a key to the program's success, noting that it is, "the quality of the Energy Managers that makes [the program] work."

The low turnover of Energy Managers has contributed to program success: Since the End-Use approach was piloted in 1992 there have been only two occurrences of turnover among Energy Managers and only one with the Scheduler.

Given the program's philosophy, its customized approach, and the need for proficient staff, the level of staff consistency has been a program attribute. Joe Flynn admits that some of the staff tenure can be attributed to "fortuitous luck" but Duquesne has also made efforts to foster staff loyalty, an especially challenging aspect since program staff are actually employees of other organizations.

From the start of the End-Use approach Duquesne's program managers recognized the importance of staff consistency and proficiency. Energy Managers were hand picked by the program management. And although the selected staffers are not Duquesne employees, Duquesne stipulated with its primary contractor, Conservation Consultants, that the Energy Managers' pay as well as holidays and vacations be set by Duquesne. Furthermore, Energy Managers are given the freedom to manage their own time and make their own calls, a latitude that is rarely found among weatherization and contracting positions. Program Leader Joe Flynn can't underestimate the value of empowering program staff to get results.

Engaging the customer in the process has been a powerful tool of Smart Comfort: One of Energy Managers' most important tasks has been to create a sense of partnership with the customer. By doing so, site visits become much more than interruptions to program participants,... in fact the visits become valuable consultations for customers on how they can use energy more wisely to save money. Energy Managers must dig in and become familiar with each customer's circumstances for the audit and site visit to be effective. The program's personal approach has been instrumental in raising customers' interest and getting them involved so that they can learn about how to reduce their usage and cut their bills. Each Smart Comfort customer plays a very important role, quickly coming up the learning curve to effectively practice energy conservation and then serving as an important source of information during the program's post-installation period. The cooperation of the customer is solicited through the partnership which the customer and Duquesne form to help minimize the financial pressures of their electric bills.

Lessons Learned (continued)

As with the measures themselves, the Energy Managers use their personal judgment to determine whether or not customers will make use of the information and services provided to them. There have been cases where it was evident that the participant had no concern or interest in decreasing energy usage, in which the Energy Manager recognized that it made no sense to invest in added measures and time. In the few instances that fit this description the customers received basic no- and low-cost installations required through LIURP.

Ironically, the absence of a spending limit on each installation has controlled program costs: Although it is counterintuitive, Smart Comfort's customized design has resulted in a highly cost-effective program. Unlike most other programs which clearly prescribe eligible measures (or which use "smart protocols" to determine cost-effective measures on the spot), Smart Comfort has been devoid of guidelines such as maximum spending limits per home. Instead it relies on its Energy Managers to create the maximum savings in a customer's home at the minimum cost. To the program model's credit – and to the credit of the Energy Managers in particular – the lack of spending limits has actually resulted in high levels of savings at relatively low costs. Duquesne's Energy Managers have achieved greater savings while spending considerably less than prescriptive refrigerator and waterbed replacement programs.

Metering refrigerators has provided program staff with the necessary information to develop threshold replacement parameters: One of the steps of Smart Comfort's end-use audit was to meter the consumption level of the customer's refrigerator. Midway through the pilot phase of the End-Use approach, the Smart Comfort staff had collected sufficient data to determine the energy usage which would warrant replacement of the appliance. It was calculated that it would be cost-effective for the program to replace any refrigerator which used over 5 kWh per day. Establishing this

threshold supplied Energy Managers with an easy and validated basis for determining if the replacement is both necessary and cost effective. This threshold was updated to 6 kWh per day at the time that Duquesne lowered its residential rates.

Stronger emphasis on follow-up contact will likely yield even greater program savings: During the early years of the program staff were necessarily focused on successfully launching the program, concentrating on the home visits themselves, with proportionately less time spent tracking results. Some analysts suggest that the lack of initial follow-up was the program's weakest link as only about 20% of the participants actually made post-visit calls to the utility. Similarly, Energy Managers frequently missed making their planned quarterly contacts. Now, with the program firmly established and operating efficiently, a greater emphasis can be placed on follow-up contact. According to Barry Kukovich, this is a goal for the current program year and a factor in Duquesne's forecast for an increased level of savings. Staff members believe that increased contact with customers will improve persistence and awareness, and consequently, savings.

Savings persistence is often beyond the scope of the Energy Manager: So far, Smart Comfort evaluations suggest impressive levels of savings and savings persistence. Duquesne staff suggest, however, that some erosion of savings is to be expected and inevitable. Factors which can impact the consumption of the household include an increase in the number of occupants; change of residents; purchase of new appliances; and neglected maintenance of repaired or replaced appliances.

Certain efficiency recommendations will invariably be met with resistance: While the efficiency of certain retrofits is unarguable, Duquesne staff have found that a certain number of customers will resist measures recommended by the program's Energy Managers. This has proven to be especially

true in the case of waterbeds as customers are sometime reluctant (or just plain unwilling!) to give up their waterbeds whether related to medical concerns, their use as heating agents, or simply because of comfort or preference. Program staff have found this to be true for other appliance replacements and retrofits as well. On one occasion a customer refused to have her inefficient refrigerator replaced because it had been given to her by her deceased mother.

Dangerous neighborhoods challenge program implementation and require special tactics: Because of the nature of Smart Comfort as a low-income program, servicing customers has frequently taken program staff into difficult neighborhoods. In fact, fully 15% of Smart Comfort program participants live on gang-controlled streets. In order to provide these customers with service safely and reliably, Duquesne employed a gang liaison to determine where and when it was appropriate to visit these customers and to ensure the safety of the Energy Manager involved.

Energy Managers have effectively addressed customers' most pressing concerns by referring them to other social services: One of the unique and perhaps unheralded aspects of Smart Comfort has been its interface with other social services. An important aspect of the Energy Managers' jobs has been observing the needs of program participants, needs that have certainly not been limited to energy efficiency. In many cases Energy Managers have noticed other problems facing their customers and have played an important community service by putting them in touch with social services and agencies to provide additional support. Over Smart Comfort's tenure, Energy Managers have referred participants to other energy assistance programs (such as LIHEAP) and to unrelated programs such as the Food Share program. Staff have also directed participants to local resources such as the Alliquipa Alliance for Unity and Development, area churches, and various social agencies. The inverse has been the case as well: social

agencies in Duquesne's service territory have often referred their clients to the Smart Comfort program.

Program managers and staff believe Smart Comfort still "has room" for further technology deployment and program savings: While Duquesne was one of the first utilities in the country to swap out waterbeds, and was among the handful of utilities to replace refrigerators free of charge – highlighting the technical sophistication and application of the program – managers and staff believe that there are still many areas in which the program can be expanded to encompass other sources of energy usage. In particular, staff are now concentrating on air distribution systems within homes as well as means of improving the efficiency of clothes dryers. While staff can be proud of their accomplishments to date, the program will remain vibrant and progressive thanks to the vision of its managers who clearly recognize the value of advanced technologies and techniques for efficiency and continuing professional growth and development of the Energy Managers in their delivery of program services.

Finally, Duquesne's Smart Comfort program proves that Commission mandates can be fulfilled beyond the minimum requirements cost-effectively: Implementing low-income programs, or for that matter all forms of DSM programs, may well not be the first choice of utilities in this age of increasing competition. Yet Duquesne has shown that through creative program design these programs can be delivered in a cost-effective manner. Innovation and flexibility are the key ingredients. Contracting staff members, minimizing the staff involved in each case, and enlisting Energy Managers to "sniff out" least-cost energy savings have helped keep program costs down without limiting the effectiveness of the program. To its credit, Smart Comfort has clearly demonstrated impressive energy savings with equally impressive cost effectiveness.

Transferability

THE END-USE APPROACH

Duquesne has been instrumental in leading other Pennsylvania utilities to go beyond heating for savings opportunities among low-income customers. The Pennsylvania PUC worked hand-in-hand with Duquesne during the design process for Smart Comfort's End-Use approach. Following Duquesne's initiative, the PPUC developed End-Use criteria for the LIURP regulations which were added to the low-income mandate in 1992. David Mick, Program Analyst for the Bureau of Consumer Services at the PPUC, commented that while other utilities in Pennsylvania have been slow to embrace the approach, all seven of the other Pennsylvania electric utilities are now in the process of either implementing or designing similar efforts. Duquesne, however, remains far ahead on the curve led by the enthusiasm of Joe Flynn and Barry Kukovich. One reason that was suggested for the sluggishness of other utilities is that the PPUC has failed to provide an effective incentive for these utilities, an oversight which has fostered a "meet the minimum requirement" mentality among Pennsylvania utilities.

Smart Comfort's success has drawn considerable attention and inquiries to Duquesne regarding the program. Joe Flynn and Barry Kukovich each report that they receive calls regularly from other interested utilities and parties. They both note, however, that the queries tend to be misdirected and are usually missing the mark. Callers often ask about "the refrigerator program" or "the waterbed program." Most interest has been specifically directed toward these prescribed measures rather than the Energy Manager approach that its managers and staff believe is Smart Comfort's real key to success. It has been the

comprehensive and customized approach that has led to significant levels of cost-effective savings, not the "sexier" program measures that have drawn national attention.[R#4,5]

ADDRESSING WATERBEDS IN LOW-INCOME PROPERTIES

Other utilities, both in Pennsylvania and beyond, have successfully tapped into the energy savings reservoir found in waterbeds. Like Duquesne, other utilities have realized that waterbeds have the greatest occurrence in low-income households; this is especially problematic as a waterbed can use as much electricity as a refrigerator. Applying this information correctly has led Midwest Power to implement a waterbed component in both its low-income and direct install programs. (The waterbed treatment has proven to be one of the most cost-effective measures in its programs.) Midwest Power installs pads on existing waterbeds at an average cost of \$25-35 and average installation time of just eleven minutes. Ohio Power and Columbus Southern Power offer similar programs.[R#6]

Pennsylvania Electric Company (Penelec) has taken its waterbed program component further by replacing the entire waterbed mattress with a spring mattress. While spring coils may have a higher perceived value, Duquesne chose to go with a foam mattress because of their lower cost and because they are easier to move and provide better comfort than the coil. Like Duquesne's program, Penelec's program requires specially sized mattresses. These replacement mattresses are available from such big name manufacturers as Serta and KingCoil. Both Duquesne and Penelec disable old waterbed mattresses by slashing them or cutting out their nozzles to prevent them from being refilled and reinstalled.[R#6]

ADJUSTING PARTICIPANT ELIGIBILITY REQUIREMENTS

With the success which the Smart Comfort program has had in saving energy and thus reducing bills for low-income customers, it seems reasonable to consider how this model can be applied to other customer segments. While an adaptation for other customer classes has not been taken beyond speculation by Duquesne yet, an expansion of the current targeted segment has been made by the PPUC. The qualifying income level for LIURP programs was raised from 150% of the national poverty level to allow up to 10% of program participants to fall between 150% and 200%. This was done in response to an interesting demographic trend taking place in Pennsylvania. The State is experiencing the fastest growth rate in the country among its elderly population, a segment whose income usually falls between 150% and 200% of the national poverty level. By moving the eligibility for low-income programs up, the PPUC has given utilities the ability to deliver energy efficiency to a new and increasing audience.[R#7]

CUSTOMIZED SERVICES IN AN INCREASINGLY COMPETITIVE UTILITY ENVIRONMENT

Recognizing that the dawn of competition will certainly change the way utilities do business, Joe Flynn has been considering how Smart Comfort will fit into the competitive industry. While no projections have been made, it seems that there is potential for developing a successful tool for customer satisfaction and retention using elements of Smart Comfort. The program possesses several of the characteristics which have been identified as the necessary tools for survival in a competitive market including: a customized approach to service, partnership between utility and customer, and flexibility. These

are all virtues which strategists are seeking to incorporate into new products and services designed for an open market.

Joe Flynn emphasizes the importance of understanding that Smart Comfort is completely different from a refrigerator program or waterbed program. The purpose of the program is not to give the customer a more efficient refrigerator, or to weatherize a home, or to replace a waterbed. The purpose of the program is to listen to and work with the customer to determine the most cost-effective way to save energy, reduce his or her bills, and increase the percentage paid of their bills. This concept is fundamental to a successful End-Use program design.

All those involved with Smart Comfort acknowledge that the key to the program's success was in the quality and training of the Energy Managers. Selecting, training, and retaining the right people who can identify every opportunity for savings and deliver strong conservation education to the customers is essential. Just as Duquesne has succeeded in providing low-income customers with able technical assistance, heightened communication, and "mass customization" of its services, successful energy services providers of the future will have to provide genuine and valuable "wrap-around" services for all their customer segments, finding solutions to their specific energy usage patterns, putting the customer's needs first to survive and prosper in an increasingly competitive utility environment.[R#5,7]

References

1. "1994 DQE Annual Report," DQE, 1995.
2. "The Duquesne Light Smart Comfort Program Performance Overview," Bill Ainsworth, independent contractor, 1994.
3. "Evaluation of Duquesne Light Company's End-Use Pilot Program 1992," Judith Gregory, Applied Energy Research, August 1994.
4. Joseph Flynn Jr., Smart Comfort Program Leader, Duquesne Light Company, personal communication, December 1995 - April 1996.
5. Barry Kukovich, Community Relations Representative, Duquesne Light Company, personal communication, October 1995 - April 1996.
6. "Waterbeds: Surprising Opportunity for Residential Programs," E Source Tech Memo, December 1994.
7. David Mick, Program Analyst, Pennsylvania Public Utilities Commission, personal communication, November 1995.
8. Conservation Consultants, Inc. promotional materials, undated.
9. Madeline Brown, Smart Comfort Program Leader, Conservation Consultants, personal communication, November 1995.
10. Helen Perrine, Executive Director, Affordable Comfort, Inc., personal communication, December 1995.
11. Gil Peach, H. Gil Peach & Associates, personal communication, November 1995.
12. Ann Gerace, Executive Director, Conservation Consultants, Inc., personal communication, December 1995.
13. Linda Wigington, Residential Energy Consultant, Wigington & Associates, personal communication, December 1995 - April 1996.
14. "Low Income Usage Reduction Program," Pennsylvania Public Utility Commission Bureau of Consumer Services, July 1995.
15. "LIURP: Historical Report and Program Analysis," Pennsylvania Public Utilities Commission, Bureau of Consumer Services, June 1994.
16. "Consumer Services Activity Report: 1993," Pennsylvania Public Utilities Commission, Bureau of Consumer Services, June 1994.
17. "1994-1995 Conservation Activities," Pennsylvania Public Utilities Commission, Bureau of Conservation, Economics and Energy Planning, undated.
18. "Electric Power Outlook for Pennsylvania 1994-2014," Pennsylvania Public Utility Commission, August 1994.
19. Judith Gregory, Consultant, Applied Energy Research, personal communication, December 1995.
20. Bill Hayduk, Senior Consultant, Integrated Resources Department, Duquesne Light Company, personal communication, January 1996.
21. "PA.'s Over-75 Population Swelling," Pittsburgh Post-Gazette, August 23, 1993.
22. Amelia Spencer, Energy Conservation Services Coordinator, Customer Relations, Columbia Gas of Pennsylvania, personal communication, February 1996.
23. John Morris, Project Manager, Regulatory and Economic Analysis, Duquesne Light Company, personal communication February 1996.