School District of Philadelphia
Save Energy Campaign
Profile #114

Executive Summary

The City of Philadelphia School System's Save Energy Campaign is one of the most remarkable success stories of its kind. Begun in 1983-1984 with no money at all, the campaign has become a leading revolving fund and has saved over $77 million in the past 11 years. By figuring out a unique and highly effective means to motivate key players in the schools themselves, the program has not only provided dramatic dollar savings, but has allowed the school system to do its number one job better, namely teaching students. In fact, through the dollar savings the program has provided the funds to purchase a large number of the personal computers in the entire district.

The School District of Philadelphia is the fifth largest school district in the country, with 258 schools, 282 buildings, and an annual enrollment of over a fifth of a million students. On top of these numbers, the School District's student population has grown by nearly 3% in the past decade, further stressing its facilities and its operating budget. Each year the School District consumes an enormous amount of energy in the forms of electricity, gas, oil, steam, and even coal, which combined account to nearly $32 million annually, taxing the School District and limiting the amount of money that can be better applied to education. These factors created the impetus for the Save Energy Campaign, one of the most exciting and successful revolving funds in the United States.

Perhaps the key lesson learned in Philadelphia is that energy can be saved in facilities when the proper incentives are put in place. While the School District has nearly 500 electric meters and over 200 gas meters, individual schools were never cognizant of their shares of energy use. In fact, a single electrical bill is sent to the School District by PECO Energy each month! What Jack Myers and others at the School District figured out was a clever way of providing an incentive for each school to save energy. By sharing the resulting energy savings between the School District overall and the individual schools that generated the savings, tremendous savings have accrued, and money has been redirected from wasted lighting and heat, to books, teachers, computers, and the like.

Remarkably, the Save Energy Campaign began with no money at all. Now after eleven years, the program has saved nearly a terawatt-hour of electricity, nearly ten billion cubic feet of natural gas, over 50 million gallons of oil, two billion pounds of steam, and over 100,000 tons of coal! These energy savings, in turn, have resulted in dollar savings that exceed $77 million, an inspiring achievement and a tribute to clever program design and the diligent efforts of the School District of Philadelphia's administration and each of the schools involved, including their principals, staff, and students. Together these players are to be commended as they have proven that saving energy is possible without capital, without utility sponsored programs, and in dire conditions for the benefit of all.

SCHOOL DISTRICT OF PHILADELPHIA
Save Energy Campaign

Sector:	*Public Schools*
Measures:	*No cost measures such as improving end user habits including turning off lights and turning down heat; and capital improvements such as lighting retrofits, controls and weatherization*
Mechanism:	*An incentive structure rewards individual schools for saving energy and feeds a revolving fund for capital improvements in facility efficiency for all energy resources*
History:	*Launched in the beginning of the 1983-84 school year and has become an institutionalized program of the School District of Philadelphia*

1993-94 PROGRAM DATA

Electricity savings:	*15.767 GWh*
Energy savings:	*396.7 Billion Btus*
Costs savings:	*$8,487,000*

CUMULATIVE DATA

Electricity savings:	*814.5 GWh*
Energy savings:	*21.181 Trillion Btus*
Costs savings:	*$77,005,000*

CONVENTIONS

For the entire 1994 profile series all dollar values have been adjusted to 1990 U.S. dollar levels unless otherwise specified. 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. ANNUAL SAVINGS 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.

Overview of Philadelphia

THE CITY OF PHILADELPHIA

The City of Philadelphia, considered by many Americans as the "birthplace of the nation," is home to over 1.6 million people, making it the fifth largest city in the country. Having endured many years of financial decline and negative publicity, Philadelphia has recently been rejuvenated. The construction of its new convention center, the second largest in the nation, has been part of the economic upswing. By balancing its budget and privatizing some City services, Philadelphia has rebounded to be ranked by Places Rated Almanac as the third most livable city in the United States in 1993. Moreover, Fortune Magazine, in 1993, reported Philadelphia as the ninth best city for business and among the top ten for skilled technical workers and quality of work force.

Like many other major metropolitan areas, Philadelphia has witnessed an exodus of urban professionals across its city line to the suburbs. This has resulted in a dwindling tax base and deteriorating urban core, leaving the City with the increasing expenses related to refurbishing its urban infrastructure but less tax dollars with which to do it. Within the City proper, ethnic diversity adds to its culture and defines its populous. Philadelphia has long been a center for African-American culture and recently there has been a surge in the population of Latin-Americans.

The City itself covers a region of approximately 117 square miles and is located in eastern Pennsylvania within a half day's travel of 38% of the nation's population. Prominently located at the heart of the Atlantic Seaboard, Philadelphia is the second largest city in eastern United States and as such has the second busiest train station in the country. Once the nation's capital, it boasts a higher concentration of historical sites than anywhere else in the United States, including the Liberty Bell and Independence Hall.

Climate for Philadelphia is best described as hot and humid in the summer, cold and damp in the winter. The average high in the summer is 90 degrees and average low in the winter is 27 degrees. The National Weather Service reported 1994's total heating degree days at 4,947 and cooling degree days at 1,075.

PECO ENERGY COMPANY

The electricity needs of Philadelphia are met by the PECO Energy Company (PECO) which changed its name from Philadelphia Electric Company in 1994. Serving some 3.7 million total customers, PECO's annual electric sales totalled 44,370 GWh, producing an electric sales revenue of $3,624.8 million in 1994. The City of Philadelphia accounts for 37% of PECO's electric sales, or 16,417 GWh. In contrast, in terms of area Philadelphia represents only five percent of PECO's service territory which totals 2,340 square miles.

Gas sales for PECO in 1994 added another $415.8 million to PECO's total operating revenue of $4,040.6 million. (Please note that the School District does not purchase its gas from PECO, but from Philadelphia Gas Works, the only gas distributor within the urban area.)

Over sixty percent of PECO's electric output is nuclear. PECO is the sole owner of the Limerick nuclear power plant, and approximately 42.5% of the other two plants supplying nuclear energy to the utility. The expense involved in constructing owning and operating these facilities has resulted in high electricity rates for their customers, consistently among the highest in the nation at 12.7¢/kWh or more. Other fuels used by the utility in 1993 were coal (16.5%), oil (5.3%), gas (1.4%), and other (16.6%).

PECO's peak demand, which historically has occurred in Philadelphia's hot and humid summers, in 1993 was 7,100 MW. Since the utility has a generating capacity of 8,877 MW, its reserve margin in 1993 was 25%.

Although PECO has not historically had a noteworthy DSM plan or set of programs, the utility's recent efforts have been nationally recognized. Oak Ridge National Laboratory reports using Energy Information Administration data that PECO ranked 21st among U.S. utilities in annual demand savings, with a savings of 42 MW in 1993 and energy savings of 8,000 MWh. This was facilitated in part by the fact that in 1993 the Pennsylvania Public Utilities Commission approved a cost recovery mechanism for DSM program costs (allowing the company to rate base its DSM investments) and shareholder earnings of a performance-based incentive.

School District Overview

OVERVIEW OF SCHOOLS IN THE UNITED STATES

There are approximately 43 million students attending public schools in the United States today, dispersed throughout 16,666 school districts across the country which in turn employ approximately 2.3 million teachers. While numbering less than 1% of the total, the 100 largest districts have the daunting task of educating 23% of the entire student population. These schools tend to be about 40% larger than average and have a much higher percentage of minority students as well as slightly higher pupil/teacher ratios, making their task that much more challenging.[R#10]

Most of the schools in the United States today are in dire physical and financial condition. The aging facilities tend to provide low comfort levels for students, teachers, and staff and suffer from overcrowding and deferred maintenance. These suboptimal conditions not only create a poor learning environment for our children, but require greater operating expenses, further burdening already overexhausted budgets.

School budgets are collapsing from the stress of increased enrollment, rising costs of books and supplies, rising energy costs, decreasing revenues, increasing federal and state mandates, and unexpected demands such as lawsuits, a sorry sign of the times related to school liability and an overly litigious society. (Remarkably, U.S. schools now face an average of 11,500 lawsuits annually.) Coupling these forces with the 1991 recession, most of the nation's school districts have now gone into deficit. By 1991, according to a study conducted by the American Association of School Administrators (AASA), the national cost of deferred maintenance had reached $100 billion dollars. This is the price tag associated with America's aging schools, 74% of which were built prior to World War 2 or during the cheap construction era of the fifties and sixties.[R#8]

Although it may seem somewhat misguided to focus on the energy efficiency of the school buildings, when the quality of the education being provided is so much more deserving of attention and money, the cost savings through improving the efficiency of buildings can clearly benefit the quality of education. American school districts' combined annual energy cost has topped $7.4 billion. By addressing energy efficiency in schools, a savings of up to 25% could be realized and directed towards better education. According to AASA this could amount to over $1.8 billion dollars a year.[R#8]

School districts, however, are faced with many barriers to applying energy efficiency measures in their schools, including lack of knowledge and awareness, leadership and interest, staff and expertise, and most acutely, a fundamental lack of funds. While there is already great competition for funds in school districts' constrained budgets, there is also a growing uncertainty of where these funds will be coming from in the future.

OVERVIEW OF THE SCHOOL DISTRICT OF PHILADELPHIA

The School District of Philadelphia (herein referred to as the School District or the District) is the fifth largest in the country. It consists of six sub-districts, totaling 258 schools and 282 buildings. The District's enrollment for the 1993-1994 school year was approximately 210,000 students. In 1983-1984, when the Save Energy Campaign began, the enrollment was 203,500, then dipped as low as 196,400 in 1987, but experienced a 3% overall growth rate for the past decade.

Already schools are overcrowded due in large part to the surge in growth of the Latino neighborhoods. In fact, auditoriums are currently being used as classrooms in some schools. With the coming years the School District is expecting further growth, by as much as 10% in the next five years. As such the School District built its second new building in the past twenty-five years in 1994, and another three buildings are on the drawing board. Additionally, the School District has recently purchased four school buildings from the Philadelphia Archdiocese which will be refurbished to meet the demands of this expected growth.[R#2,3]

In the 1993-94 school year, the District consumed 149.11 GWh, 910,000 MCFs of gas, 7.83 million gallons of oil, 96,686 Mlbs of steam, and 1,880 tons of coal. Supplying these fuels throughout the District requires some 2,000 oil deliveries 120 coal deliveries annually. Tracking energy consumption in the School District is also a major challenge and is done with over 450 electrical meters and 220 gas meters.[R#6]

With an annual operating budget of $1.3 billion (and completely separate from the City of Philadelphia's budget), the Philadelphia School District has allotted $33 million to meet its energy costs despite some attractive rate discounts given the School District's municipal government status. Electricity accounts for 48% of that total. Electricity, however, provides heat for only five of the School District's buildings. Of the five resources used to provide heating for the school facilities, the

1993 SCHOOL DISTRICT OF PHILADELPHIA	
Number of Students	210,000
Number of Subdistricts	6
Number of Schools	258
Number of Buildings	282
Number of Electric Meters	450
Number of Gas Meters	220
Annual Oil Deliveries	2,000
Annual Coal Deliveries	120
Purchased Steam Buildings	7
Average Rates	
Electric	$.12 /kWh
Gas	$6.21 /MCF
Oil	$0.59 /Gallon
Steam	$13.37 /Mlb
Coal	$86.81 /Ton

predominant fuel is oil, heating 51%, or 146 facilities. In 1994, eight coal heated buildings were converted to dual fuel, leaving only three facilities which still burn coal for heat. In addition seven buildings use steam heat and are connected to Philadelphia's district heating system, now operated independently by a private company called Trigen Energy Corporation.[R#2,3,6]

Budget limitations, aging buildings and maintenance staff cutbacks have led to a deteriorating state for most of the School District's physical plants, and deferred maintenance for its school buildings. Since it could not invest in improving the efficiency of its buildings, the District has faced rising energy costs prior to the introduction of energy conservation program. In fact these energy costs had risen disproportionately with other costs. At the onset of the Save Energy Campaign, the program's need was elevated by the basic fact that the School District was spending more than twice as much on heating and lighting as it was on books and supplies. Thus in 1983 District decided to address rising costs by fighting increasing energy costs and diverting the money that could be saved towards the School District's primary purpose of education.[R#6,8]

Like many other school districts in the nation, The City of Philadelphia's School District has been challenged by rising costs in the face of budget caps and other fiscal restrictions. In 1983, rising expenses of all kinds, and including energy costs, threatened its ability to deliver quality education without resorting to staff lay-offs and other forms of cutbacks to reduce costs. Fortunately, the School District found a more inventive solution to its budget constraints: energy conservation. In that year, the Save Energy Campaign was launched, a model for cost savings through energy efficiency that has not only served Philadelphia well, but which may be an important model for school districts across the country.

Inspiration for this approach to revenue savings sprang from the Citizens' Coalition for Energy Efficiency (C2E2) which proposed to the School District that it "adopt" six schools as models for a District-wide efficiency campaign. Although elements of the proposal were not aligned with the maintenance structure of the School District, the concept was nevertheless appealing. Thus the Budget Department's Jack Myers was called on to develop a program for effectively reducing the School District's energy consumption. An innovative incentive program was created to summon the District's schools to participate in energy efficiency, to save money that could be better applied to the District's most basic mission of education.[R#3]

At the onset of the Save Energy Campaign, its designers anticipated that if successful it could result in savings of 8% of annual energy costs for each school. This, of course, would lead to dramatic savings of expenditures, an estimated $2.5 million. In retrospect, the program's achievements have far exceeded these early expectations and have provided tremendous benefits to the School District's budget. Today's allotted budget for energy costs reflects an annual savings of almost 25%, more than triple the hoped for amount. In 1993, the actual utility costs for the District was only $30.3 million, about $9.5 million dollars below the potential amount of $39.8 million. Furthermore, since the program began in 1983, the School District has only realized a 10% increase in energy costs. When compared to the national average for energy costs for public schools, which rose by 11% between 1989 and 1990 alone, the District's accomplishments stand out that much more. Furthermore, national average costs for school energy increased by an additional 7% the following year.[R#4,8]

Revenue savings from the success of this program have been channeled toward educational needs of the District and the impact has been dramatic: Items which have been purchased with these incentives include personal computers. Most of the School District's personal computers were purchased through this program. In addition, savings have enabled purchases of textbooks, supplies, caps and gowns, auditorium stage drapes, sound systems, and film projectors. The money has been used to resurface black boards and even for putting a science lab in an old building which was converted into a high school. One school distributed $50 to each teacher to buy supplies as he/she saw fit. An automated attendance checker, which calls the homes of absentees, was also purchased through its program. Similarly, building engineers have made purchases to improve the overall maintenance of the school buildings. Their share of the incentives have been used for everything from snowblowers to tools to showers for coal shovelers.[R#3,6]

PROGRAM DESIGN

Some key elements needed to be identified in order to develop a campaign which could successfully achieve savings throughout the School District. Individuals from the Chamber of Commerce, engineering and teachers unions, science faculty, and local utility companies such as Philadelphia Electric Company (PECO) and Philadelphia Gas Works, were drawn together to form an advisory committee to assist in determining the details of the Save Energy Campaign. This wasn't easy. Some parties simply wanted all the savings to go towards computers while other insisted on a more analytical approach and that savings first needed to be calculated on a BTU per square foot basis. In the end, two basic elements were defined. First, in order to evoke full participation, the program's rewards should reach everyone in each school community–its principal, teachers, students and staff. Second, each school's performance should be evaluated on an individual basis, comparing its own savings achievements annually rather than comparing an individual school's energy use to other schools whose usage might not be comparable. With this basic understanding of how the program would work, the mechanics for delivering it needed to be determined.[R#1,3]

Perhaps the greatest feature of the Save Energy Campaign is its incentive structure. Since the School District receives all utility bills at District headquarters, individual schools had no incentive to save energy. Thus somehow an incentive structure had to be developed so that individual schools would take responsibility for their energy use and bills. Furthermore, the incentive structure had to elicit the participation of all stakeholders within the school. Success of the program was dependent on participation from as many schools in the District as possible. In order to motivate all parties, a plan had to be de-

veloped which would reward each school individually and everyone involved, be they the principal, building engineer, faculty, or student. Furthermore, the program had to provide for reinvestment in efficiency so that the program and its savings could persist and expand. To accomplish all this a simple but unique incentive structure was created.

Another baseline criteria was then established prior to launching the program. Architects anticipated savings of at least 8% annually for each school. This assumption was proven legitimate when, in its first year, the Save Energy Campaign achieved an average of 10.4% savings from previous years' average. Although the target set for individual school's reduction was originally set at 4% in order for the to be eligible for an incentive, success of the Campaign was strong enough to reward every school which achieved any savings. Incentives were awarded according to the following structure:

• Up to 40% of the savings achieved would flow directly to the school. This, of course, was the most profound incentive for individual school savings. Prior to the program, any savings flowed directly to the central School District office and the individual school would not have been rewarded.

• Another 40% of the savings would flow back to the School District's general budget, easing the District's overall cash flow predicament and allowing for sharing of the program's savings district-wide.

• Finally, the remaining 20% of the energy savings would be reinvested directly back into further energy efficiency measures. This money would be handled by the School District on a priority basis serving the oldest facilities first.

In order to determine the energy savings on a school by school basis, monthly and annual energy reports were developed which were distributed to each school's principal. Then, based on documented and weather-adjusted bill savings, oversized checks on placards representing the earned incentive amounts were awarded to the principals of participating schools at the onset of the school year in September.

The earned incentives that were subsequently awarded were and continue to be subject to certain guidelines. First, the incentive amount returned to the schools must be used to benefit the school as a whole and cannot be awarded to personnel directly, through overtime payments and/or bonuses, etc. Second, a minimum of 25% of the school's share of the savings has to go to the building's engineer. (These percentages were presented as guidelines to ensure that "significant portions" of the rewards were returned for subsequent engineering functions.) Third, all purchase requests for items to be bought from the savings had to be submitted by mid-December and could not be for items that would otherwise be allocated for elsewhere in the budget. This provision was used to assure that dollars from the energy savings provided additional benefit, not simply replacing expenditures for previously budgeted items.[R#4]

Early off in the process Philadelphia's School District understood that energy efficiency gains come not only from the purchase and use of energy-efficient equipment, but primarily as a result of changes made by occupants of buildings. Therefore, the program was designed such that involvement in the Save Energy Campaign would include everyone in the school community. The School District identified specific roles for each person within that community.

The principal, as the school's chief administrator, was clearly identified as the driving force behind the school's successful participation in the program. Through leadership and example, the principal would be key in gaining support from faculty, staff, and students. Many principals developed an energy committee or requested from the District's Energy Conservationist a site visit to their building and recommendations for improvement. The principal had to be aware of how energy is used in the building and where waste could be reduced. By giving the principal primary responsibility to enact the program, the program designers rightly believed that behavioral changes could be made quickly and at low if not no cost. For instance, the principal could schedule events in appropriately sized rooms, avoiding instances in which small events were scheduled in auditoriums, a situation requiring additional heat and light. The principal would be responsible for making sure that building exits were used only as needed and not left open when not in use. Clearly as the number one in command, the principal could play a key role in coordinating not only scheduling issues but in instigating the program, marketing it internally to his or her staff, and thus driving the program to success.

Jack Myers recalls one instance of how an overzealous principal embraced the program and its benefits by instructing the building's engineer to turn off all hallway and stairwell lights while class was in session. During one such period, the subdistrict superintendent visited this school and panicked upon entering the building, fearing a blackout had occurred![R#2]

The building engineer has the most direct influence in energy conservation for the building. Managing operations in an efficient manner, so that systems such as heating and ventilation are only on when necessary, has been essential for success in the program. Likewise, maintaining the facility's boiler plants, lighting fixtures plumbing, etc., is a critical technological component of achieving program savings.

Faculty and staff play an important role as well. Through the program design, teachers became aware of consumption within classrooms, keeping thermostats set at comfortable but reasonable levels, turning off projectors when not in use, and turning off lights when classrooms were empty. Cooks and kitchen staff were also seen as important in influencing savings through their awareness of energy use at work. Keeping refrigerator doors shut all the way and refrigerator coils clean, running dishwashers only when full, and making sure that stoves and ovens are only on as high as needed and turned off when not cooking are all measures that have contributed to the school's savings.

Finally, the program's architects recognized that student participation should not be discounted. Their roles in the day-to-day use of hot water, building entrances, and lights was clearly part of the equation. Although fine-tuning these patterns would not have the largest impacts quantitatively, student involvement and awareness in energy efficiency and the resulting campaign has been invaluable and educational.

One challenge presented by the structure of the program was to accurately project a fair budget for each school's energy consumption. This was complicated by the fact that several elements influence the energy use within a particular school from year to year and from building to building. These factors include weather conditions, school closures, additions to buildings, nighttime uses of various facilities, asbestos removal procedures, and the list goes on. Thus a reasoned and justifiable method for accounting for these factors when calculating baseline energy consumption for each school needed to be established.

When the program was initiated, individual school building energy budgets were based on the average consumption between the years 1981-1983. Actual metered consumption for 1984 was compared to this average to determine first-year savings. From that point forward, new baselines, again built on three-year averages, were and continue to be recalculated periodically. Furthermore, weather adjustments are made to actual consumption figures to correct for any abnormalities caused by extreme weather.

Adjusting savings for abnormal weather conditions was key in determining actual savings. For instance, if an exceptionally warm winter occurred, in which there was less than average heating required, school's would not be rewarded for energy savings that were not justifiably correct. Inversely, exceptionally cold winters might erode any energy savings, potentially stripping away the hard work of schools with energy efficiency. A further discussion on these adjustments is presented in the Monitoring and Evaluation section of this profile. [R#2,4]

Communicating information on an individual school's budgeted and actual energy consumption in a concise method so that each school administrator could track his or her school's savings performance also needed to be established. Thus a monthly energy report prepared by the District was developed for each school. This report, which has been updated over the years, includes the school's budgeted energy consumption for each fuel (electricity, natural gas, oil, coal, and/or steam); actual monthly and weather adjusted total energy consumption; and consumption figures for the prior year. Year-to-date volume savings and dollar savings for each fuel are also tabulated and presented on the form as is a figure for percent savings for each fuel and each fuel's commensurate bill. All of this information enables each school to monitor its consumption for achieved savings and progress through the year. Since the School District operates on a July through June fiscal year, the monthly report in June provides year-end total savings for each school.[R#4]

One of the most inspiring features of the Save Energy Campaign is that it was bootstrapped into prominence. At the onset of the program, it simply had no budget, no loans were requested for installing energy efficiency measures, and no incentives or rebates were available from local utilities. Instead the program was initiated without any investment from the School District and was implemented primarily through behavioral changes and a basic fine-tuning of operations engaged through more careful attention to detail. For instance, savings were achieved from basic measures such as turning off lights in empty classrooms; turning boilers off at 1:00 instead of 3:00, using the building's internal heat gain to provide adequate warmth for the end of each day; and repairing broken windows and leaky faucets. Through these simple measures, the School District was able to save an impressive $3.3 million dollars in its first year alone. This first year savings has led to far more impressive savings. Eleven years later, almost $76 million dollars have been saved and reinvested in the school system through the Save Energy Campaign. [R#2,4]

MARKETING AND DELIVERY

The Save Energy Campaign was launched at the beginning of the school year in 1983. At the September opening convocation for the Philadelphia School District, attended by the School District administration as well as the administrators for each individual school, the program was described and the incentive structure for the program was explained. Each principal received an individual energy budget for his or her school based on prior years' usage. Accompanying this budget was a signed letter from the superintendent stating that each school would receive money back if it could achieve a minimum 4% savings in their energy consumption. With this, the bait had been set for the Save Energy Campaign!

In October of the same year each principal received his or her first monthly energy report. This provided a clear snapshot of the school's energy consumption and allotted budget by month. Later that school year, each school received its first program newsletter, highlighting efficiency steps that were being employed by various schools in the District and ideas on how to improve energy efficiency in school buildings. Essentially it served to share ideas between schools and to stimulate further energy savings activities.

One idea that was shared in the newsletter involved an administrator who had sent a questionnaire to his faculty asking for feedback on what each teacher's preference was as far as classroom lighting, temperature, etc. Information from this survey resulted in a swapping of classrooms, so that teachers who preferred warmer temperatures got warmer rooms and those who preferred to work in cooler temperatures got cooler rooms! How simple the measure was, but how important these types of steps were in cultivating what later became a multi-million dollar saving program![R#1]

In June of 1984, an annual report announcing the District's total savings of over $3 million dollars was distributed to each school. Clearly the program had been a success in its first year. To hammer this point home and to garner additional enthusiasm and participation, in August of 1984 a luncheon was held, honoring the achievements of specific participants including principals, custodians, and administrators. The State Energy Office and the Philadelphia Chamber of Commerce were on hand for the event as well.[R#6]

Despite its fanfare and celebratory tone, this paled in comparison to the impact felt at a school board meeting held in October of 1984 when one incentive check in the sum of $80,000 was awarded to one school in the District for the savings it had achieved that first year! Other principals that hadn't taken the program and its incentive structure as seriously quickly caught on. The check awarded could easily buy more staff or a lot of supplies, both highly in demand and therefore of envy between schools. Thus program participation increased dramatically in the second year when savings grew by 25%.[R#1,2]

One example of the motivating power that this first year's incentives had was illustrated by a sub-district superintendent's phone call to the Budget Director, inquiring why no schools in his region received a check. The superintendent sited a particular school which he claimed had saved energy in the past school year. In fact, that principal had never even mentioned the Save Energy Campaign. Energy use for that facility went so unregarded that one faculty member returned to his desk on Monday to find the candle left there over the weekend drooped over! With just prodding from the superintendent, that principal requested a site visit from the budget director. The following year, the school achieved a $120,000 savings![R#3]

Promotional tactics were employed by the School District to further heighten awareness in the Campaign. Such events included an art contest for a sticker to go over light switches, encouraging students, teachers, and staff to turn off lights when classrooms were not in use. Fully one thousand entries for the contest were received and many of the winning stickers are still in use in Philadelphia classrooms today.[R#3]

PROGRAM GROWTH

In the program's second year the incentive structure was modified and updated to safeguard against a lack of savings persistence. In order to discourage an administration from slipping in their conservation efforts and resting on the laurels of past activities, current year savings were compared to the previous year's achievements, so that only 20% is awarded for a savings level equaling prior year's, in other words simply keeping pace with prior initiatives. As the program continued, it was decided to take the percentage of savings achieved over the past two years, and compare them to the current year's savings. Thus for a school that saved 10% off budgeted the energy consumption in either of the prior two years, and saved 8% in the current year, only 20% of the total dollar savings would be rewarded. If, however, the school saved 12% in energy, the dollar savings generated by the first 10% would be rewarded at the 20% level, while the additional 2% of energy savings would be rewarded at the higher 40% incentive level. For schools participating for the first time, all savings would be rewarded at 40%. This not only discourages schools from

slacking in their efforts, but puts a larger carrot in front of hem to improve their rate of energy savings.

With time this formula was simplified. Those schools whose savings continued to increase were rewarded at the full 40% rate. For schools whose efficiency efforts lessened, and thus current year savings were less than those in prior years, the savings were rewarded at the 20% level.[R#1,3,4]

Clearly the School District was wise in earmarking 20% of the total savings from all schools for subsequent energy efficiency investments. Through this mechanism, savings generated by the program have persisted and grown to dramatic proportion. In its first year, the program had no money invested in efficiency measures and concentrated on basic fine tunings through behavioral changes and attention to details that previously had slipped through the cracks. These basic steps, however, were ample to generate impressive savings in the program's first year, 20% of which was allocated directly towards capital improvements related to energy efficiency. This fund also paid for the salary of an Energy Conservationist to administer the program.

Once the program began to generate capital through the carefully crafted incentive mechanism, it was possible for the School District to increase its savings by 25% in the next year. Accordingly, 20% of that savings was reinvested to generate an even greater cost savings for the following year. Essentially, the program created a revolving fund that has financed not only long-deferred maintenance on facilities but also the installation of energy efficiency measures on a continuing basis so that savings for the School District have not only persisted but accumulated.

The capital improvements that have ensued have primarily been focused on lighting and HVAC improvements such as compact florescent lamps, motion sensors, steam trap installations, and pipe and tank insulation. More than a quarter of a million dollars has been spent annually on lighting alone and another half million dollars annually on automated temperature control (ATC) maintenance and water treatment. A portion of the savings revenue set aside for subsequent energy efficiency improvements was used for training engineers. After maximizing energy efficiency on their own in 30 high schools, the School District contracted Honeywell, Inc. to ensure their continued savings under a guaranteed savings contract.[R#1,6]

Perhaps the School District received its ultimate program surprise when its energy efficiency initiatives resulted in dramatic electricity demand charge savings! In fact these unforeseen dollar savings have far outstripped the savings from energy use reductions. As the District's energy reductions have become significant, its has been privy to dramatically lower demand charges, tariffs that have ratcheted downwards as the District's usage has dropped and passed below set levels, causing dramatic reductions in monthly demand charges.[R#3]

Demand charge savings were not accounted for in the structure of the program and thus the participating schools never balked at their exclusion from these savings since they were never part of the original plan. The schools, in fact, were very pleased and adequately incited by receiving the share of the revenue savings that they had been promised. Nevertheless, while most of these additional savings have been fed back to the School District's budget, the District has invested part of this revenue stream back into further efficiency measures in the schools. Therefore, in addition to the 20% of an individual school's savings being returned to specific schools for subsequent capital improvements related to energy efficiency, the District has returned a portion of the demand charge savings towards these efforts so that almost a third of the District's total savings was reinvested in energy efficiency. Finally, this reservoir of savings provided a reserve margin for those schools which went over their energy budget, so that the savings achieved by one school was not taken to pay for the over consumption of another. This way, the District could keep their pact of paying incentives to reward efficiency practices. [R#2]

MEASURES INSTALLED

As discussed above, measures for energy efficiency employed by the School District of Philadelphia have included everything from simple behavioral changes to complete retrofitting based on capital improvements. Initially, due to a lack of capital, conservation measures were confined to the fine tuning of operations, and other behavioral changes. These behavioral measures are still the cornerstone of the programs success. Efficiency practices employed by the District include: turning off lights in empty classrooms; turning boilers down or off at 1:00 PM and letting the building ride on heat gain; timely repairs of broken windows and doors; scheduling events in appropriately sized rooms; keeping exits closed when not in use;

and many others, some of which are outlined in the School District's Energy Policy presented in this profile.

These "human" measures generated enough savings to provide capital for further technical measures. Retrofits for lighting and HVAC account for most of the expenditures. Technical measures installed have included compact florescent lamps; T8 lamps and ballasts; motion sensors; steam traps; pipe and tank insulation; energy managements systems for heating, ventilating, and air conditioning; ATC repair; and water treatment for boilers. Capital has also been spent on training engineers.[R#6]

By "keeping an ear to the ground and an eye on the future," the School District has been able to tap other resources for additional funds and apply new technologies when possible. Currently, District staff are considering applying solar window films to appropriate glazings as well as photovoltaic panels in select circumstances. Other measures installed included energy management systems for 100 buildings, using funds partially procured from the Institutional Conservation Program. Finally, Malcolm Sender, the School District's Energy Conservationist, follows developing technologies closely to seize any opportunity to test market new products to see if they are suited for schools. Presently, he is eyeing the possibility of testing sulfur lamps which he believes hold the promise of being close to application on a commercial scale and which will provide for highly efficient lighting for institutional buildings.[R#1,3]

STAFFING REQUIREMENTS

Clearly the Save Energy Campaign has involved a large number of players at each school, at the School District, as well as outside entities. In 1994, the school system's employees totalled 23,500, including: 6 sub-district facility managers, a custodial force of 2,200 including engineers and cleaning personnel, 500 maintenance staff, 260 principals and 12,000 teachers. In the same year, student enrollment was in the neighborhood of 210,000. All of these people had an active part in the Save Energy Campaign with varying levels of involvement.

Since no staff was initially allocated for administering this program, participation came from various employees of the School District, including the Office of Financial Planning and Analysis, maintenance departments, and faculty. Key players in the development of the program included Jack Myers, Director of Financial Planning and Analysis and overseer of the program, and Mike Hanson who was hired in the campaign's second year as the School District's Energy Conservationist and later became the Energy Manager. Malcolm Sender is the current Energy Conservationist for the School District and has been key in implementing the program since 1990. His tasks include everything from site visits to conduct energy audits to pressing for energy repairs to tracking energy use to following up on purchase requests from earned incentives.

Entities outside of the School District have contributed to shaping the campaign as well including the Philadelphia Chamber of Commerce, local affiliates of the State Energy Office, the citizen's action group C2E2, and local utilities such as Philadelphia Electric Company and Philadelphia Gas Works which have supplied technical information (but stopped short of providing any incentives). These organization have not only played an advisory role, but have provided technical information and additional financial resources as well.

CASE STUDY: FRANKLIN LEARNING CENTER

In its first year, the Philadelphia School District's Save Energy Campaign awarded $80,000 to the Franklin Learning Center, a high school housed in a building constructed in 1910. Every occupant of the building had a hand in school's efficiency efforts. From the development of a Student Patrol which turned off lights in empty rooms and closed windows when the heat was on, to the Vice Principal who crawled under the building to look for steam trap leaks, everyone did their part. Conservation measures were even incorporated into the curriculum. Students who were assigned to perform public service as a part of their schoolwork could spend a weekend weatherizing the school building to fulfill the requirement. The result of their efforts was an energy savings in the neighborhood of $200,000, a 52% savings in their first year's total energy budget. They increased their efforts to achieve a 64% savings in the second year. Currently the School District is keeping energy efficiency in mind for this facility as it continues to make building improvements.[R#1]

ENERGY POLICY FOR THE SCHOOL DISTRICT OF PHILADELPHIA

At the onset of the Save Energy Campaign in 1983, an Energy Policy for the School District was established. It is designed to save scarce resources without infringement upon the educational mission of the School District. All operations of School District facilities shall be governed by these specifics:

A. LIGHTING

1. All lights will be turned off in any area which will be unoccupied for a period in excess of fifteen (15) minutes except for corridors, stairwell, and at exits as required by code.
2. The following standard lighting levels shall be maintained:
   a. Classrooms and offices 50 footcandles
   b. Corridors 20 footcandles
   c. Storage 10 footcandles
3. Under no circumstances will decorative lighting be permitted.

B. TEMPERATURE CONTROL

1. Temperatures, from October 15th through May 15th, will be maintained at 68° F in classrooms and offices; and, in those facilities that are air conditioned, 80° F will be maintained between May 15th and October 15th. Special consideration will be given to certain preschool and special education classrooms where possible. Warehouse and garage facilities will be maintained at 55° F during the heating season.
2. Personnel will not obstruct ventilation ducts or return grills with books, charts, furniture or plants.
3. All windows and doors must be kept closed during the heating season or when air conditioning units are in operation.
4. Entrances and exits to all buildings shall be limited where possible in their use to minimize heat loss.
5. Broken windows, doors, etc. shall be reported to the building engineer in a timely manner.
6. Unauthorized personnel or students found tampering with temperature regulating devices such as thermostats or valves will be subject to disciplinary action.
7. Portable space heaters of any kind are banned from use within School District facilities as a matter of safety except where provided by Maintenance and Operation.
8. Employees and students are encouraged to wear sweaters, sweatshirts or similar clothing when it is apparent that the heating plant is not uniformly maintaining the desired temperature throughout all sections of a school facility.

C. SCHEDULING

1. Small group activities will not be scheduled in large areas such as auditoriums and gymnasiums. Use of such areas will be coordinated with the custodial staff to enable reduced lighting and heating during periods of non-use.
2. At the end of the school or office day, all windows shall be closed, the blinds or shades drawn to approximately 3/4 the distance from the top of the window to the window sill and the lights turned off. Cleaning staff will turn lights on only for the period when a specific area is being cleaned.

D. OTHER

1. Hot water for washing and showers will be maintained at 105° F. Food services operations requiring higher temperature levels by code shall use a booster.
2. Refrigerators and/or similar appliances shall be limited in their use to certain designated areas as determined by the principal or similar facility authority.

MONITORING

The Monthly Energy Report which is distributed to every school in the District is the primary tool for tracking the energy efficiency improvements for the Save Energy Campaign. Each individual school's savings performance can be monitored by both the School District and an individual school's own administration with this report. It documents data by month and year-to-date totals for each fuel source used by that school (electricity, gas, oil, coal, and steam). For easy comparison, monthly metered readings are listed along side the previous year's consumption and the calculated monthly budgeted usage. (PECO supplies all of the monthly metered readings on disc after the billing period, to be downloaded into PSD's system for internal use, including this report.) From the monthly energy reports provided to each school, an annual report is then generated that simply lists the earned incentives on a school-by-school basis.

To compensate for unusual weather that may be experienced for that month, all readings for the building's primary heat source are weather adjusted. (The building's primary and secondary heat sources are listed on the report.) Modifications are based on heating degree days, a measuring standard issued by the National Weather Service. The baseline value for heating degree days at 65 degrees has ranged from 4,500 to 5,035 degree days for Philadelphia. The School District checks the degree days monthly, in correlation with the metering, and calculates the variance from the average value as a percentage. This percentage is used to weather adjust the actual monthly consumption for comparison to the budgeted monthly usage. For those buildings in which electricity is not the primary heat source, there is also a slight adjustment for electricity as it is used to operate the heat delivery system including pumps and fans.[R#2,3,4]

The weather adjusted data is also used for calculating average budgets for forthcoming years. In this way, there is consistency between figures from year to year despite any unusual weather patterns. Typically, the weather adjusted consumption figures from the past three years are averaged together to determine each school's energy budget. Those years which skew the average too much because of elements which could not be compensated for are dropped. Consideration is also given to a school's level of consumption when budgeting, such that if a school has been over-consuming, budgets are not re-averaged to reflect their higher usage level. Budget calculation must also reflect any other influencing elements. One such factor which was a recurring event for the District was the removal of asbestos, which both increased load and extended building hours. Other numerous elements needed to be incorporated into the budget calculation including: new construction, such as adding kitchen equipment; adding new electrical equipment; new heating systems and windows; changing the schedule for the facility's use; and boiler replacements.[R#3]

Data for registered demand and billed demand for electricity and steam are also included in the report. This information can be helpful in reducing costs for the School District. However, a method for calculating demand savings by school for inclusion in the incentive has not been developed yet.

EVALUATION

Evaluation of the Save Energy Campaign is conducted on an individual basis for each school. Compiled data from the Monthly Energy Report, tracking each school's energy usage, indicates (1) if an overall savings from the budgeted consumption was achieved and (2) if savings achieved from the previous year have persisted. These are the criteria used for evaluating a school's efficiency. A formal evaluation of the program itself has not been conducted.

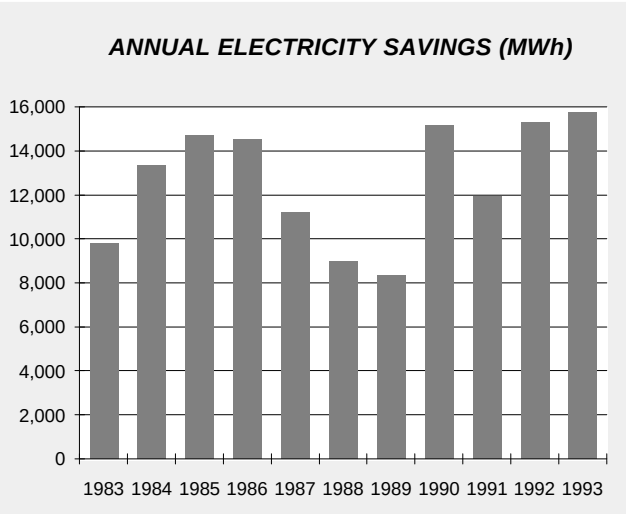
Evaluation of the measures used at a particular school does not have a formal structure. Initially, site visits were made upon requests to help identify areas of energy waste and simple methods of conservation. Currently, site inspections are conducted once a week at four or five facilities, generally on those buildings which are not achieving an energy savings or exhibit an unusual peak in usage. Requests for site visits are still received and honored. Many times the request is from a principal who has been active in the program in the past and has relocated to a new school.[R#3]

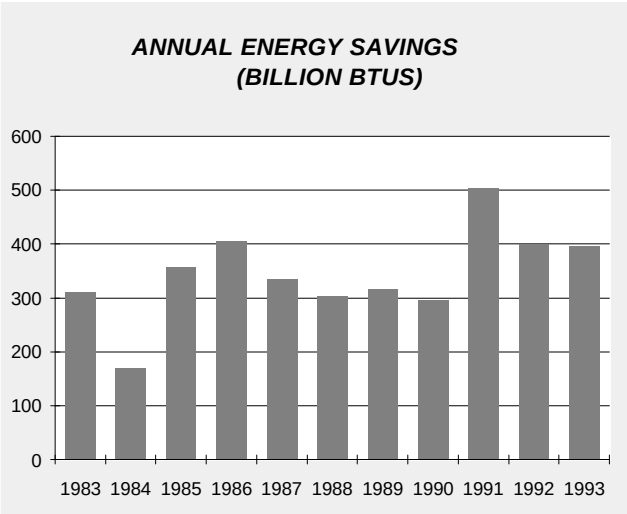
Data Alert: Savings reported in the Annual Fuel Savings and Cumulative Fuel Savings tables are calculated by comparing actual consumption to a projected consumption. These values were not subject to verification.

PROGRAM SAVINGS

In its first year and generally without capital improvements the Save Energy Campaign produced significant savings levels for each of the fuel sources used by the Philadelphia School District: 9.8 GWh of electricity, 61,961 MCF of gas, 831,055 gallons of oil, 22,116 Mlbs. of steam, and 3,705 tons of coal. Each of these savings represented a minimum 7% reduction from the averaged previous consumption and was as high a 36% for coal due to several factors discussed below. Then in the next few years the schools continued to save more supported by the capital that was tilled back into the program. During the three school years 1987-1988 through 1989-1990, however, the rate of savings for most of these fuels decreased, including savings in electricity, the School District's most expensive energy source. In this timeframe, the program's tracking experienced personnel turnover including the departure of its Energy Manager, Mike Hanson, which may have effected consistency in calculating data. This may partially explain the apparent drop-off in program success for these years.[R#3]

ANNUAL FUEL SAVINGS	ELECTRICITY SAVINGS (MWh)	GAS SAVINGS (MCF)	OIL SAVINGS (GAL.)	STEAM SAVINGS (MLB)	COAL SAVINGS (TONS)	TOTAL SAVINGS (BILLION BTUS)
1983-84	9,774	61,961	831,055	22,116	3,705	309.29
1984-85	13,350	141,907	483,100	21,790	1,064	169.90
1985-86	14,679	152,378	614,055	41,107	1,182	356.95
1986-87	14,526	135,080	887,649	46,216	2,288	404.48
1987-88	11,186	58,325	811,648	48,211	3,558	335.19
1988-89	8,940	119,962	792,498	28,636	730	302.72
1989-90	8,332	104,810	1,347,560	27,865	-827	316.86
1990-91	15,157	145,039	1,671,851	23,076	-197	294.88
1991-92	11,909	217,364	1,575,053	26,985	662	503.02
1992-93	15,278	174,321	1,175,048	28,262	-354	399.50
1993-94	15,767	243,409	417,101	37,997	-55	396.70
Total	138,898	1,554,556	10,606,618	352,261	11,756	4,056.27



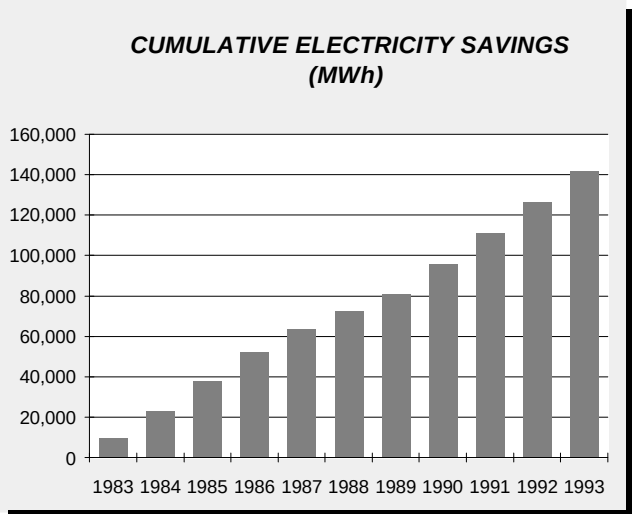


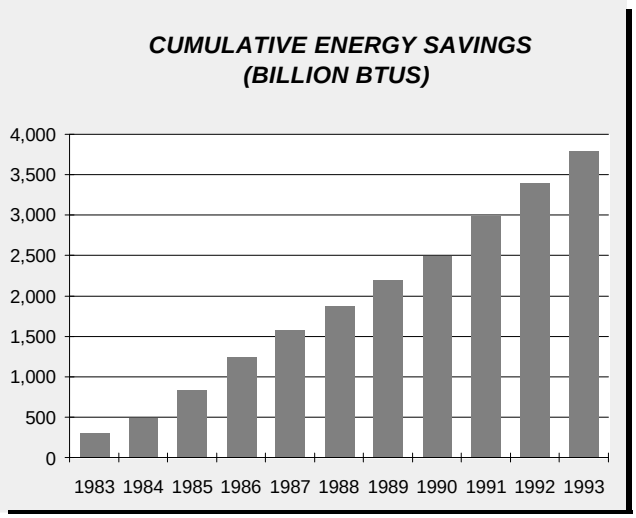
Electricity savings for 1993-1994 was 15.8 GWh, an impressive 61.3% growth in savings achieved since the program's inception. For the most part savings in electricity has continuously increased from the first year, with the exception of the 1988-1990 period, discussed above. The only other year for which electricity savings did not improve was 1991-1992. While there was no improvement over the previous year, there was still a 9% level of savings when compared to budgeted consumption. This dip in savings may have been the result of the previous year's reduction of 12%. Such a successful savings would lead to a greater ratcheting of the following year's budget.

Fluctuations in oil and gas savings may represent complications with dual fuel, which sometimes need to be switched to oil only, resulting in decreased savings for oil and improved for gas. This event occurred in the 1990-1991 and 1993-1994 data. The use of dual fuel began in 1986.

Consumption for coal has fluctuated greatly and has actually been over the budgeted amount for most of the period since the 1989-1990 school year. Factors which influence this pattern include the quality of the coal used and whether it is wet or not, as well as the methods of burning the coal which vary from engineer to engineer as a result of turnover. Additionally, the decreasing number of buildings which use coal and the their state of disrepair resulting from lack of availability for replace-

CUMULATIVE FUEL SAVINGS	ELECTRICITY SAVINGS (MWh)	GAS SAVINGS (MCF)	OIL SAVINGS (GAL.)	STEAM SAVINGS (MLB)	COAL SAVINGS (TONS)	TOTAL SAVINGS (BILLION BTUS)
1983-84	9,774	61,961	831,055	22,116	3,705	309.29
1984-85	23,124	203,868	1,314,155	43,906	4,769	479.19
1985-86	37,803	356,246	1,928,210	85,013	5,951	836.14
1986-87	52,329	491,326	2,815,859	131,229	8,239	1,240.62
1987-88	63,515	549,651	3,627,507	179,440	11,797	1,575.80
1988-89	72,455	669,613	4,420,005	208,076	12,527	1,878.52
1989-90	80,787	774,423	5,767,565	235,941	11,700	2,195.38
1990-91	95,944	919,462	7,439,416	259,017	11,503	2,490.26
1991-92	111,101	1,136,826	9,014,469	286,002	12,165	2,993.28
1992-93	126,258	1,311,147	10,189,517	314,264	11,811	3,392.78
1993-94	141,415	1,554,556	10,606,618	352,261	11,756	3,789.48
Total	814,505	8,029,079	57,954,376	2,117,265	105,923	21,180.72





ment parts has contributed to inconsistent consumption levels.

The 1993-1994 school year produced a gain in savings of electricity, gas, and steam at 15.8 GWh, 243.4 MMCFs, and 37,997 Mlbs respectively. A total of 417,101 gallons of oil were saved in that year, down 64% from the previous year's achieved savings. However, this year saw an increase in heating oil due to a higher use of dual fuel.

Total cumulative savings for the program are as follows: 814,505 MWh of electricity, 8,029,079 MCFs of gas, 57,954,376 gallons of oil, 2,117,265 Mlbs. of steam, and 105,923 tons of coal.

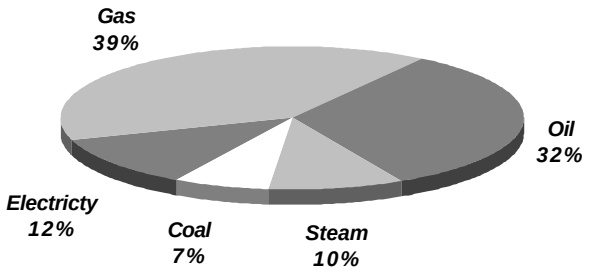
Total savings in Btus was calculated for each fuel source and totaled in the Annual and Cumulative Fuel Savings table. Conversion to Btu for steam was calculated with a equation from Trigen Energy Corporation, from whom the School District purchases its steam. Savings from all other fuel sources were calculated using conversions in the DOE/EIA's 1993 Annual Energy Review. Energy Savings produced by the School District average 368.75 billion Btus annually, for a total annual savings of 4,056.27 billion Btus. Cumulatively, the Save Energy Campaign has saved 21.181 trillion Btus.

PARTICIPATION RATES

Data for the number of schools which achieved an energy savings and thus earned an incentive through the Save Energy Campaign is not available for participants prior to the 1990-1991 school year. Staff believe, however, that savings have been historically achieved by between one-half and two-thirds of the District's schools. The names of schools which make the incentive list fluctuates yearly. This is to be expected, since a school which has successfully achieved savings over a couple of years will be faced with an increasingly tougher budget to beat. From 1990-1991 to 1993-1994 a total of 579 incentive checks were awarded with an average of 145 schools each year.

PARTICIPATION TABLE	*SCHOOLS RECEIVING INCENTIVES*	*TOTAL INCENTIVE DOLLARS (x1,000)*
1990-1991	122	$427.82
1991-1992	152	$457.75
1992-1993	157	$404.78
1993-1994	148	$296.36
Total	579	$1,586.72

TOTAL ENERGY SAVINGS BY FUEL SOURCE



FREE RIDERSHIP

While some of the energy savings improvements within the School District of Philadelphia would have occurred without the Save Energy Campaign, for the most part and given the constrained budgets discussed at length in this profile, it was the Save Energy Campaign that made most behavioral changes and capital improvements possible. The School District, naturally, does not consider free ridership, a utility term used mostly for purposes of DSM program cost recovery and shareholder incentives. Thus while there is technically a degree of free ridership in the program, for instance replacing old boilers at the time of failure and waiting a year to determine how to adjust the energy consumption budget, the program lacks the mechanisms for backing these savings out of the program data. Furthermore, on a larger scale, the concept of free ridership is not applicable for this model, since all parties are contained in the same institution and the School District is essentially paying itself.

MEASURE LIFETIME

Initial savings achieved by the program were obtained by correcting and improving the habits of the energy users. Hopefully, the lifetime on such measures has no limits. However, since the program targets a comprehensive effort towards energy efficiency, a broad variety of measures were applied including maintenance, retrofits, fuel switching, energy management system installations. Furthermore, a thorough tracking system for measures installed was not essential to the campaign, and as such has never been established. Calculating an accurate and complete figure for measure lifetimes for this program would be difficult at best and would never be more than a ballpark approximation. As such, The Results Center is not stating a measure lifetime for the methods used in the program.

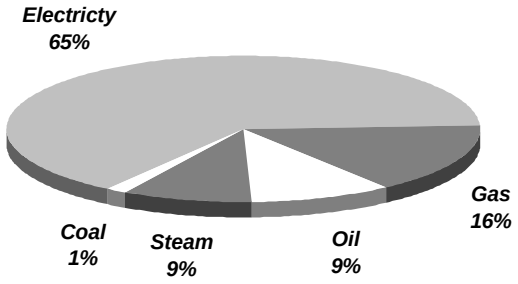
Although the Save Energy Campaign was initiated without any budget at all, the program's design included a revolving fund for reinvesting savings to achieve further energy efficiency measures and improvements, and to fund an Energy Conservationist to administer the program. The program's revolving fund mechanism provides that a minimum of 20% of the volume dollar savings achieved by each individual school, plus a portion of the total electrical demand savings realized for the School District, was reinvested in energy efficiency. This sum generally equalled around one-third of the total energy costs saved for the School District.

COST SAVINGS

The Save Energy Campaign achieved dollar savings through energy efficiency improvements of $4,180,000 in its first year without capital improvements, relying instead on behavioral changes as discussed earlier. Savings have continued to increase annually since its inception in 1983 with the exception of the 1989-90 school year when savings showed no growth. While the growth rate in savings declined, 1989-1990 still resulted in twice as much savings in dollars as the program's first year since savings had accumulated for five years by that point. After eleven years, total cumulative savings of $77,005,000 have been earned for the Philadelphia School District. Furthermore, growth in energy costs for the School District has been kept substantially below that national average.

Electricity accounts for 48% of the School District's total energy costs and represents an even larger segment of the total savings. In the 1993-1994 school year, the total cost of energy saved was $8,487,000. Fully two-thirds of that sum was from savings in electric consumption, totaling $5,895,000 in savings including demand savings. Similarly, electricity also accounts for the largest savings in energy costs, some 64.5% of total cumulative savings by the program. Gas savings are next in proportion of costs saved at 15.8%, followed by oil, steam, and coal at 8.9%, 9.5%, and 1.3% respectively.

TOTAL DOLLAR SAVINGS BY FUEL SOURCE



ANNUAL COSTS SAVINGS	ELECTRICITY SAVINGS (x1,000)	GAS SAVINGS (x1,000)	OIL SAVINGS (x1,000)	STEAM SAVINGS (x1,000)	COAL SAVINGS (x1,000)	TOTAL SAVINGS (X1,000)
1983-1984	$1,922	$458	$890	$556	$356	$4,180
1984-1985	$2,696	$1,151	$464	$537	$94	$4,941
1985-1986	$2,921	$1,153	$520	$920	$113	$5,627
1986-1987	$4,446	$956	$512	$680	$201	$6,794
1987-1988	$4,426	$634	$508	$786	$272	$6,624
1988-1989	$5,096	$1,000	$483	$524	$56	$7,159
1989-1990	$4,509	$799	$1,011	$538	($74)	$6,783
1990-1991	$6,156	$947	$1,355	$516	($17)	$8,957
1991-1992	$5,640	$1,664	$896	$588	$56	$8,843
1992-1993	$6,026	$1,383	$658	$570	($26)	$8,610
1993-1994	$5,895	$1,926	$0	$670	($24)	$8,487
Total	$49,732	$12,069	$7,294	$6,884	$1,025	$77,005

Environmental Benefit Statement

AVOIDED EMISSIONS: ***Based on 814,505,000 kWh electricity saved***

Marginal Power Plant	Heat Rate BTU/kWh	% Sulfur in Fuel	CO2 (lbs)	SO2 (lbs)	NOx (lbs)	TSP* (lbs)
Coal	***Uncontrolled Emissions***					
A	9,400	2.50%	1,756,073,000	41,662,000	8,422,000	842,000
B	10,000	1.20%	1,872,547,000	16,127,000	5,438,000	4,032,000
	Controlled Emissions					
A	9,400	2.50%	1,756,073,000	4,166,000	8,422,000	67,000
B	10,000	1.20%	1,872,547,000	1,613,000	5,438,000	269,000
C	10,000		1,872,547,000	10,751,000	5,376,000	269,000
	Atmospheric Fluidized Bed Combustion					
A	10,000	1.10%	1,872,547,000	4,928,000	2,688,000	1,344,000
B	9,400	2.50%	1,756,073,000	4,166,000	3,369,000	253,000
	Integrated Gasification Combined Cycle					
A	10,000	0.45%	1,872,547,000	3,315,000	538,000	1,344,000
B	9,010		1,684,396,000	1,201,000	404,000	81,000
Gas	***Steam***					
A	10,400		1,021,389,000	0	2,329,000	0
B	9,224		886,996,000	0	5,555,000	263,000
	Combined Cycle					
1. Existing	9,000		886,996,000	0	3,405,000	0
2. NSPS*	9,000		886,996,000	0	1,613,000	0
3. BACT*	9,000		886,996,000	0	224,000	0
Oil	***Steam--#6 Oil***					
A	9,840	2.00%	1,478,327,000	22,399,000	2,643,000	2,509,000
B	10,400	2.20%	1,567,922,000	22,220,000	3,324,000	1,613,000
C	10,400	1.00%	1,567,922,000	3,172,000	2,670,000	842,000
D	10,400	0.50%	1,567,922,000	9,318,000	3,324,000	512,000
	Combustion Turbine					
#2 Diesel	13,600	0.30%	1,962,143,000	3,906,000	6,066,000	332,000
Refuse Derived Fuel						
Conventional	15,000	0.20%	2,329,484,000	6,003,000	7,902,000	1,756,000

In addition to the traditional costs and benefits there are several hidden environmental costs of electricity use that are incurred when one considers the whole system of electrical generation from the mine-mouth to the wall outlet. These costs, which to date have been considered externalities, are real and have profound long term effects and are borne by society as a whole. Some environmental costs are beginning to be factored into utility resource planning. Because energy efficiency programs present the opportunity for utilities to avoid environmental damages, environmental considerations can be considered a benefit in addition to the direct dollar savings to customers from reduced electricity use.

The environmental benefits of energy efficiency programs can include avoided pollution of the air, the land, and the water. Because of immediate concerns about urban air quality, acid deposition, and global warming, the first step in calculating the environmental benefit of a particular DSM program focuses on avoided air pollution. Within this domain we have limited our presentation to the emission of carbon dioxide, sulfur dioxide, nitrous oxides, and particulates. (Dollar values for environmental benefits are not presented given the variety of values currently being used in various states.)

HOW TO USE THE TABLE

1. The purpose of the accomanying page is to allow any user of this profile to apply the School District of Philadelphia's level of avoided emissions saved through electric effiency improvements in its Save Energy Campaign to a particular situation. Simply move down the left-hand column to your marginal power plant type, and then read across the page to determine the values for avoided emissions that you will accrue should you implement this DSM program. Note that several generic power plants (labelled A, B, C,...) are presented which reflect differences in heat rate and fuel sulfur content.

2. All of the values for avoided emissions presented in both tables include a 10% credit for DSM savings to reflect the avoided transmission and distribution losses associated with supply-side resources.

*** Acronyms used in the table**

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

3. Various forms of power generation create specific pollutants. Coal-fired generation, for example, creates bottom ash (a solid waste issue) and methane, while garbage-burning plants release toxic airborne emissions including dioxin and furans and solid wastes which contain an array of heavy metals. We recommend that when calculating the environmental benefit for a particular program that credit is taken for the air pollutants listed below, plus air pollutants unique to a form of marginal generation, plus key land and water pollutants for a particular form of marginal power generation.

4. All the values presented represent approximations and were drawn largely from "The Environmental Costs of Electricity" (Ottinger et al, Oceana Publications, 1990). The coefficients used in the formulas that determine the values in the tables presented are drawn from a variety of government and independent sources.

LESSONS LEARNED

Energy and dollar savings can be bootstrapped in school districts if carefully designed incentives are part of the package: In its impressive eleven-year history the Save Energy Campaign has been enormously successful in generating energy and dollar savings for Philadelphia's School District. What makes this success so profound is that fact that the program began with no budget, no government intervention, no utility rebate, nor other financial assistance. Instigators of the program certainly had an uphill battle. Yet they were successful in delivering a program with little external support in an organization where there are many crucial issues looming. Now entering its twelfth year, the campaign boasts a powerful track record and has become institutionalized within the School District.

Ratcheting down the baseline for energy consumption was key to assuring ever-increasing energy savings: Savings achieved in the previous years were reflected in the budgeted usage. The baseline for energy consumption is updated frequently to incorporate and subsequently discount savings from those measures which have already been installed. Tightening the energy budget to include each years' reduction in energy usage has ensured that those savings will perpetuate and continue to cut the District's budget by nearly $10 million annually.

By letting the previous years' savings set the standard for efficiency, schools are encouraged to maintain and improve their conservation efforts: Rather than allowing schools to rest on their laurels and prior years' energy efficiency achievements, the School District added an extra ingredient to the formula and hinged the size of the reward to outperforming previous years' achievements. The incentive structure, beginning in its second year, based the percentage of savings to be awarded not simply on how much was saved during that school year, but how much greater those savings were from the previous two years. Thus, to earn a full 40% incentive, schools must not only maintain their current level of savings, but generate new savings as well.

Distributing "big bucks" after the first year — in a well-attended ceremony — was successful in garnering initial interest in the program: Initially, participation in the program was hampered by apathy and skepticism from school administrators. In its first year, only a handful of schools participated in the Save Energy Campaign. The School District's principals had seen incentive programs before which had failed to deliver. Previous incentivized programs within the District, targeting issues such as attendance, lacked follow through in rewarding achievements as outlined. Moreover, the faculty was still feeling the sting of a 10% raise which was promised but never delivered, a year and a half before the Campaign was introduced. It was not surprising that when the School District announced its Save Energy Campaign, administrations were jaded and took little interest. Once that first award check was distributed, however, the program's impact was felt. Establishing and maintaining credibility of the campaign through follow-up of earned incentives has been the cornerstone of its success.

For a school district saturated with demands, problems and economic constraints, easily translating energy savings into real dollars was central to program success: In the Philadelphia School District "money talks," and was wholeheartedly heard by its individual schools. With so many economic demands (not to mention asbestos removal!), there has been little room for cutting costs, and education has usually been the victim. The School District spends twice as much money on lighting and heating as it does on books and supplies. Where so many issues, such as crime and violence, drugs, quality of learning, lack of educational materials, teen parenthood, etc., plague an administration, revenue has become a powerful tool for combating the elements. By providing schools' administrations a means of independently generating their own revenue, the program created the opportunity for "site-based management" of their economic resources. This empowered the principals to address their school's unique needs and problems.

One of the essential elements in this incentive structure, and a contributor to it success, was its method of rewarding everyone involved in accomplishing an energy savings: The program's design aimed at delivering its benefits to everyone in the School District. This approach has been invaluable in soliciting complete participation. Without cooperation from all occupants of the facility, from the principal on down to the kitchen staff, only a fraction of the possible success could be realized. By distributing savings to both the District as a whole and the individual schools, the School District

as a whole has benefitted, while separate schools have been able to address their particular needs individually. Allocation of the school's incentive is regulated so that the whole school profits, including the building engineers. Thus all parties in the School District have been motivated to participate, knowing that their efforts will be rewarded.

A high turnover rate among the School District of Philadelphia's facilities administration and engineers required system to be kept simple and the program needed to be continually plugged: The frequent changing of the school's principal or building engineer can greatly impact the savings achieved by a certain school. A new building engineer may not have the skills of his predecessor and therefore not be as adept at maintaining the building efficiently. Factors as simple as how coal is shoveled in the boiler can come into play. Since there is such a high turnover in facility managers, there is less of a tendency to become acutely familiar with their buildings. Thus when installing retrofits, it is best to work on buildings as a whole, instead of a wing at a time, to keep the system homogeneous.

Similarly, the administration is another place where high turnover has been experienced, with principals relocating within the School District or leaving the system altogether. While this means that successful principals take their conservation habits with them to new buildings, it also means that they may be followed by less-motivated principals. This inconsistency in how schools are administered on a yearly basis often caused backsliding in the savings achieved by certain schools.

Of course, turnover has occurred in the student body as well. Those students who were enrolled in Philadelphia's School District when the Save Energy Campaign was introduced have now moved on as new students enter the School District. This continuous change in the student population requires a constant drumming of message that "energy efficiency equals money saved."

Although energy conservation is a source of budget savings for the School District of Philadelphia, there remain other concerns which precede it: There are many instances where energy efficiency is not the highest priority. For example, safety of the building's occupants obviously, must always come first. Although energy conservation may advocate turning off lights at night, if security concerns dictate the burning of outside lights all night long, it is inarguably appropriate to leave them on. Likewise, comfort levels should not be sacrificed for the purpose of energy efficiency.

When discussing the success of the Save Energy Campaign, its creators found that the "Tom Sawyer" approach works best: The program has become a feather in the cap of many people. Despite the fact that the utility did not play a key role in the program, PECO received an award for the energy savings accomplished through the program because of the technical advice that it provided and the overall guidance to the program. The Chamber of Commerce boasts credit for helping the School District spend tax dollars on energy efficiency in literature it distributes. Naturally, everyone wants to take the credit for the program's success. For Philadelphia's School System, sharing the glory just makes these organizations participate and that much more accessible for help when the School District needs it.

Distribution of capital available for energy efficiency measures is governed by not only maintenance needs but political considerations as well: Within the School District of Philadelphia there are six sub-districts. Although the savings and the efficiency needs of each sub-district are not equal, attention from the District is given to how the money is allocated so that balance is maintained. Too much activity and investment within one sub-district may be viewed as favoritism. Conversely, if little is done within a particular sub-district, it might feel slighted. This means that those buildings which need maintenance or new installations the most may not always get it depending on where they are located.[R#4]

The School District continues to suffer budget constraints that affect staffing levels, notably facility engineers: Budget constraints have not only led to a long list of deferred maintenance, which the Save Energy Campaign has helped to offset somewhat, but have also dictated staff cuts in the maintenance department, among other areas. As a results some facilities have been left with one engineer, when two are needed to run the building efficiently. In addition to being understaffed, the remaining staff were pulled toward other critical demands. While these staff cuts may be prudent cuts for the School District to make, they become yet another barrier to efficiency for the schools.

TRANSFERABILITY

The Save Energy Campaign is a brilliant example of how energy efficiency can be initiated and conducted internally to create revenue savings while benefitting the environment. Furthermore, it is a forerunner in the sort of "site-based management" which equips individual schools with the means to impact their own budgets. The Save Energy Campaign has served as a model for other school districts in the country. Likewise, it has spawned other incentive programs within the School District, pursuing such elements as attendance. The logistics for measuring and implementing these programs, however, have not been worked out yet.[R#3]

Although it was not the first such program, it has enjoyed a longevity which has not been reached by others. In Rochester, New York a similar incentive plan was implemented in its school district. When the budget needed to be cut, however, the incentives were one of the sacrifices made. Without realizing the paybacks they were promised, the schools reversed their efforts and the program failed.

This same structure has been successfully used by other districts in the country. One of the strongest examples is in Prince George County, Maryland, where Mike Hanson and Jack Myers consulted on the District's program. An identical formula was applied to this school system with highly successful results. As a result, the program went statewide in Maryland in 1992. The School District of Philadelphia receives an average of half a dozen inquiries per year from other school districts around the country, wanting to implement such a program in their own system. Chicago, for example has looked closely at what Philadelphia has done.

An exciting by-product of this program is that it is educating tomorrow's energy users in the process, even though the program was not developed for a curricular purpose. Many such energy efficiency programs for schools have been developed throughout the U.S. and Canada with the dual purpose of conservation and education in mind. The EcoGroup, located in Tempe, Arizona, developed an educational program called "In Concert With The Environment," whereby school curriculum becomes a watering grounds for growing energy efficiency practices in the home and school. This program has grown to use in 17 states by 25 utilities. (See The Results Center Profile #72) In Canada, Destination Conservation parallels the School District of Philadelphia's program, involving broad-based participation from school districts' to employ efficiency habits in energy use to achieve a savings, which is then fed into a revolving fund for subsequent retrofit activity.(Profile #82) The program has spread to 24 school districts in Canada and is being considered by some in the United States.

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