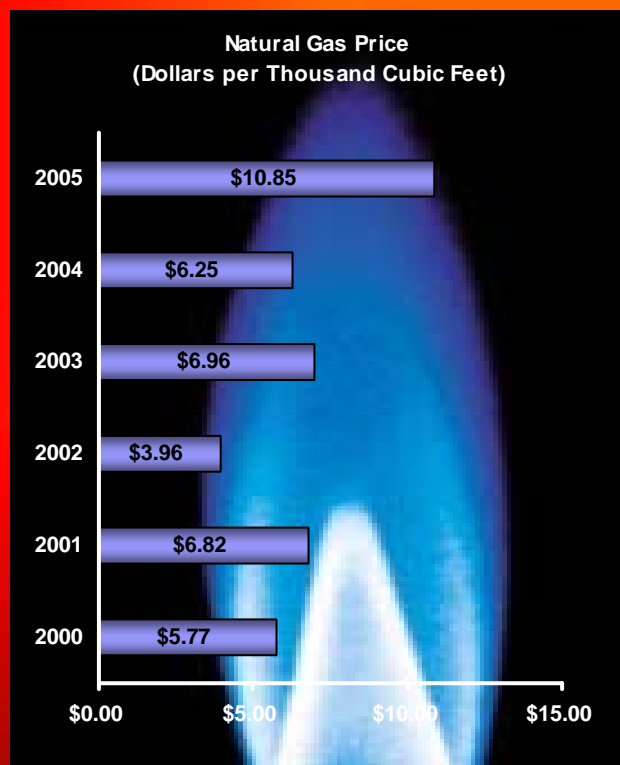
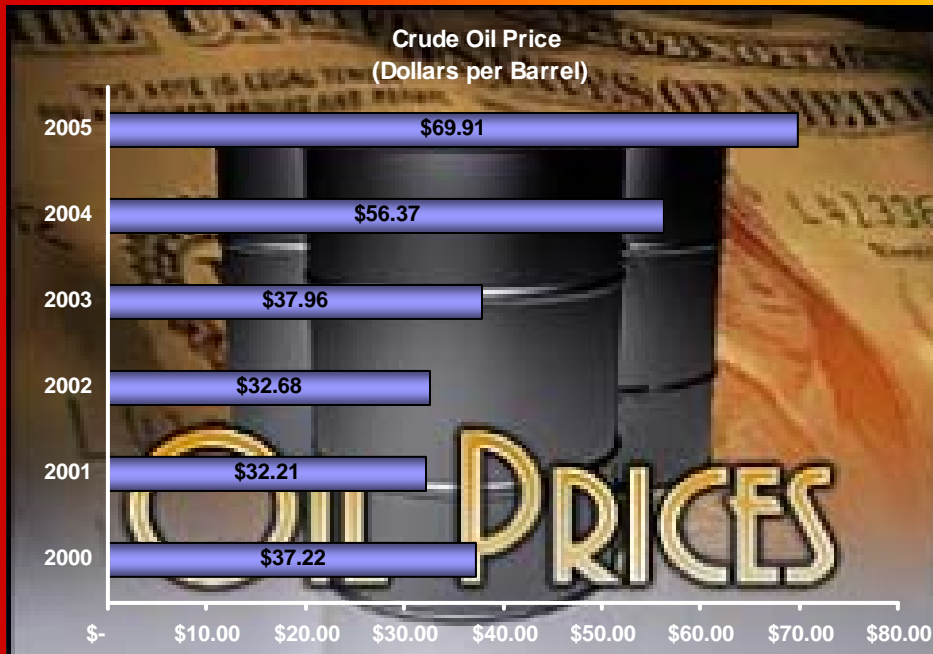


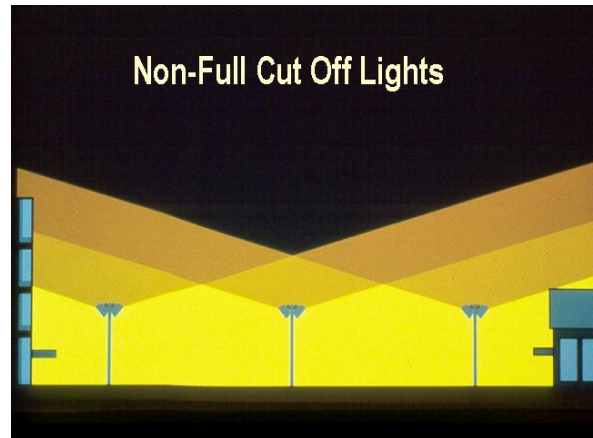
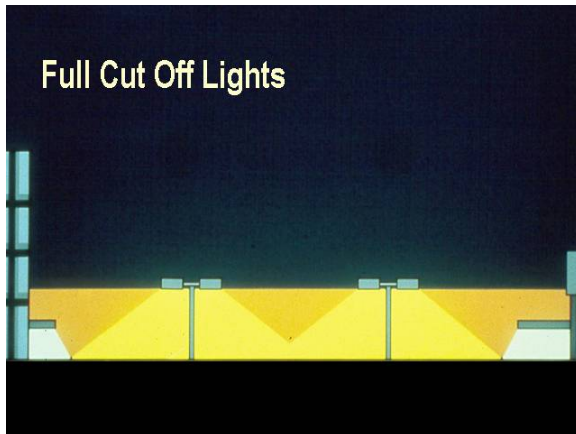
City of New Haven Energy Conservation Program



Mayor John DeStefano, Jr.
AUGUST 30, 2005

MAJOR ACCOMPLISHMENT THIS FISCAL YEAR

- **Replaced 11,300 street lighting fixtures which have reduce energy and maintenance cost by \$.5 million per year as well as significantly reduce light emissions to the night sky.**



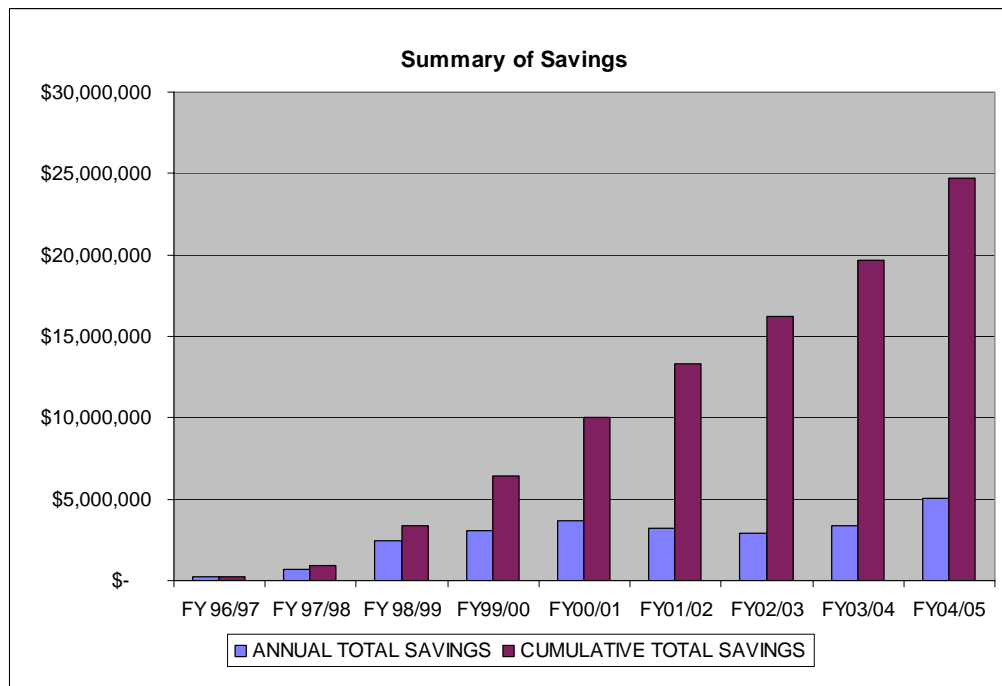
- **Have reduced the total cost of natural gas by \$278,000 for all Board of Education facilities despite, a 25% increase in gas rates and a 289,000 square foot increase in physical plant.**



- Have reduced the cost of electric power for all municipal buildings by \$595,000 despite a 30% increase in electric power rates.



- Have avoided over \$5.0 million in energy cost in FY 2004/05



- **This table illustrates the effects of the Energy Conservation Program efforts at the Board of Education.**

METRIC	FY 2000/01	FY 2004/05	% CHANGE
KWH	22,105,587	34,112,401	54%
COST\$	2,777,724	4,816,009	73%
\$/KWH	0.126	0.141	12%
SF	2,693,706	3,963,686	47%
KWH/SF	8.21	8.61	5%

The Board has faced rising electric power rates (\$/KWH) of 12% and an increase in electric power cost (\$) of 73% as well as an increase in electric power consumption (KWH) of 54%, coupled with an increase of over 47% in school area (SF). However, given these increasing pressures the power density (KWH/SF) in all school facilities i.e. the amount of power used per square foot of building area has only increased by 5%. This indicates that the Conservation efforts at the Board of Education are having significant impact. Newer buildings are more efficient while energy conservation investments in older buildings are having impact. Had these measures not been taken the Board's cost for utilities would have been over 11.8 million dollars higher since the inception of the program in 1994.

Executive Summary

History

In early 1994 the DeStefano administration reviewed all aspects of city management and finance. The administration recognized that a plan was needed to resolve problems related to the rising use and cost of energy in public facilities throughout the city. The annual cost of energy for all city departments and authorities was about \$14 million in 1994. These expenditures were spread over 700 electric and 300 gas accounts in more than 300 facilities and a citywide street lighting system. In addition, knowing that the city was about to embark on an ambitious rebuilding program for all schools and that at least 10 new schools were to be added, which would further exacerbate energy consumption, Mayor John DeStefano Jr. directed the Budget Director for the city, Mr. Frank A. Altieri, to prepare and implement a comprehensive plan to analyze and control the future cost and use of energy.

Mr. Altieri formed an Energy Committee consisting of the City Engineer and Public Works Director, Mr. Richard Miller, P.E.; the Chief Operating Officer for the New Haven Public Schools, Robin Golden; and the city's overall Energy Consultant, Mr. Ed Melchiori, P.E. The mission of the committee was to develop and implement a plan. The plan consisted of a group of strategic objectives and capital investments aimed at the goal of reducing energy consumption and associated costs. Implementation of the plan relied on internal forces, together with outside contractors and consultants under the overall day-to-day direction of Mr. Altieri and Mr. Melchiori. Beginning in 1997 the plan began to produce results.

Results Thus Far

As of the close of Fiscal Year 2005, this program has reduced energy and maintenance costs by an aggregate amount of approximately \$24.7 million over the 11 years since its inception in 1994. At the time of this writing the price of a barrel of crude oil has risen to over \$65 per barrel as compared to \$25-\$30 a barrel during the 1994-95 period when this program began (on August 30, 2005, one day after Hurricane Katrina struck the gulf coast, crude oil hit \$71 per barrel). The cost of energy consumed by the City and the Board of Education currently totals some \$10.5 million per year. It is important to note that the program has reduced energy costs from 1994 levels even with the addition of 23 new and renovated schools with an additional 1.1million square feet of physical plant that is about twice as energy intensive than older facilities. If this program had not been put in place, the city's current energy cost would be 5.0 million per year higher than current cost. The goal of this plan is to further offset increased consumption and cost by an additional \$6.1 million per year by 2010. While this program has been highly successful to date, it continues to evolve and grow to harness energy use and associated costs using increasingly sophisticated methods and approaches. Plans going forward will require more sophisticated technology to meet the future goals of energy cost and consumption reduction. The following chart describes the result's thus far and future goals of the program.

INVESTMENTS, SAVINGS, OTHER ACHIEVEMENTS AND GOALS

Energy Investments to Date

Board of Education Performance Contract	\$6.10 Million
Elm/State Street Tunnel Improvements	\$0.10 Million
Crown Street Parking Garage	\$0.07 Million
Temple Street Parking Garage	\$1.50 Million
Street Lighting System Management	\$3.30 Million
Traffic Lighting System Improvements	\$0.78 Million
2002/03 Energy Conservation Investments	\$1.57 Million
2003/04 Energy Conservation Investments	\$4.25 Million
Total Energy Investments to Date	\$17.67 Million
Energy and Maintenance Savings to Date	\$24.71 Million
Savings in Excess of Investments	\$ 7.04 Million

Other Achievements to Date

Utility Company Rebates Earned	\$0.96 Million
Federal and State Grants Received	\$2.52 Million
Environmental Pollution Reduction	72 Million Pounds CO ₂ , NO _X , SO ₂ *
Awards Received	CT DEP Green Circle Awards 2002, 2003 & 2004

Future Goals by Fiscal Year 2010

Additional Energy and Maintenance Cost Savings	\$35.6 Million
Additional Utility Company Rebates	\$1.5 Million
Additional Federal and State Grants	\$5.0 Million
Additional Energy Investments	\$10.0 Million
Additional Environmental Pollution Reductions	180 Million Pounds CO ₂ , NO _X , SO ₂ *

*CO₂ Carbon Dioxide, NO_X Nitrous Oxides, SO₂ Sulfur Dioxide

THE CITY OF NEW HAVEN ENERGY MANAGEMENT PROGRAM

Detailed Program Description

The Plan

Simply put, the strategic goals of the plan are as follows:

- Use cleaner-burning fuels.
- Pay less for the energy used by buying it smarter and at a lower cost.
- Invest in energy saving opportunities that have clear and immediate paybacks with positive cash flows from energy cost savings.
- Build new facilities so that they use less energy per square foot than other facilities of a similar nature.
- Maintain the facilities so that they continue to use less energy.
- Take advantage of all available federal, state and private funding, grants, and rebate opportunities to lower the cost of investments that reduce energy consumption and cost.
- Continue to investigate and install newer and more sophisticated technologies that control energy use and reduce its cost while upgrading the quality of the facilities environment.
- Create a cleaner environment within the city and its surrounding areas by reducing the amount of energy used, thus burning less fossil fuel and reducing airborne contaminants.
- Create a program that will allow New Haven's citizens and small and large businesses to understand energy and environmental relationships by offering education and outreach programs in concert with local utilities and community groups.
- Audit and verify that targeted results are being achieved.

The Results

Use Cleaner-Burning Fuels

- Beginning in 1995 the city undertook a comprehensive program of removing all underground fuel oil storage tanks and converting its facilities to natural gas. This had a significant impact on environmental quality in the city, since emissions from burning fuel oil were reduced and the threat of contamination of the underground water table was eliminated.

Pay Less for Energy

- Beginning in 1997 the city formed a consortium with all public agencies in the city and surrounding towns to buy natural gas on the open retail market. Since its inception, the city and its agencies have saved over \$3.8 million in the cost of gas. The entire consortium has saved more than \$4.5 million.
- In 1999 the city prepared a Request for Proposal for purchasing electric power in the retail market. To date retail electric power has not been purchased because the local utility, through its standard offer, still offers the lowest cost power. In 2006 when the standard offer is no longer available and the open retail market is scheduled to actually begin, the city is prepared to go to the marketplace to procure the lowest cost power available from a reliable supplier.

Invest to Produce Major Energy and Cost Savings

To date over \$17.7 million has been invested in energy reduction improvements, which have resulted in 24.71 million of avoided utility and maintenance cost. The following summarizes the most significant energy savings investments the city and other public agencies have implemented since the initiation of the program, and the attached spreadsheet summarizes the overall results of this effort to date:

- *Board of Education Performance Contract (Nine-year program)*
 - \$6.1 million of leased improvements.
 - \$250,000 in utility rebates to offset capital cost.
 - \$5.6 million in energy, maintenance, parts and labor cost saved to date.
 - \$8.8 million savings guaranteed over the nine-year program.
 - \$8.35 million saved to date over seven years
- *Board of Education Energy Conservation Program*
 - Total Saved to date \$1.2 million
 - One Time Savings \$ 0.8 million
 - Annual Recurring Savings \$ 0.4 million
- *Crown Street Parking Garage Lighting Improvements*
 - \$61,600 in leased capital improvements.
 - \$63,000 in utility rebates to offset capital cost.
 - \$204,341 in energy and maintenance savings to date.
- *Traffic Lamp Changeover to Light Emitting Diode (LED)*
 - \$780,000 bonded capital cost.
 - \$240,000 grant from DOT.
 - \$180,000 in utility rebates to offset capital cost.
 - \$ 2,286,389 in energy and maintenance savings to date.
- *State /Elm Street Tunnel Lighting and Ventilation Improvements*
 - \$241,500 from operating budget capital cost.
 - \$113,000 in utility rebates to offset capital cost.
 - \$ 393,818 in energy and maintenance savings to date.
- *Temple Street Garage Lighting Improvements*
 - \$150,000 in bonded lighting improvements.
 - \$54,000 in utility rebates to offset capital cost.
 - \$ 291,916 in energy and maintenance savings to date.
- *Street Lighting Management*

The City of New Haven owns and operates its own street lighting system. Under the direction of a professional manager and maintenance organization, it is estimated that \$1,329,150 in energy and operating costs are saved each year when compared to the traditional method of leasing the streetlights from the local utility.
- *Replace all Street Lighting Fixtures*

The City has replaced over 11,000 street and road lighting fixtures. The new fixture reduces up lighting and is in compliance with “Light the Night” standards. Fixture, maintenance and energy savings to date: \$ 0.5 million.

- *New Haven Water Pollution Control Authority Fuel Cell*
 This investment was made with the assistance of a \$2.4 million grant from the Connecticut Clean Energy Fund. Electric power that is generated by the fuel cell offsets electric power consumption from the grid, and hot water by-product from the fuel cell offsets electric power previously used to process fats, oils and grease (FOG) at the wastewater treatment plant.
 \$2.4 million capital cost granted from Connecticut Clean Energy Fund (CCEF).
 \$50,000 energy savings to date
 1.9 million pounds per year of emissions reductions in New Haven.
- *FY 2003/04 Energy Conservation Investments*
 This group of investments included real-time monitoring of electrical power consumption, as well as demand monitoring. Improvements included lighting upgrades, dimmable lighting, vending machines controls and demand management at over 60 facilities.
 \$1.6 million leased capital improvements.
 \$38,000 in utility rebates to offset capital cost.
 \$ 391,825 in energy and maintenance savings to date.
- *FY 2004/05 Energy Conservation Investments*
 This group of investments will expand the real-time energy monitoring and controls to more than 90 facilities throughout the city. It will also include the replacement of the city's entire roadway lighting system to effect more efficient use of power and reduce maintenance cost, as well as light pollution. Additional improvements include power factor correction for large motors, as well as boiler efficiency controls.
 \$4.25 million in leased capital improvements.
 \$100,000 in utility rebates to offset capital cost.
 \$ 640,298 per year in energy and maintenance savings.

Build New Facilities so they cost less to Operate

The City of New Haven has embarked on the most aggressive school construction program in city or state history, which includes 50 renovated/new schools, costing more than \$1.5 billion over 10 years. Each school is designed and built to current State Building Code Standards for minimum energy consumption. In addition, each school is designed with additional energy saving features that further reduce energy use and cost, and qualify the structures for incentive rebates from the utility companies. To date, 11 new schools have been built, nine are under construction, eight are under design and 17 are anticipated in the future. The Board of Education has received more than \$620,000 in utility company rebates for adding additional energy reduction improvements such as occupancy sensors to shut off lighting when the room is vacant, high efficiency electric motors, and digital energy monitoring systems. Since the second phase of school design began in 2003, all new schools have been designed to a combination of Leadership in Energy and Environmental Design Standards (LEEDS) and Energy Star Standard. This will further reduce energy consumption and environmental pollution as well as create environmentally friendly buildings for teachers and students. In addition, all schools will be required to meet the new Energy Standard as set forth in the New Haven Public Schools Standard entitled *High Performance Schools - A Design Guide*. This will require schools to be at a minimum of 20% below the 2001 Energy Code required by the State Building Code. The schools will also be required to be in the top 25 percentile of all new energy efficient schools built in the U.S., by using the Energy Star Energy Target Finder Method. To date this effort has produced eight (8) new schools that are expected to consume 30% less than older designs and lower utility cost by \$400,000 per year which will yield over a \$10,000,00 lifetime savings over the next 20 years.

Maintain Facilities So They Operate at Peak Efficiencies

City municipal facilities and Board of Education facilities are managed by professional facilities personnel. State-of-the-art management systems and highly experienced professional staff to monitor established programs for preventative maintenance (PM). The results are facilities that run more efficiently, with less system breakdowns and lower energy cost. PM is tracked daily and work orders are written and tracked by staff using sophisticated electronic technology. Maintenance work is inspected for completeness, all of which delivers a more reliable and comfortable facility at less cost. PM also extends the useful life of systems and equipment, thus lowering yearly capital replacement needs and associated cost.

Take Advantage of All Available Federal, State and Private Sources of Funding to Reduce Capital Cost

To date the city has received the following:

- \$955,501 in utility rebates and incentives related to energy reduction improvements.
- \$2.5 million in state and federal grants related to funding a central energy management function.

The goal is to maximize the funding intake with a target of \$250,000 per year.

Continue to Investigate New Technologies to Further Reduce Energy Consumption and Cost

Real-Time Energy Management

Through the use of a federal/state grants, as well as infrastructure funded by United Illuminating, the city has installed a central Energy Management System and an Energy Manager to monitor and control energy use in all of its facilities. Technology using a real-time based monitoring and control apparatus will be installed to control not only the amount of energy consumed, but also when energy is consumed. Since the cost of energy is time sensitive, energy consumption will be reduced during peak cost hours without affecting the ability of the facility to function. The first phase of this program was completed in July 2003 and is expected to save more than \$472,000 per year in energy cost. Savings associated with the second phase, which was completed in June 2004, are projected to exceed \$1.3 million annually.

Natural Gas Fueled Vehicles

The city has secured, through a no-cost lease arrangement with Southern Connecticut Gas Company, the use of a Natural Gas Vehicle Fueling Station, which has been installed at the Public Works Garage at 34 Middletown Avenue. This station, coupled with the city's participation in the Gas Purchasing Consortium, will allow for the operation of a fleet of up to 30 natural gas powered vehicles. The resulting savings in fuel cost and the decrease in air pollutants will have significant benefits to residents and taxpayers.

Fuel Cells

A 200 kW fuel cell manufactured by United Technologies has been installed at the New Haven Water Pollution Control Authority's East Shore wastewater treatment plant. It will produce 9% of that facility's electric power needs – some 1.7 million kWh per year - and will supply all of the heat required for the expanded fats, oils and grease (FOG) processing facility. Running on natural gas, the fuel cell will produce a net savings of about \$50,000 per year in total energy cost while enabling the FOG unit to generate an additional \$216,000 per year in usage fees. In addition, the ultra clean fuel cell will eliminate 946 tons per year of CO₂, 4.2 tons per year of NO_X, and 12.8 tons per year of SO₂ from the local environment. Other applications of this state-of-the-art technology will be explored in the future.

Create a Cleaner Environment

The estimated reduction in airborne contaminants from the city's Energy Management Program is as follows:

Reductions to Date

- Combined total of 72 million pounds of CO₂, NO_X and SO₂

Total Anticipated Reductions

- Combined total of 180, million pounds CO₂, NO_X, and SO₂

Audit and Verification Methods

The need to be able to measure and audit the results of the program is critical. It is only through the accurate, comprehensive application of these techniques that the success of the program can be verified. Measurement and audit techniques include the following:

- Federal Energy Management Program Measurement & Verification Guidelines Methods as outlined in DOE/GO-10096-248 February 1996 and latter versions.
- Quarterly analyses of utility invoices for accuracy, correct tariff rates and consumption.
- Physical investigation and maintenance of investments to insure proper operation.
- Ultimate installation of real time measurement equipment capable of constant measurement, monitoring and control of utility cost.

The Energy Committee, through Mr. Altieri and Mr. Melchiori, reviews semi-annual reports and provides direction for correction, as necessary.

Plans Going Forward

The city and the Board of Education are currently planning two LEED certified schools for opening in 2006, the Barnard and Jepson Schools. The Barnard school will be built with a photovoltaic solar system that will produce 7.2 KWh of electrical power.

The City has already begun a systematic program of purchasing "Green Power" which is expected to consist of 20% of the total power mix by 2010.

The Board of Education has launched an Energy Conservation Program utilizing its own Facilities Management staff. This program is aimed at identifying low cost and no cost opportunities to reduce utility cost. Typical examples of these efforts include:

- Through examination of utility bills to reduce rate errors, tax errors and erroneous charges.
- More emphasis of using the Central Energy Management System to reduce excess operating hours, reduce temperature and shut down equipment that does not need to operate.
- Tighter control of transfer of utility accounts to contractors when schools are shut down for renovations and reopened when completed.

This program has already saved over \$1.2 million in utility cost during the last fiscal year and is expected to yield acquiring savings in excess of \$ 500,000 per year over the next four years

In addition to the Energy Management and Reporting System, a continuous emphasis will be placed on identifying additional investment opportunities that can reduce energy cost. Increased emphasis is being placed on designing new schools and other facilities to meet strict energy use standards.

The city is planning a comprehensive outreach program to educate and inform its citizens about the interrelationship between energy conservation and environmental quality. In the fall of 2001, the city in concert with local utilities and community organizations began a series of public events aimed at informing citizens about conservation programs, and self-help programs available from local utilities and other organizations involved in energy conservation and environmental quality.

The ultimate continuing goal is to keep the City of New Haven's energy cost to a reasonable level by reducing consumption, buying the most competitive retail energy available and curtailing inefficient use of energy by building and maintaining the most economically efficient facilities possible.