**City of Stamford, Connecticut**
**Cities for Climate Protection Campaign**

# Local Action Plan:
# Greenhouse Gas Emission Reductions

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## Acknowledgements

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## Executive Summary

In the spring of 2003, Mayor Dannel Malloy issued a proclamation establishing the City of Stamford's participation in the Cities for Climate Protection Campaign, a program of ICLEI-Local Governments for Sustainability. In doing so, Stamford has joined more than 500 governments worldwide, 140 of which are in the United States, by committing to reducing emissions that lead to global warming and air pollution. Stamford completed the first milestone of this campaign in the summer of 2003. With the assistance of an ICLEI intern, the city completed an inventory of global warming pollutants emitted by both the municipal and community sectors. These greenhouse gases include carbon dioxide, methane, and nitrous oxide. Though these gases are naturally occurring, their levels have been severely aggravated due to human activity: primarily fossil fuels burned to run cars and trucks and provide power to homes, businesses, and factories. Due to the excessive production of these gases, there is a thickening "heat-trapping" blanket in the atmosphere, causing the average global temperature to increase at the fastest rate in recorded history, with devastating consequences that have already begun to take hold. Addressing this issue in Stamford is not only contributing to the global warming solution, but, in addition, will enhance Stamford's livability by improving air quality, reducing traffic congestion, and lowering utility and fuel bills.

This document details the local action plan for the City of Stamford to reduce its emissions contribution to this global problem, examining both existing programs implemented on both the municipal and community side and specifying proposed reduction measures. These measures are primarily focused on energy and fuel efficiency, renewable energy, traffic reduction, and public outreach and education.

An emissions reduction target of 20% below the 1998 emission level, the baseline year set out in the emissions inventory, is established here in this report. Section 2.2 presents the targets set, and the reductions needed to bring the emissions level down from the forecasted "business-as-usual" scenario, in which it is assumed that no actions have been taken that reduce emissions, to a level 20% below that of 1998. The target year is 2018, so the City of Stamford has 13 years to implement these measures and achieve these reductions.

The table on the next page summarizes the existing and proposed measures itemized in this report for both the municipal and community sectors, along with the associated emissions reductions (in tons $eCO_2$) and cost savings, if calculated.

**Emissions Reduction Measures Summary**

| **Sector/Measure** | Emissions Reduction (tons) | Cost Savings/yr | Status |
|---|---|---|---|
| **Municipal** | | | |
| Rebuild America: energy efficiency measures | 1,354 | $306,920 | existing |
| Energy Services Performance Contract:schools | 3,207 | $721,240 | existing |
| Solar Energy System: Recycling Center | 5 | | existing |
| AITE Solar Energy System | | | proposed |
| WPCA Wastewater Residuals to Energy | 3,725 | | proposed |
| 20% by 2010 Clean Energy Campaign | 1,867 | | proposed |
| Comprehensive "Green Buildings" Policy | | | proposed |
| Environmentally Preferable Purchasing | | | proposed |
| Streetscape Renovations | 84 | $20,911 | in progress |
| LED Traffic Light Conversions | 636 | $158,764 | in progress |
| Gasoline-Electric Hybrid Vehicle Phase-in | 78 | $9,459 | proposed |
| Clean School Bus program | | | existing |
| Expand telecommuting | | | proposed |
| | | | |
| **Community** | | | |
| Fairfield County Energy Conservation Pilot | 2,888 | $589,318 | existing |
| 10% Challenge | 46,210 | | proposed |
| Promotion of State Climate Change Action Plan programs | 65,166 | | proposed |
| Global warming/energy efficiency curriculum | | | proposed |
| "Smart Growth" development | | | in progress |
| Bicycle/multi-use trail network | | | in progress |
| Stamford Urban Transitway | 8,929 | | in progress |
| Expand telecommuting: commercial sector | | | proposed |

Significant cost savings have already been achieved through several municipal measures, as seen in the table below. It is evident that implementing these actions not only reduces emissions, which affects both air quality and the global warming issue but achieves substantial cost savings for the City of Stamford.

**Municipal Cost Savings**

| Measure | Cost Savings/year |
|---|---|
| Rebuild America program | $306,920 |
| Energy Services Performance Contract | $721,240* |
| LED Conversions | $64,642 |
| Streetscape Lighting Renovations | $10,561 |
| Total annual savings: | **$1,103,363/year** |

*These savings will go towards paying implementation costs for the next 10 years

# Section I. Introduction

## 1.1 What is Global Warming?

To fully comprehend the global warming problem, one must first be aware of the "greenhouse effect." The "greenhouse effect" is a natural, life-sustaining phenomenon. Greenhouse gases, including carbon dioxide, methane, and nitrous oxide trap some of the sun's energy in the atmosphere, maintaining the earth's average temperature at 60º F, making the planet hospitable for life. The gases are, in effect, functioning like the panes of a greenhouse: they let some radiation from the sun in but don't let all radiation back out and so form a "heat-trapping blanket" in the atmosphere.

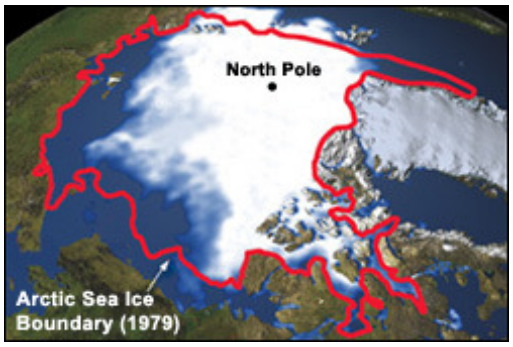
The problem arises when the greenhouse effect is aggravated by human-generated greenhouse gas emissions[1]. These gases are building in the atmosphere, a thickening layer of pollution that is heating up the planet faster than natural factors can account for. Since the beginning of the Industrial Revolution, the atmospheric levels of greenhouse gases have risen significantly, augmenting the heat-trapping capability of the earth's atmosphere. According to the Environmental Protection Agency, there is new and stronger evidence that most of the warming over the past 50 years is attributable to human activity. Fossil fuels burned to run cars and trucks, heat homes and businesses, and power factories are responsible for about 98% of U.S. carbon dioxide emissions, 24% of methane emissions, and 18% of nitrous oxide emissions[2]. Increased agriculture, deforestation, landfills, industrial production, and mining also contribute a significant share of emissions.

Although local temperatures fluctuate naturally, over the past 50 years, the average global temperature has increased at the fastest rate in recorded history. Experts think this trend is accelerating: the ten hottest years on record have all occurred since 1990, with

[1] USEPA. *Climate Change and Connecticut*. 1997.
[2] USEPA. *Global Warming-Climate.* 2000.
http://yosemite.epa.gov/oar/globalwarming.nsf/content/climate.html

the three hottest since 1998. Scientists say that unless we curb global warming emissions, average U.S. temperatures could be 3 to 9 degrees higher by the end of the century[3].

To know how serious of a problem global warming is for this planet and our society, we need only to look at the Arctic region, global warming's "canary in the coal mine." Most scientists view this highly sensitive region that is being severely affected by the changing climate as a harbinger of things to come. Average temperatures in the Arctic are rising 2X as fast as they are elsewhere in the world, causing the Arctic ice to thin, melt, and rupture. The polar ice cap is contracting at a rate of 9% each decade, with more than 20% melting away since 1979[4].



Source: www.nrdc.org

## 1.2 Connecticut and Global Warming

Climate change is having significant impacts on the State of Connecticut as well. The mean annual temperature for Connecticut is increasing at a rate of 1.7° F every 100 years, with the rate of increase nearly doubled (3.5° F) for areas such as the southern shore. Overall, the temperature increase in Connecticut is greater than that for the remainder of New England[5].

What does this mean for the state of Connecticut? There are numerous serious impacts. First of all, with a global warming trend, there will likely be a significant rise in ground-level ozone, which would aggravate respiratory illnesses such as asthma. Moreover, emissions contributing to the rising greenhouse gas levels are also associated with triggering asthma and contributing to other respiratory illnesses. Approximately 1 in 11 children in Connecticut suffers from asthma[6]. Also, in terms of public health, an increased incidence of vector-borne diseases is expected as global warming continues. At present, Connecticut rates as second in the nation for incidence of Lyme disease, which would be expected to increase with further global warming. In addition, with the increased combination of warming and extreme weather events, mosquito populations would likely increase, and so too would West Nile virus outbreaks. Finally, in terms of

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[3] Natural Resources Defense Council: Global Warming Basics
http://www.nrdc.org/globalWarming

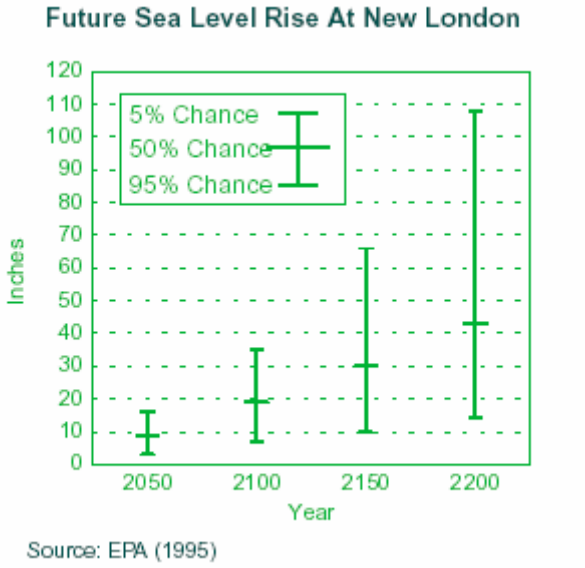
[4] Natural Resources Defense Council: Global Warming Puts the Arctic on Thin Ice.
http://www.nrdc.org/globalWarming

[5] The Executive Office of Governor John G. Rowland. *Connecticut Climate Change Fact Sheet*. www.ct.gov.

[6] *Asthma in Connecticut Update*. Connecticut Department of Public Health. May 2003.

public health impacts, the rates of heat-related illnesses and deaths would also obviously increase as well.

The sea level rise associated with global warming will severely affect coastal zones. Already, along the coast of New England, sea level is rising at a rate 10 times faster than rates recorded anytime in the last 1,000-2,000 years. According to Environmental Protection Agency projections, cumulative costs through 2100 to protect Connecticut's coastline from a 20-inch sea level rise could be $0.5-$3 billion[7]. Impacts associated with the sea-level rise are flooding of low-lying property, beach erosion, and saltwater contamination of drinking water[8].

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With global warming, the character of Connecticut's forests could also change. According to US EPA results, between 30-60% of the maple-dominated hardwood forests could be replaced by a mixture of pines and hardwoods, more adapted to a warmer climate. This would have evident impacts on New England fall foliage and, thus, a decrease in tourism revenue for the State of Connecticut[10].

## 1.3 ICLEI-Local Governments for Sustainability: Cities for Climate Protection (CCP) Campaign

ICLEI-Local Governments for Sustainability is a worldwide organization comprised of more than 500 local governments working towards sustainable development, with a focus on environmental conditions, by implementing measures at the local level[11]. The specific goal of ICLEI's Cities for Climate Protection campaign is to

[7] Clean Water Action. *Connecticut Climate Action Project.* http://www.cleanwateraction.org/ct/ccap.
[8] USEPA. *Climate Change and Connecticut*. 1997.
[9] USEPA. *Climate Change and Connecticut*. 1997.
[10] Clean Water Action. *Connecticut Climate Action Project.* http://www.cleanwateraction.org/ct/ccap.
[11] ICLEI. http://www.iclei.org/about.htm

reduce greenhouse gas emissions at the local government level. These emissions result from the burning of fossil fuels along with other human activities, and cause both global warming and air pollution. Addressing the global warming issue at the local level is key because it is here that major decisions regarding areas such as land use and development, waste, and public transit are made. These decisions not only affect the local air quality and standards of living but also the global climate[12].

Participating cities, towns and counties pass a resolution by which they pledge to reduce greenhouse gas emissions from local government operations and from the communities they represent. The following steps, or milestones, must then be carried out:

1. Conduct a baseline emissions inventory and forecast "business-as-usual"emissions growth over the next 10-20 years.

2. Set an emissions reduction target.

3. Develop a local action plan detailing reduction measures to be taken in order to achieve the established target.

4. Implement measures described in the action plan.

5. Monitor progress[13].

# Section II.

## 2.1 Greenhouse Gas Emissions Inventory: A Summary

A greenhouse gas (GHG) emissions inventory and forecast for the city of Stamford was conducted in 2003, establishing a baseline year of 1998 and a target year of 2018. This inventory addressed both the community and municipal sectors. In this report, data was also presented for 2002, as an interim year. The software used to analyze the data collected is the Clean Air and Climate Protection (CACP) Software. The software converts a given unit of measure, such as kilowatt hour of electricity or gallons of oil into tons of equivalent carbon dioxide ($eCO_2$ ). This emissions inventory has been utilized as the basis for establishing a greenhouse gas reduction target along with existing and recommended measures for reducing the city's greenhouse gas emissions, both presented in this report, representing Milestones 2 and 3 of the Cities for Climate Protection Campaign.

[12] ICLEI. http://www.iclei.org/#ccpdescription
[13] ICLEI. http://www.iclei.org/us/ccp/milestoneprocess.html

As shown in Figure 2.1 below, in 1998, the baseline year of the study, the most significant contributor to GHG emissions on the community side in Stamford was the residential sector (33% of total emissions) while the commercial and transportation sectors closely tracked the above sector, with both at 27%.

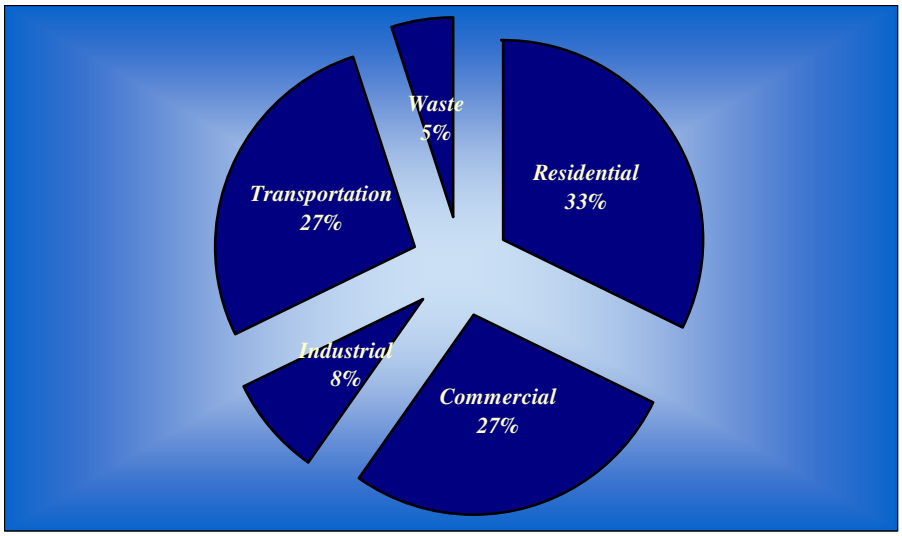


**Figure 2.1: Community Emissions by Sector for 1998**

As for municipal operations for the 1998 baseline year, the buildings sector represented the most significant contribution to GHG emissions, accounting for 61% of the 52,089 tons of carbon dioxide equivalents calculated to represent total municipal emissions. The most significant emitters within this sector were Stamford High School, Westhill High School, and the Government Center. The vehicle fleet lagged behind, representing 19% of total municipal emissions, while wastewater/sewage came in at 12.6% and streetlights, at 7%. Within the vehicle fleet, the Board of Education proved to be the greatest source of GHG emissions due to the large school bus fleet, followed by the police department. The inventory also broke out the exact sources of GHG emissions. For the government sector, with its buildings as the highest energy consumer, electricity was the highest source of emissions followed by natural gas and oil.

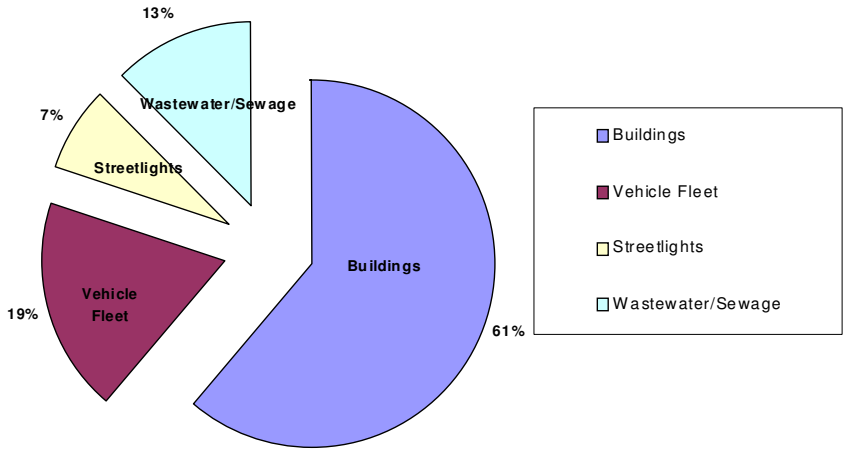


**Figure 2.2: Government Emissions by Sector for 1998**

The forecast is an estimate of the change in greenhouse gas emissions over the twenty-year period if no reduction measures were to be taken, which is referred to as a "business as usual" scenario. Based on information from the United States Energy Information Administration, it was determined that, within the community sector, that total emissions would increase by 35% between 1998 and 2018. As for the government sector, this "business as usual" forecast was assumed to remain constant in terms of energy use but fluctuate in terms of emissions based on the fuels used to provide the electricity purchased by the city.

The government operations inventory showed an approximate 4-5% reduction in overall GHG emissions between 1998 and 2002 for the municipal sector. These reductions are primarily attributed to programs implemented by the City to reduce natural gas and electricity usage in the buildings sector and electricity use in streetlights, along with diesel and gasoline reductions in the vehicle fleet. In particular, school buildings generally demonstrated a marked decrease in energy demand with the associated reduction in GHG emissions, with the exceptions being Northeast Elementary, the Rippowam Center, and the Turn of River Middle School. Despite the overall decrease for the municipal sector, government buildings alone, according to the inventory, displayed an increase in both energy consumption and $eCO_2$ emissions. In addition to organizing data on a building-by-building basis, the inventory also made departmental distinctions. As of 2002, the top 3 GHG-emitters in terms of municipal departments were the Board of Education, Community Centers, and Government Center.

For the community inventory, data were obtained for the residential, commercial, and industrial sectors. Information on natural gas, fuel oil, and propane consumption was collected and presented in the inventory. In addition transportation data was provided as daily vehicle miles traveled (DVMT) and categorized by vehicle type: passenger cars, motorcycles, light trucks, buses, single-unit trucks and combination trucks. Finally, waste data was also included in the inventory, even though this is shipped out of state.

The basis for this inclusion is that Stamford is producing the waste and therefore should take responsibility for emissions associated with it. In addition, the City should be able to "take credit" for avoided emissions at these sites as a result of waste reduction measures implemented in Stamford.

## 2.2 Emissions Reduction Target

The following greenhouse gas emission reduction targets are specific quantified percentages by which the City of Stamford plans to reduce its GHG emissions below 1998 (baseline year) levels. The target year has been established as 2018, by which the City plans to achieve these emission reductions. In following the percent reductions recommended by the Cities for Climate Protection Campaign, Stamford has established an emissions reduction target of 20% below the 1998 emissions level, to be achieved by 2018 (see Table 2.1). Municipal leaders from all over the world have embraced the 20% below baseline year target, including St. Paul and Minneapolis, MN, Tuscon, AZ, Portland, OR, and Toledo, OH.

**Table 2.1. Emissions Forecast and Reduction Targets***

| Sector | 1998 emissions | 2018 forecasted emissions | 2018 target emissions level | Reduction Below Forecasted Emissions |
|---|---|---|---|---|
| Municipal | 52,089 | 55,575 | 41,665 | 13,909 |
| Community | 1,515,865 | 2,039,169 | 1,212,692 | 826,477 |

*Emissions in tons $eCO_2$

# Section III: Existing/Proposed Reduction Measures – Municipal

## 3.1 Buildings

A number of energy conservation measures have been implemented in municipal buildings and facilities.

### Rebuild America

Rebuild America is a voluntary network of community partnerships, established by the Department of Energy in 1994, to reduce building energy consumption and, in doing so, reduce costs. Rebuild Stamford consists of facilities and engineering department staff along with CL&P, controls companies, contractors, and architects collaborating to implement energy efficiency projects throughout city buildings and facilities. Under this program, a number of energy efficiency measures were implemented at municipal buildings and facilities between 1998 and 2002. Because 1998

was established as the baseline year for the emissions inventory and this action plan, those projects implemented during 1998 are not accounted for here. The assumption has been made that these savings would have already been incorporated into the baseline energy usage reported for 1998. Therefore, the following refers only to projects implemented between 1999-2002. The types of projects carried out under the Rebuild America program include the following:

- Lighting renovations
- Occupancy sensors
- Variable frequency drives
- High efficiency air conditioning and hot water pumps
- HVAC control repairs
- Energy Management Systems (EMS) expansion

Though these measures and more were carried out at a number of municipal buildings, the majority of the work was implemented at the Government Center, Police Headquarters, the public school system, and Terry Conners Rink. The emissions reduction associated with the total reduction of approximately 3 million kWh/year resulting from the Rebuild America projects is 1354 tons $eCO_2$. Cost savings per year amount to approximately $306,920.

**$eCO_2$ reduced:** 1,354 tons
**Air pollutant reductions:** (lbs)
$NO_x$ : 1,791
$SO_x$ : 2,550
CO: 4,345
VOC: 476
PM10: 2,836
**Lead Department**: Engineering Bureau
**Estimated Cost**: $725,000
**Estimated Savings**: $306,920/yr
**Status**: existing

**Energy Services Performance Contract**

Energy efficiency improvements to Stamford public schools went beyond the Rebuild America program. In seeking to reduce operating expenses, upgrade existing electrical and HVAC infrastructure in its buildings, and create a healthier and more comfortable learning environment for both students and educators, Stamford Public Schools implemented an Energy Conservation and Improvement Performance Contract[14], entering into an Energy Services Agreement with NORESCO LLC in August 2002. In total, 23 energy conservation measures were implemented, though not all measures were taken at each of the 20 schools. The most predominant measure applied was the installation or survey and repair of computerized Energy Management Systems (EMS). Prior to the performance contract work, temperature controls in most Stamford schools were pneumatic systems dating from the original construction of the schools. In many of the schools, there was a long-term lack of professional maintenance, and, through the

[14] NORESCO. *Stamford Public Schools: Energy Conservation Performance Contract Proposal*. 2/2001.

years, in order to compensate for equipment problems and comfort complaints, many controls had been overridden. As a result, heating systems were running continuously in many schools. In comparison to pneumatic systems, computerized energy management systems provide improved temperature control and more flexible scheduling[15]. The other predominant measures implemented include lighting improvements with occupancy sensor control and improvements to pneumatic control systems. Table 3.1 below displays the cumulative savings at each of the schools. The energy conservation measures lead to savings in terms of electricity, natural gas, and oil.

**Table 3.1: Stamford Public Schools: Energy Savings Performance Contract**

| School | Electricity (kWh) | Nat gas (Mcf) | Oil (gal) |
|---|---|---|---|
| Cloonan | 65800 | 2505.6 | 220 |
| Davenport Ridge | 286480 | -245.7 | 0 |
| Dolan | 128729 | 734.6 | 0 |
| Hart | 15856 | -15.6 | 0 |
| Murphy | 200488 | 394.3 | 224 |
| Newfield | 238140 | 1654.9 | 524 |
| Rippowam | 156740 | 6723.2 | 1347 |
| Rogers | 560731 | 175.5 | 100 |
| Roxbury | 351,324 | 585.2 | 951 |
| Springdale | 20912 | 0 | 7205 |
| Stark | 93450 | 1584.3 | 358 |
| Stillmeadow | 863800 | 1981.4 | 0 |
| Toquam | 341495 | 1066.3 | 273 |
| Turn of River | 462548 | 984.6 | 334 |
| Westhill | 101074 | 3305.2 | 636 |
| **Totals** | **3887567** | **21433.8** | **12172** |

Table 3.2 summarizes savings in terms of these 3 energy sources and the associated emissions reductions. Overall, the energy savings resulting from these energy conservation measures result in an annual reduction of **3,207 tons $eCO_2$**.

**Table 3.2: Noresco Performance Contract Emission Reductions**

| Energy Source | Savings | $eCO_2$ reduction (tons) |
|---|---|---|
| Electricity | 3,887,567 kWh | 1,715 |
| Natural | 21,434 Mcf | 1,351 |
| Oil | 12,172 gal | 141 |
| | | **Total: 3,207** |

**$eCO_2$ reduced:** 3,207 tons
**Air pollutant reductions:** (lbs)

[15] *Energy Savings Guarantee Agreement By and Between Stamford Public Schools and NORESCO LLC.* 8/2002

$NO_x$ : 10,067
$SO_x$ : 4,930
CO: 7,491
VOC: 1,022
PM10: 3,870
**Lead Department**: Engineering Bureau
**Estimated Cost**: $6,091,145 (paid for through energy savings over 10 years)
**Estimated Savings**: $721,240/yr
**Status**: existing

Additional energy improvements not completed through the performance contract are planned for a number of the public schools. Approximately 75% of this work would be funded by the Municipal Buildings program of Connecticut Light and Power, which provides technical and financial assistance through energy-efficiency improvements to municipally-owned buildings and facilities. Lighting retrofits are still needed in auditoriums in the following schools: Dolan, Roxbury, Westhill, Davenport, Cloonan, Springdale, and Rogers. Lighting conversions are also planned in the following 3 gyms: Newfield, Roxbury, and Dolan. The City of Stamford has taken advantage of CL & P's Municipal Buildings program for a number of other city buildings as well and has definitive plans to do the same for several other buildings and facilities.

- Ferguson Library
- Community policing stations/trailers
- Vehicle maintenance building
- Transfer station
- Smith House

Table 3.3 shows the top 3 municipal buildings by tons $eCO_2$, energy use, and cost per square foot. The top 3 buildings in each category were considered out of the top 10 GHG-emitting municipal buildings rather than all municipal buildings. Ferguson Library and Smith House should be prioritized as sites for improving energy efficiency. Terry Conners Ice Rink and 148 Magee, the fire department's training facility are energy-intensive according to function. Those energy-efficiency improvements that were feasible have already been made.

**Table 3.3: Top 3 Government Buildings for 3 Listed Categories (per square foot)**

| **1998 TOP ECO2/SF** | **TONS/ SF** | **2002 TOP ECO2/SF** | **TONS/SF** |
|---|---|---|---|
| Ferguson Library | 0.0237 | Ferguson Library | 0.0256 |
| Terry Connors Rink | 0.0175 | Smith House | 0.0171 |
| Smith House | 0.0163 | Terry Connors Rink | 0.0141 |
| | | | |
| **1998 TOP MMBTU/SF** | **MMBTU/SF** | **2002 TOP MMBTU/SF** | **MMBTU/SF** |
| Ferguson Library | 0.253 | Ferguson Library | 0.274 |
| 148 Magee | 0.217 | 148 Magee | 0.227 |
| Terry Connors Rink | 0.182 | Smith House | 0.182 |
| | | | |
| **1998 TOP ENERGY COSTS/SF** | **$/SF** | **2002 TOP ENERGY COSTS/ SF** | **$/SF** |
| Ferguson Library | 5.084 | Ferguson Library | 5.298 |
| Terry Connors Rink | 3.59 | Terry Connors Rink | 2.786 |
| Smith House | 2.442 | Smith House | 2.6 |

## Renewable Energy at Government Facilities

The City of Stamford is making real progress on the renewable energy front as well. The following projects will hopefully lead Stamford to becoming a model city in terms of clean energy.

The State of Connecticut is poised for a significant increase in PV/Solar activity. There are several indicators that this "dawn" of a solar economy in Connecticut is imminent:

1. Contrary to general perception, Connecticut has a solid solar resource – the Connecticut River Valley has a particularly high level of sunshine for its latitude.
2. The Southwest corner of Connecticut is one of the most troublesome transmission and distribution "hotspots" in the country.
3. The State has one of the highest per capita incomes in the country, which includes influential individuals concerned about the environment and in the position to make a difference.
4. The State's renewable energy trust fund (CCEF) has re-allocated at least $5 million in incentives explicitly for PV. It is highly motivated to support the installation of hardware and growth of local infrastructure[16].

### Solar Energy System: Katrina Mygatt Recycling Center

A Solar Demonstration project was installed on the roof of the Katrina Mygatt Recycling Center in the summer of 2004. The Connecticut Clean Energy Fund committed to funding 50% of project costs, while the remainder is being funded through the energy conservation capital account. The solar system will provide power to the small office area, but, more significantly, the majority of power produced will flow back

[16] Correspondence: *Solar Connecticut Re-Introduction*. Moneer H. Azzam. August 12, 2004.

to the utility grid, relieving electrical load congestion in the City of Stamford. The recycling center is a heavily used community facility where residents drop-off their recyclables. Both the location and the use of this facility were factors in choosing this as the site for a solar demonstration project. With heavy residential use and the potential for close-up visibility due to the low (12 ft) roof, this location choice achieves maximum exposure to the community. A large informational sign will be posted at the site to provide residents with an overview of the benefits and design of the system[17]. It will also be established as a stop on a Connecticut Clean Energy Fund "Green Energy Trail," a collection of sites throughout Connecticut where renewable forms of energy have been implemented.

**$eCO_2$ reduced:** 5 tons
**Air pollutant reductions:** (lbs)
$NO_x$ : 7
$SO_x$ : 9
CO: 16
VOC: 2
PM10: 10
**Lead Department**: Engineering Bureau
**Estimated Cost**: $35,000
**Estimated Savings**: first year savings to be determined
**Status**: existing

**Academy for Information Technology and Engineering**

A 50 - 60 kW solar electrical energy system, which would reduce power consumption for electrical lighting by 50-60%, is being considered for the proposed Academy of Information Technology and Engineering to be constructed on the Rippowam campus located on High Ridge Road. The photovoltaic cells would be roof-mounted on 8,000 – 10,000 square feet of area. The Connecticut Clean Energy Fund is interested in funding 50% of project costs, while another source of funding is being sought for the remainder of the cost. Pareto Energy, Ltd., a Washington, D.C. based company that funds and implements energy-savings projects and earns fees as a percentage of energy cost savings achieved[18], has pledged to be the corporate sponsor for this project. Pareto Energy is working with the U.S. Conference of Mayors to develop ultra-reliable and efficient electric power for commercial businesses in selected US cities. Pareto Energy would contribute to this project on a pro bono basis. The company already has previous experience with sponsoring alternative energy in schools.

**Status:** proposed

[17] *Stamford Solar Lights and Power: Katrina Mygatt Recycling Center* project description
[18] http://www.paretoenergy.com/finance

**WPCA Wastewater Residuals to Energy Project**

The organic residuals generated through the wastewater treatment process, because they have a high heating value, can be used as a renewable fuel source when treated properly. The general concept is based on drying the residuals, producing dried pellets, and then using those pellets as a fuel to generate electrical power that may then be used on site or sold to the power grid.

A wastewater residuals to energy project as described above is in the feasibility and design stage for the Stamford Water Pollution Control Authority. The fuel value available in the approximated 25 dry ton per day residuals input would, according to economic modeling, be sufficient to produce about 1 megawatt of electric power. The Stamford facility currently requires approximately 0.8 megawatts for its operation.

Estimates of capital costs range from $18 to $20 million for this project. Overall analysis taking into account the total capital and operation and maintenance costs along with available credits for renewable energy, use of generated energy onsite, reduced cost in transport and residuals to landfill and in disposal-tipping fees results in a positive financial value for the Stamford Water Pollution Control Authority.

This facility will be a model to the nation, demonstrating wastewater residuals as a "green," renewable energy source, providing an independent reliable energy source in the event of a blackout or terrorist attack, and solving the residuals disposal problem[19]. The wastewater treatment plant currently utilizes 8,444,630 kilowatt-hours per year. This power usage has associated emissions of 3725 tons /year.

**$eCO_2$ reduced:** 3,725 tons
**Air pollutant reductions:** (lbs)
$NO_x$ : 4,928
$SO_x$ : 7,016
CO: 11,954
VOC: 1,309
PM10: 7,802
**Lead Department**: Water Pollution Control Authority
**Estimated Cost/Savings**: to be determined (based on design)
**Status**: proposed

**20% by 2010 Clean Energy Campaign**

In addition to on-site generation of clean energy, there exists the opportunity for the City of Stamford to commit to obtaining 20% of the municipal energy supply from clean energy sources. This commitment would be made through the 20% by 2010 Clean Energy campaign, a collaborative effort by Clean Water Fund, Environment Northeast, the Interreligious Eco-Justice Network and Smart Power to promote the purchase of clean energy by households, businesses, churches, municipalities, and state governments. Participation in this program would require the City of Stamford to purchase 20% of its municipal energy from clean, renewable sources by the year 2010. The second major

[19] Stamford WPCA Wastewater Residuals to Energy Project description

element of the City's commitment would be the promotion of the clean energy option to Stamford businesses, organizations and households (See section 4.1. Commercial/Residential Measures).

**$eCO_2$ reduced:** 1,867 tons
**Air pollutant reductions:** (lbs)
$NO_x$ : 2,471
$SO_x$ : 3,518
CO: 5,993
VOC: 656
PM10: 3,912
**Lead Department**: Engineering Bureau
**Status**: proposed

**Green Buildings Policies**

Green building practices offer the opportunity to create environmentally sound and resource-efficient buildings. Green buildings use an integrated approach: promoting resource conservation measures (energy efficiency, renewable energy, and water conservation), considering environmental impacts and waste minimization, creating a healthy and comfortable environment, reducing operation and maintenance costs, and addressing issues such as access to public transportation. The entire life cycle of the building and its components is considered, as well as the economic and environmental impacts and performance[20]. There is an impressive cost savings associated with a green building design. In a study of 33 green buildings, the California State and Consumer Services Agency found that though the construction costs are slightly more expensive for green buildings ($3-$5 or 2% more) as compared to conventional structures, there was an estimated $50-75 per square foot savings over the average 20-year life of a building – more than 10 times the 2 percent cost premium for green buildings[21].

Many cities throughout the United States have instituted policies focused on "green buildings." It is recommended that the City of Stamford follow suit, making this a key priority.

A model to follow would be that of San Jose, California, which put forth several policies regarding green buildings. The first established a local version of LEED (Leadership in Energy and Environmental Design) standards, which is a voluntary, consensus-based national standard. The second policy mandated municipal buildings to meet LEED standards. Finally, the third policy established a program in which the city works with the private sector to encourage the achievement of LEED. A comprehensive policy identical or very similar to this should be developed for Stamford.

[20] *Smart Communities Network: Creating Energy Smart Communities.* http://www.sustainable.doe.gov/buildings/gbintro.shtml
[21] *'Green' Sounds Great – But is it Affordable?*. Nation's Cities Weekly. Volume 27, Number 28. July 12, 2004.

In addition, there is the potential to start up a local chapter of the United States Green Building Council in Connecticut. Collaboration with architects emphasizing sustainable practices in their work would be necessary for this initiative.

**Status**: proposed

### Environmentally Preferable Purchasing

A goal must be set to implement a buying strategy of EnergyStar equipment for municipal buildings and facilities. Along with this, a manager awareness campaign/training should be implemented to encourage energy-conscious consumption of equipment and products so that they may bring this back to their respective departments.

Environmentally Preferable Purchasing (EPP) is a State of Connecticut Department of Administrative Services program, the goal of which is to promote the use of environmentally preferable products and services by state agencies and political subdivisions. The term "environmentally preferable" means that those products, services, or practices described have a lesser or reduced negative effect on human health and the environment when compared to competing products, services, or practices that serve the same function. Environmentally preferable attributes include:

- Fuel efficient
- Energy efficient
- Made of recycled content
- Made of biodegradable materials
- Recyclable
- Less or non-toxic

As a political subdivision, the City of Stamford can purchase environmentally preferable products at lower rates by purchasing off the DAS State Contracts. The City of Stamford could potentially benefit from the EPP program in several ways. First of all, the EPP program assists the municipality with purchasing decisions by identifying new EP products and services by verifying their cost, effectiveness, and availability. In addition, the EPP program provides technical expertise and educational assistance to municipalities, holding information events and training sessions to introduce EP products to municipalities[22].

**Status**: proposed

## 3.2 Lighting

### Streetscape Renovations

Streetscape lighting improvements were carried out in December 2002 and November 2003, with Phase III planned for spring 2005. Although the primary

[22] http://www.das.state.ct.us/Purchase/Epp/Index.htm

objectives of this project were to improve the architectural appearance of the downtown streetscape lights and to significantly reduce ongoing maintenance costs, energy efficiency and energy cost savings were also achieved. 210 watt fixtures were replaced with 85 watt induction lights. The 2002 conversions achieved an energy savings of 42,020 kWh/year. For those conversions carried out in 2003, the savings was 53,993 kWh/year. With a total savings of 96,013 kWh/year, the emissions reduction for the completed conversions is 42 tons $eCO_2$ and the cumulative annual cost savings is $10,561.Once Phase III has been completed in spring 2005, an additional 94,091 kWh/year will be saved, also with an associated emissions reduction of 42 tons $eCO_2$. The cost savings for Phase III is $10,350 per year. The measure summary below shows data for the entire measure, Phases I through III.

**$eCO_2$ reduced:** 84 tons
**Air pollutant reductions:** (lbs)
$NO_x$: 111
$SO_x$: 158
CO: 427
VOC: 30
PM10: 176
**Lead Department**: Engineering Bureau
**Estimated Cost**: $489,372
**Estimated Savings**: $20,911
**Status**: in progress

**LED Traffic Light Conversions**

Light-emitting diodes, or LEDs, are light fixtures that consume 80-90% less energy than conventional incandescent bulbs. With both a significantly lower wattage and life span 6 to 10 times longer than an incandescent, the LED reduces both electricity and maintenance costs for the city[23]. Switching to LEDs, then, is an ideal measure to pursue if a city aims to increase energy efficiency and reduce fossil fuel emissions while cutting costs.

The City of Stamford began converting its incandescent traffic signal lights to more efficient LED lights in 1998. Between 1998 and 2003, 1582 individual LED signal displays were installed. 2918 incandescent bulbs remain to be converted. If these conversions are continued (approximately 316 fixtures per year) at the past rate, the remainder will take an additional 9 years to complete. In order to complete this project within 5 years, 584 individual signal displays would need to be installed per year. If decreased to 3 years, 973 lights per year would be necessary. Appropriate funding must be requested for the 3 year or 5-year plan. By installing these fixtures at a more rapid rate, cost savings will be maximized. With cost savings per year amounting to $94,122 for all proposed conversions, completing the project in 3 years versus 5 years means 2 extra years of savings, so an additional $188,244 in savings. The payback period for proposed LED conversions is only 1.1 year.

[23] ICLEI. *10 Things Local Governments Can Do to Cut Global Warming Pollution*.

This report focuses on the cost savings and emission reductions if all 12" and 8" red, yellow, and green bulbs are to be replaced by LEDs. Therefore, arrow lights and pedestrian signals are not factored into any of the figures presented below.

Overall, with those LED conversions already completed between 1998-2003 in combination with those planned, the city will have cut its energy consumption by 1,443,308 kilowatt-hours per year. This is equivalent to an annual reduction of 636 tons $eCO_2$. See calculations in Appendix A.

**$eCO_2$ reduced:** 636 tons
**Air pollutant reductions:** (lbs)
$NO_x$: 842
$SO_x$: 1199
CO: 2043
VOC: 224
PM10: 1334
**Lead Department**: Engineering Bureau
**Estimated Cost**: $155, 602
**Estimated Savings**: $158,764/yr
**Status**: in progress

## 3.3 Vehicle Fleet

### Hybrid phase-in/ formal "rightsizing" plan

The purchase of hybrid vehicles and the idea of "rightsizing" vehicles go hand-in-hand. "Rightsizing" refers to matching duty requirements of staff to the most efficient possible vehicle for the task, and it is a critical step toward increasing the overall efficiency of the city's fleet[24]. Where downsizing is feasible, the replacements should be hybrid-electric vehicles (HEVs). Hybrid-electric vehicles combine the internal combustion engine of a conventional vehicle with the battery and electric motor of an electric vehicle, offering low emissions similar to electric vehicles and the power, extended range, and convenient fueling capability of conventional gasoline vehicles[25]. Though there are several other advanced-technology vehicle types that would offer lower emissions, HEVs seem to offer the most benefits with the least drawbacks. Another major option, for example, would be compressed natural gas (CNG) vehicles. There are several drawbacks to these alternative fuel vehicles, however, including lack of available refueling stations and the cost of constructing and operating such a station. HEVs, on the other hand, require no special infrastructure changes[26]. In addition, the range of dedicated natural gas vehicles is generally less than gasoline vehicles, due to the lower

[24] ICLEI. *Sustainable Transportation Options for Protecting the Climate: A Guide for Local Governments*.
[25] http://www.eere.energy.gov/cleancities/vbg/fleets/about_hybrids.html
[26] *Ready to Roll: The Benefits of Today's Advanced Technology Vehicles for Connecticut*. ConnPIRG Education Fund.

energy content of natural gas[27]. Moreover, there is a mainstreaming of HEVs occurring, with a number of both compact and mid-size models along with several SUVs available as of early 2005 and most automobile manufacturers having announced plans to manufacture their own HEV versions.

. There are both "full" hybrids, such as the Toyota Prius, and "mild" hybrids, such as the Honda Civic or Insight. The 2003 models of all 3 of these vehicles are certified as super-low emission vehicles (SULEVs), meaning that their emissions are 90% cleaner than the average 2003 model year car. A "full" hybrid-electric vehicle is defined by the following 4 basic characteristics:

- capability to shut off the conventional engine when the vehicle is stopped
- use of regenerative braking, which captures energy otherwise lost when the vehicle is slowing down
- reduced engine size compared to conventional vehicles
- capability to drive the vehicle using only electric power

In comparison, the "mild" hybrid is characterized by all of the above except the ability to drive the vehicle using only electric power[28].

A number of fleets have already acquired light-duty HEVs in order to reduce both emissions and fuel consumption. As of 2003, the City of New York's fleet, for example, included 480 HEV sedans[29]. For the City of Stamford fleet, HEVs may be phased in slowly, with perhaps just one or two purchases per year. Though the up-front cost is more than the used vehicles typically purchased, these hybrids consume less fuel, saving money in the long-run. The Toyota Prius, for example gets 60 miles/gallon in the city as opposed to 21 miles/gallon for a typical sedan, which most of the vehicles targeted for replacement are.

Used vehicles may still be purchased for the remaining replacements, but a real effort to purchase the most fuel-efficient models along with "rightsizing" the vehicle to the employee's tasks must be focused on.

We have identified approximately 20 vehicles in the city's fleet, either due or overdue for replacement, that represent opportunities for hybrid phase-in. These vehicles are used by the following departments: Health Department, Board of Education, Engineering Bureau, Parks and Facilities, and Administration.

The estimated CO2 reduction below is based on 2002 fuel consumption data from the fossil fuel inventory for mid-size and or compact cars within the following departments:

[27] http://www.eere.energy.gov/cleancities/vbg/fleets/about_naturalgas.html
[28] *Ready to Roll: The Benefits of Today's Advanced Technology Vehicles for Connecticut*. ConnPIRG Education Fund.
[29] http://www.eere.energy.gov/cleancities/vbg/fleets/about_hybrids.html

**Table 3.4: Fuel Consumption Data for Hybrid Phase-In Quantification**

| **Department** | Gasoline Usage (gal) |
|---|---|
| Board of Education | 393.6 |
| Engineering | 1746.7 |
| Health | 3593.6 |
| Facilities Management | 403.0 |
| Fleet Management | 359.1 |
| Highways | 2179.9 |
| Solid Waste and Collections | 2267.9 |

Total usage: **10,943.8 gallons**

The estimate is based on the total number of mid-size and compact cars utilized by these departments and responsible for this level of fuel consumption. If these vehicles were to be replaced with hybrids, this would cut fuel consumption to 1/3 the original consumption.

Cost savings per year are based on the 2005 cost of gasoline. As of 2005, the gasoline price for the City of Stamford was $1.29 per gallon.

**$eCO_2$ reduced:** 78 tons
**Air pollutant reductions:** (lbs)
$NO_x$: 365
$SO_x$: 21
CO: 5342
VOC: 493
PM10: 11
**Lead Department**: Office of Operations
**Estimated Savings**: $9459
**Status**: proposed

**NSTA Clean School Bus Subgrant program**

Diesel engines produce more than one-quarter of New England's fine particulate matter (PM) emissions. Diesel particulate matter contains more than 40 hazardous pollutants listed in the Clean Air Act. Elevated PM levels may trigger asthma and heart attacks. In addition, black carbon, or soot, content in diesel PM is high. Black carbon has been recently identified as a primary driver of global warming, with 25% of warming attributed to this agent[30]. The Stamford Board of Education has taken a major proactive step aimed at significantly reducing emissions from its diesel-powered school bus fleet. Approximately 35 of the buses are being fitted with diesel oxidation catalysts (DOCs), a widely available and commonly used retrofit technology that reduces diesel particulate

[30] *New England Diesel Initiative Project description sheet*. Environment Northeast.

matter by 20 to 30%. The device is installed in the exhaust system where it breaks down the pollutants in the exhaust stream into less harmful components. The diesel oxidation catalyst is a relatively simple, low-cost device that can be installed in almost all buses and requires very little maintenance[31]. The purchase of the DOCs was made possible through a National School Transportation Association (NSTA) Subgrant under the EPA Clean School Bus program, while Laidlaw Educational Services contributed the installation of the devices.

An EPA rule promulgated in 2001 set new emissions requirements for heavy-duty diesel engines that will begin to take effect in model year 2007. The standards require the use of ultra-low sulfur diesel coupled with high-efficiency catalytic exhaust emission control devices, particulate filters, or other advanced technologies. These standards are expected to decrease particulate matter (PM) and $NO_x$ emissions to levels that are 90% and 95% below current levels, respectively[32]. Some buses may meet 2007 EPA standards ahead of schedule. In that case, the goal should be to acquire those buses that are meeting the standards by inquiring with manufacturers.

An additional strategy for minimizing emissions from the school bus fleet is to conduct efficient route management by assigning the cleanest buses to the longest routes.

The effort must be made to expand these strategies to other city departments with diesel-run vehicles.

**Lead Department**: Board of Education
**Estimated Cost:** $0.00 due to EPA grant and in-kind contributions
**Status:** existing

## 3.4 Waste/Recycling

The City of Stamford ships out its approximately 75,000 tons/year of municipal solid waste (MSW) to landfills in Pennsylvania and Ohio. At an approximate cost of $75 per ton, including hauling and disposal costs, the annual cost to the City is approximately $5,625,000. It is evident then that a reduction in waste sent to these landfills should be highly significant both in terms of environmental effects and the substantial cost. In addition to the 43,476 tons $eCO_2$ with the waste itself, there is a significant emissions contribution from the trucks that carry this waste out to Pennsylvania and Ohio and back. 12-15 trucks per day make the trip (6 days per week). Bridgeport, Connecticut has a waste-to-energy facility, which converts an average 700,000 tons/year of MSW from 14 Connecticut townships into electricity for an estimated 40,000 households. The possibility exists to send a percentage of Stamford's MSW stream to this facility, reducing the emissions associated with both landfilling and vehicle-miles traveled to transport the MSW out of state.

[31] *Clean School Bus USA: What You Should Know About Reducing Diesel Exhaust From School Buses.* www.epa.gov/otaq/schoolbus.
[32] *Meeting Technology Challenges for the 2007 Heavy-Duty Highway Diesel Rule* (Report of the Clean Diesel Independent Review Panel). EPA. 2002.

# Section IV: Existing/Proposed Measures – Community Sector

## 4.1 Commercial/Residential

According to the emissions inventory for Stamford, the commercial sector accounted for 28% of community-wide emissions for the 1998 baseline year, while the residential sector was the more significant contributor, at 33%. The measures listed below will lead the Stamford commercial and residential sectors towards achieving the 20% reduction target.

**Fairfield County Energy Conservation Pilot**

Energy is the single largest operating cost for commercial office buildings. The Southwestern Area Commerce and Industry Association of Connecticut (SACIA) has partnered with EPA's ENERGYSTAR program and Northeast Utilities to carry out a commercial building energy-benchmarking pilot. EnergyStar building benchmarking is a tool by which the energy efficiency of a building is rated on a scale of 1-100. If a building is rated 75 or above, it is considered to be very efficient and qualifies to be recognized as an "EnergyStar" building.

The goal is to position Fairfield County as the most energy-efficient office market in the United States over the next 5 years. The ultimate goals are to benchmark the 46 million square feet of Class A commercial office space in Fairfield County, audit those buildings that fall below a 50% score on the ENERGYSTAR standard and determine what it will take to get these buildings up to a score of 75.

Through this program, 8.5 million square feet of commercial office space in Fairfield County has already been benchmarked. This resulted in a median score of 23.5 out of 100. Sixty percent of the buildings scored below 50. These buildings use 50% more energy per square foot than those scoring above 50. The savings conservatively are within the $2-3 million range. Five buildings within this group have been chosen for a pilot retrocommissioning study, in which efforts are focused on "re-tuning" these buildings to get them back to the way they were originally designed. Some of the more sophisticated computer systems and energy management systems that help control how energy is used in these buildings have gotten out of tune or operators have overridden some of the limits. So the project deals not only with how to improve the systems but also how the buildings need to be managed to be the most energy efficient. Through the retrocommissioning study, this pilot is finding out what it will take to bring these buildings up to an EnergyStar standard and how much these measures will cost. It is expected that a minimum of 20% of an energy bill may be saved with the implementation of these measures[33]. This pilot program will also be exploring creative approaches to financing "packages" of upgrades, including incentives from utility programs[34].

An estimation of the emissions reduction for the pilot program was carried out by using the average energy consumption rate for commercial buildings over 5,000 square

[33] *Getting Energized About Energy in Southwestern Connecticut.*
[34] *ENERGYSTAR: Benchmarking and the Financial Value of Improved Energy Efficiency.* Presentation by Stuart Brodsky, US EPA.

feet (19.6 kWh/sq ft/yr). This consumption level drops to 12 kWh/sq ft/yr when the office building qualifies for the EnergyStar label, a 40% reduction. Using the average square footage for a downtown private sector office building, which is 334,840 square feet, according to the Building Owners and Management Association, a $0.09/kWh rate, and the prediction that this program will translate to 20% savings off a building's energy bill, it was approximated that savings per building would amount to 1,309,596 kWh/year, and, so, for the 5 pilot buildings would total 6,547,982 kWh/year which translates to a 2,888 ton reduction in $eCO_2$.

**$eCO_2$ reduced:** 2,888 tons
**Air pollutant reductions:** (lbs)
$NO_x$: 3,821
$SO_x$: 5,440
CO: 9,269
VOC: 1,015
PM10: 6,050
**Estimated Savings**: $589,318
**Status**: existing

**10% Challenge**

The 10% challenge would be a voluntary initiative for Stamford residents and businesses to voluntarily pledge to reduce their emissions by 10%. This is a program developed by the City of Burlington, Vermont to reduce greenhouse gas emissions[35]. As in Burlington, sign-up would be possible via a website linked to the City of Stamford homepage. Households or businesses would register with the program, pledging to reduce their emissions by 10% per year. Resources for participation would be available on the site as well, such as an emissions calculator to do an informal inventory, information on purchasing ENERGYSTAR appliances, and incentives offered by Connecticut Light and Power. In addition, the site could provide educational information on global warming and energy efficiency, as well as present the highlights of this local action plan for Stamford.

If 50% of Stamford households participate in this program and each achieves the 10% reduction, the total emissions reduction would be 24,970 tons $eCO_2$. If 50% of the commercial sector were also to participate and successfully achieve the 10% reduction target, this emissions reduction would amount to 21,240 tons $eCO_2$.

**$eCO_2$ reduced:** 46,210 tons
**Status**: proposed

[35] http://www.10percentchallenge.org

**Global warming/energy efficiency curriculum**

Students are an effective force for social change. Recycling, for example, has infiltrated home and community behavior, due in part to school-sponsored education. Students explaining the basis for a measure like replacing an incandescent light with a compact fluorescent and why this is a wise investment will have more of an impact on their parents than other modes of educational outreach, such as brochures or public service announcements. Students may stimulate their parents to participate in the 10% challenge described above, incorporating energy efficiency into household purchasing decisions and daily habits. For example, students and parents may work together to conduct an energy audit of their home[36].

Implementing formalized energy efficiency curriculum is the Stamford public school system should be a primary measure to involve community members in the energy conservation measures already being taken by the municipality and business community.

Most importantly, the educational value of a curriculum of this kind is significant. Energy conservation curriculum in the classroom provides an opportunity for multidisciplinary learning, incorporating math, science, social studies, and language arts.

There are many resources available to educators so that this type of curriculum may be adopted in Stamford classrooms. Because the material is malleable, it is tailored for individual grade levels from K-12.

**Status**: proposed

**Promote State Climate Change Action Plan**

Additional emissions reductions are possible on the community side through municipal support in Stamford of the following measures identified in the State of Connecticut's Climate Change Action Plan.

- **Promote Green Power option**

  A green power or clean energy option will soon allow Connecticut ratepayers to choose electricity derived from renewable energy sources, provided at a slight premium. If electricity customers representing 10% of Stamford's electricity usage in the residential, commercial, and industrial sectors opt to purchase 100% renewable power by 2018, there would be a substantial emissions reduction:

  **$eCO_2$ reduced**: 55,978 tons

- **Promote and Support Statewide Low Emission Vehicle program**

  The State Climate Change Action Plan estimates that by adopting California LEV II Standards, overall greenhouse gas emissions from the transportation sector will be reduced by roughly 2.5% below State emissions of greenhouse gases from the

[36] Alliance to Save Energy website. http://www.ase.org

transportation sector in 2000. If the City of Stamford were to support and promote this program and achieve a 2% reduction in greenhouse gas emissions from 1998 levels by 2018 then:

**$eCO_2$ reduced:** 8,438 tons

- **Promote and Support Statewide - Appliance Swapping Program**

One action under the State Climate Action Plan is to "develop a "pay-as-you-save" program under the Conservation and Load Management Fund to replace old appliances in the residential sector with new Energy Star appliances. Appliances to be covered include Energy Star Tumble Clothes Washer, Energy Star Refrigerator, Energy Star Room A/C (6500 BTU), and Energy Star Dishwasher." Reductions in Stamford from fully implementing this measure would be:

**$eCO_2$ reduced:** 750 tons

Cumulatively, the promotion of these state initiatives in Stamford would amount to the following emissions reduction:

**$eCO_2$ reduced**: 65,166 tons
**Status**: proposed

## 4.2 Transportation

**"Smart Growth" development**

In 2002, the City of Stamford put forth a Master Plan, a set of policies and principles developed by citizens to guide the growth and development of the city over the next few decades. Those development priorities set in that plan and being pursued currently by the city are in sync with this action plan to mitigate Stamford's contribution to global warming. Therefore, many of the following measures have been directly pulled from the Stamford Master Plan 2002 to bring these ideas to the forefront and reinforce the need for implementation. In addition to the advantages cited in the Master Plan such as creating a "City Beautiful" and improving the quality of life, these measures play an important role in reducing the City's greenhouse gas emissions.

The Master Plan is based on a "smart growth" strategy, which seeks to direct growth to existing centers, where the possibility of public transit use and walking will reduce traffic impacts.

Improvements to the Metro-North railroad system will improve the commuter experience, and, thus, encourage the use of this form of mass transit. Suggested improvements to the rail system proposed by State legislators include more rail cars, more trains, and lower ticket prices so that commuters may ride the Metro-North with the

ease of a subway system[37]. According to a Chamber of Commerce Transportation Study, approximately 15% of commuters in Stamford currently use Metro-North. With the improvements listed above, this percentage would hopefully increase.

As set forth in the 2002 Master Plan, Stamford cannot "build its way out of traffic problems." Adding new roads and widening existing ones will only encourage more traffic, which will increase polluting emissions and erode the neighborhood quality of life.[38]

Expansion of available local transit, particularly made accessible and convenient at the Transportation Center, is also strongly urged.

**Status:** in progress

## Emphasis on pedestrian/bike-friendly city

There is a bicycle and multi-use trail network for the City of Stamford in various stages. This network involves elements of several plans presented in detail below. Along with providing emissions reductions by mitigating traffic, the emphasis on developing a pedestrian and bike-friendly city is significant in terms of health improvements, in light of a severe increase in obesity, particularly in children.

### Mill River Corridor project

The Mill River Corridor project addresses an area representing a portion of the entire Mill or Rippowam River, which meanders 35 miles from its source in Ridgefield to its terminus in Long Island Sound, through the most densely populated areas of the city. To the west, there is the predominantly residential West Side neighborhood. To the east is downtown, with its heavily developed commercial core. Within only a block's distance, are the Transportation Center, Government Center, UConn campus and the UBS Center, and, within a mile of the river, approximately 50% of the City's population resides[39]. The plan involves the creation of a Greenbelt park system along the west side of the Mill River. The idea is to achieve a "river renaissance" through the heart of the city by the creation of this "Mill River Greenbelt." The linear park concept will link existing active recreational areas like Scalzi Park with passive areas like Mill River Park, Rotary Park, and Kosciuszco Park through a series of hiking/jogging trails[40]. Major goals of this plan are to improve the pedestrian quality and safety of streets and to develop a mixed income residential community.

The Mill River Project involves a 12-foot wide multi-use off-street trail on the west side of the Mill River between Broad Street and Tresser Boulevard scheduled to go out for construction during the summer of 2004. Phase II of the Mill River project will continue this 12-foot wide multi-use trail on the west side of the river between Tresser

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[37] *The Advocate*. "Lawmakers are Encouraged to Consider Hike in Highway Spending." June 23, 2004
[38] *Creating a Future for Stamford: A Summary of Stamford's Master Plan 2002*.
[39] http://www.cityofstamford.org/PlanningBoard/MillRiverCorridorIntroduction.htm
[40] http://www.cityofstamford.org/PlanningBoard/MillRiverCorridoradoption.htm

Boulevard and Richmond Hill Avenue, and is expected to go out for construction in spring 2005. Finally, Phase III, which is in the planning stage, will extend the multi-use trail, establishing a connection to Scalzi Park.

A preliminary traffic study prepared for the Mill River Corridor Plan projected traffic mitigation associated with this project, and findings suggest that the combination of the Plan's emphasis on residential development and the creation of pedestrian/bicycle trails linking this development with downtown employment centers, UCONN and the Transportation Center will encourage the use of other modes of travel in lieu of the private automobile[41].

**Stamford Urban Transitway**

This project will improve access to the Stamford Intermodal Transportation Center, alleviating traffic congestion on both the North State Street and South State Street corridors. Therefore, the Stamford Urban Transitway (SUT) will likely promote the use of public transit. The annual net emissions reduction for mobile source pollutants was estimated for the Final Environmental Assessment for the SUT. The calculated reduction for carbon dioxide is **8,929 tons per year**.

In addition to improved access to the transportation center, the urban transitway will be a multi-mode facility that will include on-street bike lanes. Phase I of the project is scheduled to go out for construction in 2005, while Phase II should go out in 2007.

**$eCO_2$ reduced:** 8,929 tons
**Air pollutant reductions:** (lbs)
$NO_x$: 14,400
CO: 83,000
VOC: 12,000
PM10: 15,200
**Lead Department**: Engineering Bureau
**Status**: in progress

**Greenwich Avenue**

This project is in the preliminary planning stage and currently includes an on-street bicycle facility on Greenwich Avenue and Davenport Street between Pulaski Street and Selleck Street. The average daily traffic (ADT) on Greenwich Avenue is approximately 12,000 cars per day. A conservative reduction in traffic due to the on-street bike facility would be 1%, or a reduction of 120 cars per day on Greenwich Avenue.

**Status:** in progress

[41] http://www.cityofstamford.org/PlanningBoard/MillRiverCorridorImplementation.htm

**Harbor Plan**

The Admiral's Wharf development project has agreed to construct a multi-use trail along the harbor connecting Atlantic Street with Kosciuszco Park. Also, this development will construct on-street bicycle lanes on Washington Boulevard between Atlantic Street and Kosciuszco Park. The average daily traffic for Washington Boulevard is approximately 20,000 cars per day and a predicted minimum 1% reduction in traffic is equivalent to 200 cars per day.

There is a missing link in the connection of the multi-use trail along the Harbor. The City of Stamford is working on a design to connect the trail.

**Status:** in progress

**Washington Boulevard corridor**

Washington Boulevard is a State roadway approximately 1½ miles in length that serves as the primary connection between I-95 and north Stamford and the Merritt Parkway. Since its inception, Washington Boulevard has operated primarily as a vehicle-oriented roadway, carrying in excess of 26,000 vehicles per day. However, it is also the primary pedestrian corridor connecting the Stamford Transportation Center with downtown Stamford. Because pedestrian crossing areas across the roadway are limited to major intersections with the distance between some in excess of 900 feet and traffic signal timing favoring vehicle progression, pedestrian safety along this corridor has been a major concern, leading the city to establish a strategic plan for Washington Boulevard. Three recent major developments along Washington Boulevard have already included "pedestrian-friendly" elements into their developments. UConn improved pedestrian circulation, adding a traffic signal and curbside fencing. UBS Center included a pedestrian trail leading to the Transportation Center. Finally, Connecticut Place will create a bicycle/pedestrian connection to the Mill River. Measures included in the plan are as follows:

- Develop a connected pedestrian network on the Boulevard
- Provide for additional crossing locations
- Reduce cycle times of the traffic signal network[42]

The above measures should be aggressively pursued because the implementation will help to achieve two major goals of this action plan: making Stamford a more "pedestrian-friendly" city and promoting the use of public transit, due to the location of this pedestrian corridor. The Washington Boulevard strategic plan should be a highly prioritized city project.

There are several recommended projects to accompany the extensive bicycle network that will likely be completed by 2008, 10 years after the baseline year of the emissions

[42] http://www.cityofstamford.org/TransportationPlanning/WashingtonBlvd.htm

analysis. These projects will help to promote the use of these bicycle lanes and multi-use trails.

**Bike Rack installation plan**

As of the summer of 2004, bike racks are located at the transportation center, on CT transit buses, and at the Ferguson Library. With the extensive bicycle network planned, bike rack installation will need to be significantly expanded to make the use of this mode of transportation convenient for Stamford residents. A strategic installation plan should be set up with sites carefully chosen for convenience and visibility. It is the lack of adequate bicycle parking and fear of theft that are major deterrents for all bicyclists. Convenient bicycle parking should be particularly available in the "downtown core". Sites chosen must be visible and prominent locations – if they are not seen they will not be used. In addition, racks should be located where there is high pedestrian activity because this adds to the cyclists' perception of security[43].

**Status**: proposed

**Public Education campaign**

A public education campaign focusing on both the health and environmental benefits of walking and biking would be a key feature of the success of the bicycle and multiple-use system. Educational signage at the entrances to paths, along with other promotional materials located in key city locations, would likely increase use of this system.

Beyond this, the health benefits of biking and walking should be incorporated into school curriculum. In those schools where access to the trails is convenient, walking or running along these paths could be incorporated into the physical education program.

Also in terms of public outreach, local cycling groups and public health organizations could be collaborated with on this effort. For example, the Connecticut Bicycle Coalition is working with partners around the state to promote bike to work programs. The organization works with municipalities to start up "Bike-to-Work" campaigns[44]. Once the network in Stamford is complete, biking to work will be a much more efficient mode of commute and should be aggressively promoted to mitigate traffic and emissions.

**Status:** proposed

[43] *Bicycle Parking: Facility Guidelines*. Connecticut Bicycle Coalition
[44] http://www.ctbike.org/bike_to_work.htm

**Telecommuting**

One of the key ways to reduce commuter trips, easing Stamford traffic congestion and reducing emissions, is to expand the implementation of telecommuting programs both for city employees and within the private sector.

Telecommute Connecticut works with employers, providing best practices for successful telecommuting arrangements for qualifying employees, advocating for 1 to 3 days per week. By helping to arrange formalized telecommuting programs, Telecommute Connecticut helps employers to avoid the risks of informal telecommuting such as Worker's Compensation and discrimination exposure. By implementing these programs companies will help reduce traffic congestion, air pollution, and global warming, and so become "Employers of Choice," improving both their employees' quality of life and the Stamford community itself. There are numerous other benefits to the employer as well such as reduced turnover and increased productivity.

In the business community, programs have been set up with: the Women's Business and Development Center, Pitney Bowes, LeadMasters Inc., Malloy Insurance, GuinnessUDV, SWRPA, Comware Systems, and Commercial Risk Reinsurance. When these programs were launched, 127 teleworkers could be accounted for. It is evident that the opportunity exists for expansion of telecommuting in the Stamford business community. In order to expand, Telecommute Connecticut would need to set up meetings with Senior Management and/or HR Directors of various Stamford employers who have not incorporated formalized telecommuting programs yet. Telecommute Connecticut would introduce their program and free expert services. This is an initiative that the City and possibly SACIA could collaborate on with Telecommute Connecticut in order to promote this.

Telecommute Connecticut has also worked with the City of Stamford to set up a pilot telecommuting program for Land Use Bureau employees. The pilot program should be analyzed and an expansion throughout departments within the Government Center should be aggressively pursued.

**Status:** proposed

## Appendix A: Calculations

**Targets (in tons $eCO_2$)**

Municipal:

52,089 * .20 = 10,418

52,089 – 10,418 = 41,671

55,534 - 41,671 = 13,863

Community:

1515864.9 * .20 = 303172.98

1515864.9 – 303172.98 = 1212691.92

2039169.2 – 1212691.92 = 826477.28

**LED Conversions**

Wattage:

12” incandescent 116 W
8” incandescent 67 W

LED: used average values to account for variations in red, green, and yellow lights

12” LED: (15+25+14)/3 = 18 W

8” LED: (8+18+8.5)/3 = 11.5 W
-used 4380 as standard hrs/year for operation of traffic light bulbs

(116 W * 4380)/1000 = 508.08 kWh/yr per bulb

(67 W * 4380)/1000 = 293.46 kWh/yr per bulb

(18 W * 4380)/1000 = 78.84 kWh/yr per bulb

(11.5 W * 4380)/1000 = 50.37 kWh/yr per bulb

**Completed conversions: (1998 – 2003)**

1091 12” incandescent bulbs * 508.08 kWh/yr per bulb = 554,315.28 kWh/yr

1091 12” LEDs * 78.84 kWh/yr per bulb = 86,014.44 kWh/yr

kWh savings: 554,315.28 – 86,014.44 = 468,300 kWh/yr

491 8” incandescent bulbs * 293.46 kWh/yr per bulb = 144,088 kWh/yr

491 8” LEDs *50.37 kWh/yr per bulb = 24,731.67 kWh/yr

kWh savings: 144,088 – 24,731.67 = 119, 356.33 kWh/yr

Total kWh savings: 587,657.17

average conversion cost per LED: $89.85

1998 - 2002: CL&P rebate of $72,000

1304 lights * $89.85 = $117,164.40

$117,164.40 - $72,000.00 = $45164.40

2003 conversions:

$24,000 * .614 = $14, 736 expected rebate

$24,000 - $14,736 = $9,264

Total cost to city: $45164.40 + $9,264 = $54,400

**Proposed conversions:**

786 12” incandescent bulbs * 508.08 kWh/yr per bulb = 399,350.88 kWh/yr

786 12” LEDs * 78.84 kWh/yr per bulb = 61,968.24 kWh/yr

kWh savings: 399,350.88 - 61,968.24 = 337,382.64 kWh/yr

2132 8” incandescent bulbs * 293.46 kWh/yr per bulb = 625,656.72 kWh/yr

2132 8” LEDs * 50.37 kWh/yr per bulb = 107,388.84 kWh/yr

kWh savings: 625,656.72 -107,388.84 = 518,267.88 kWh/yr

Total kWh savings: 855,650.52

Cost savings:

Cost per kWh - $0.11

Completed: 587,657.17 kWh * $0.11 = $64,642.29

Proposed: 855,650.52 kWh * $0.11 = $94,121.56

**Hybrid Phase-In**

10,943.8(.33) = 3611.4 gal

10,943.8 - 3611.4 = 7332.40 gallons saved

7332.40($1.18) = $8652.23

**Fairfield County Energy Conservation Project**

19.6 kWh/sq. ft./yr * $0.09/kWh = $1.76/sq. ft.

$1.76/sq. ft. * 334,840 sq. ft. = $589, 318.40 annual cost of electricity per building

-According to SACIA, with the implementation of the energy-savings measures involved in the retrocommissioning project, a minimum of 20% of the energy bill may be saved. Therefore:

$589, 318.40 * .20 = $117, 863.68

$117,863.68 /($0.09/kWh) = 1,309,596 kWh savings building/yr

1,309,596 kWh savings/building * 5 pilot buildings = 6547982.22 kWh/yr

**10% Challenge**

residential:

500,362 tons/45,399 households = 11 tons per household * .1 = 1.1 ton reduction per household

45,399(.50) = 22,700 households

1.1 ton reduction * 22,700 households =  24,970 tons

commercial:

424,805 tons * .50 = 212403 tons * .10 = 21,240 tons reduced

total $eCO_2$ reduced = 24,970 + 21240 = 46,210 tons