City of Monrovia
Energy Action Plan

Prepared by San Gabriel Valley Energy Wise Partnership

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1. Executive Summary

With the unprecedented energy challenges resulting from increased import dependency, concerns on supply of fossil fuels worldwide, and an undoubtedly discernable climate change, it is clear that action needs to be taken. In order to combat these problems, a relationship has been formed between Southern California Edison, Intergy Corporation and the City of Monrovia to create and implement an Energy Action Plan. This EAP lists goals for the city's future and sets forth commitments to achieve these goals through specific actions. These actions will ensure that sufficient, dependable, and reasonably-priced electrical power and energy supplies are achieved and provided through policies, strategies, and actions that are cost-effective and environmentally sound for the city's consumers and taxpayers. This plan looks at self-generation and demand reduction strategies that can further offset the energy, water, and transportation needs for the city of Monrovia, including the use of renewable energy sources. **This EAP is a living document meant to change with time, experience, introduction of new technologies and needs as the city progresses toward a sustainable future.**

The City of Monrovia is committed to address these challenges and take environmental leadership in producing a sustainable future.

The San Gabriel Valley Energy Wise Partnership (herein referred to as The Partnership) is an innovative partnership between 30 San Gabriel Valley cities, the Southern California Association of Governments (SCAG), and Southern California Edison. This remarkable partnership provides 1,400,000 San Gabriel Valley residents with vital energy efficiency information, training, and materials. The program is community-based and helps public agencies, businesses, and residents reduce energy use and expenses. The Partnership provides project identification analysis for city facilities, Energy Action Plans (EAP's) and implementation of the recommended energy efficiency projects in the city facilities.

California Legislation

California passed legislation, AB32 which provides goals that the state will reduce greenhouse gas emissions to 1990 levels by the year 2020. This is especially significant for California since the state has been identified as being the 12th most significant emitter of greenhouse gases in the world. It is essential that California take the leadership and put an aggressive program in place for mitigating GHG emission.

The greenhouse gases targeted by this legislation are those contributed by human activity such as water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Natural greenhouse gases are beneficial for warming the earth to a certain temperature, but those additional gases produced by humans trap in infrared rays causing the earth's atmosphere to overheat. Carbon dioxide is the

most common greenhouse gas focused on by scientists and the general public and will be the target of reduction in this Energy Action Plan.

In order to accomplish this goal the state needs to partner with cities and counties so that they can drive this effort on the local level.

With imperative energy efficiency on the rise and the strong support and incentives that local utilities provide its customers, it is more feasible for cities to take actions that make meaningful changes. Cities can receive incentives to have audits conducted where energy conservation HVAC and lighting consultants determine energy efficiency opportunities at city facilities along with incentives to implement suggested actions. These audits fuel awareness in city management structures and governments. The bottom line is that energy efficiency projects are easier to do now more than ever as funding is provided for both the means and the ends.

The Partnership supports the City of Monrovia in being a leading partner in meeting California's goal of carbon emission reduction as well as on establishing a policy on carbon emissions reduction.

The City of Monrovia has already made significant inroads of carbon emissions reduction on a local level with the numerous energy efficiency projects completed. Details of these efforts, along with their environmental impact, are outlined throughout this document.

Other cities throughout the San Gabriel Valley can benefit from the structure and commitment Monrovia has already exemplified and the ground they've covered in its efforts to reduce their carbon emissions.

Impacts of Different Levels of Actions

An Energy Action Plan entails considerable effort and expense. Reduction of carbon emissions involves the implementation of energy-efficiency retrofit projects in buildings, replacement of fleet vehicles, and a more disciplined attitude towards resource conservation. Realizing an effective Energy Action Plan requires more than just consent from elected officials and municipal staff. It requires a very active role that involves all policy-makers and implementation staff at all levels. Funding for these projects must be made available either through budgeted items or if necessary through fund-raisers.

All efforts to reduce carbon emissions have to be funded to a certain extent. In a world of limited resources, priorities must be established and acted upon. This is true whether the carbon emission reduction effort involves hardware installation (more efficient lighting, HVAC, Photovoltaic's, etc) or an education campaign urging city staff to be more energy conscious.

Priorities should be established on what measures provide the largest reduction per dollar. To this end our EAP evaluates all options based on cost, energy savings, carbon emission reduction, and payback considerations.

2. Monrovia Energy Action Plan Overview

The Partnership recognizes Monrovia as a forerunner in taking action to be as energy efficient as feasible. To assure success in their commitment, Monrovia formed a select group of City Staff – The Green Team – representing each City Department and overseen by the Public Works. The Green Team has submitted special projects to coincide with the City's two-year fiscal budget. Last July, the City Council adopted the Monrovia Environmental Accords (MEA) and Administrative Policy No. 9.02. The Green Team meets monthly in order to capture and follow through on any tasks in accomplishing a "greener" city to live and work in. In January the team provided a mid-year update on the Green Team's progress on the Accords. Reporting is scheduled to repeat every six months to assure momentum and accountability.

The Monrovia Environmental Accords consist of twenty-one (21) action items. The action items focus on seven major topic areas sustainability: Energy, Waste Reduction, Urban Design, Urban Nature, Transportation, Environmental Health and Water. A complete list of the Monrovia City Accords can be found in ***Appendix A***. Within the 21 Accords, 59 projects were identified to accomplish during the current fiscal year; the city clearly identified each project including a measurable goal. This report will focus on three resource area of the MEA's which are: Energy, Water, and Transportation.

Monrovia capitalized on incentive opportunities to obtain a free assessment through the Partnership whereby a team of energy professionals visited the city's facilities and provided detailed recommendations on ways to increase energy efficiencies and obtain their goals. The assessment acts as a guide for Monrovia to make informed energy upgrade decisions.

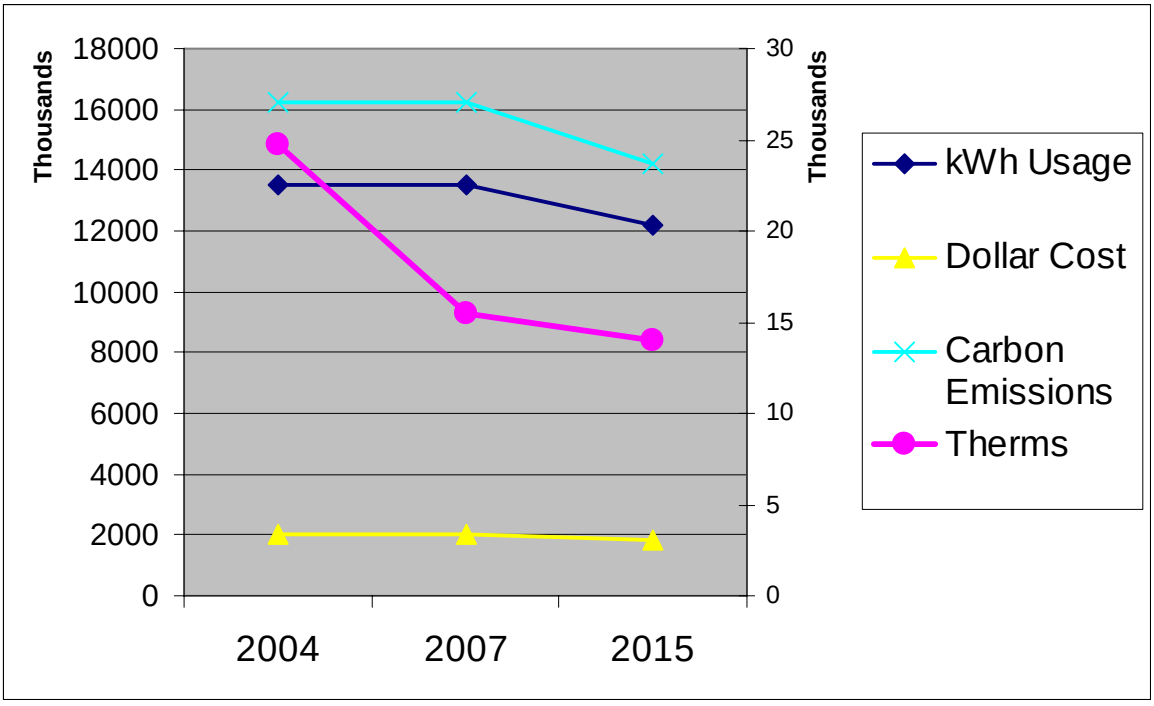
Quantifiable Results to Date and Future Goals

Historical data illustrates the emissions that can be attributed to Monrovia's past energy usage during the last 5 years dating back to Fiscal year 2003/2004 (herein referred to as Fiscal year 2004). Fiscal Year 2003/2004 data was chosen to represent the costs, energy, gas, and carbon emission changes already taking place from the energy-efficiency installations performed by the City of Monrovia. Comparable data from Fiscal year 2006/2007 (herein referred to as Fiscal year 2007) forms the current baseline measurement that The Partnerships' Reduction Proposal uses as a starting point.

Moving forward, Monrovia has identified future goals to reduce the city's peak electric load by 10 percent within seven years (by Fiscal year 2014/2015 (herein referred to as Fiscal year 2015)) through energy efficiency, shifting the timing of energy demands, and conservation measures. (Monrovia Environmental Accord (MEA) - Action Item 2).

City Buildings

Comparison of Electrical and Natural Gas Usage, Cost, and Carbon Emissions in Fiscal Year 2004, 2007, and Anticipated 2015 Goals



*See **Appendix B** for electrical back up details.*
*See **Appendix C** for natural gas back up details.*

3. Moving Forward: Achieving Future Goals

City Buildings Site Information

Intergy Corporation conducted an Energy Efficiency Assessment of the Monrovia City Buildings in order to explore opportunities for reducing energy demand and utility costs; several areas of improvement have been identified and provided to city staff for consideration. Intergy continues to support the city in its quest to be more energy efficient by way of technical services, conducting post inspection on completed work and leveraging utility incentives to pay for projects.

All of these improvements form the basis for the projected emissions into the future. The difference between projected and base line emissions constitute the GHG reductions that Monrovia is projected to realize. The analysis for future trends for energy-efficiency is based on projects currently in the works and those scheduled.

The current GHG emission inventory is attributable to the everyday operation of the City of Monrovia. The buildings surveyed include: City Hall, City Hall Annex, Police Department, Fire Station #1 and #2, Community Center, Youth Center, Boy's & Girl's Club, Historical Museum, Corporate Yard, Canyon Park Entry Station, Canyon Park Cabin, Canyon Park Nature Center, and the Well Field.

A comprehensive list of Energy Efficiency Measures were identified and evaluated including the lighting fixtures of the buildings, and the HVAC systems load.

All city buildings have some office, storage, or classroom space. Plug load equipment is primarily comprised of computers, printers, and copiers. There is also a substantial load providing interior lighting to all of the structures. The occupancy hours of every building varies and were taken into consideration in the analysis.

During the survey, numerous opportunities for energy efficiency improvements were identified and categorized by equipment type. Installation costs are based on discussions with lighting and HVAC professionals, and cost data from SCE.

Appendix D summarizes the energy efficiency measure recommendations and energy and cost savings, grouped by HVAC and lighting measures.

Appendix E provides Energy Efficiency Measure and Site Location details for a full understanding of the suggested options.

Potential Savings:

Overall, the identified potential energy costs savings are **$19,348** per year (minimum rate using charge of $0.149 per kWh). Attaining these energy costs will provide a rebate to the City of **$19,613**, which equals a combined investment of **$38,961**.

Already Achieved Savings:

The City of Monrovia has already achieved a cost savings of **$36,082** (also using the minimum savings rate) this year in their projects completed (FY 2007-2008). This has returned a rebate of **$25,167** back to the City, which has brought a total savings of **$61,249**.

All calculations were based upon an electricity rate of $0.12/kWh, and rebate levels of $0.10/kWh saved for lighting and $0.14/kWh saved for HVAC (Applies to 2007 ONLY and future rates are uncertain).

City Buildings Recommendations

2.2.1. Conservation

The most obvious and sensible way for the City of Monrovia to reduce CO2 emissions and become more energy efficient is to conserve and decrease their use of energy. Programs such as "Flex Your Power" or "Energy Star" allow for simple, effective ways to accomplish this. Educating employees, citizens, and local businesses on small changes they can make throughout the day in order to conserve energy can make a dramatic difference in the amount of energy saved. Finding ways to promote public awareness and purchase products that reduce energy use will be vital for the City of Monrovia to incorporate in their budgets and events in order to meet their goals.

Demand Response

Demand Response is a growing area of programs by SCE. Generally, this requires cities to be willing to reduce electrical usage particularly peak demand at the request of the utility. They are generally given 1 hours notice to reduce down to a level arranged in advance by contract with the utility.

We believe a study should be initiated to determine the extent Demand Response can be contracted for at larger City locations such as City Hall and the Corporate Yard. Incentives are currently available up to $250/kW for engineering and installation of the systems which are needed to be able to deliver these reductions at the request of

SCE. These systems generally work with lowering lighting levels and reducing HVAC per a planned sequence

2.2.2. Saving Calculation Process

The energy and cost saving calculations for the measures specifically identified at the sites are based on standard DEER demand reduction (wattage) values multiplied by the annual hours of operation. The measures are grouped according to no-cost, low-cost, and investment categories based on project costs. The no-cost category also includes measures for which the San Gabriel Valley Energy Wise Partnership can provide incentives to cover all installation costs.

2.2.3. Current Efficient Technologies

A number of energy-using technologies were found inside and outside of the city's buildings that were of a high enough efficiency, or low enough usage, as to not warrant any changes. These included CFL's, T8 fixtures, and low pressure sodium lights.

No-Cost Measures

Office Equipment

- Turn on the energy saving features for all computers. These can turn off monitors and turn the computers to standby mode when they are not being used, providing an easy way to save electricity. Most screen savers do not save electricity.
- Turn off computers, printers and copiers when you leave the building. Even in standby mode these systems will use a small amount of electricity.

Lighting

Since lighting consumes a great amount of energy we cannot overlook the no-cost saving opportunities such as:

- Turn off lighting in unoccupied areas.
- Turn off lighting when the building is vacant.
- Encourage occupants to turn their lights off when they will be out of the office for more than 15 minutes.
- If dimmers are installed, the lighting levels can usually be reduced without affecting occupant comfort. Essentially, reducing the light level by 10% can save almost 10% of the energy consumption, and the 10% lighting reduction is difficult to detect by the human eye. It pays to use the dimmers you have installed.

HVAC

- Clean coils, repair leaking ductwork.
- Check economizer operation.
- For cooling, set the thermostat to 78° F during the workday and to 85° F or off when your facility is vacant. For heating, set to 68° F during the workday and to 63° F after

hours. A study was performed on the difference between setting the thermostat in the Youth Center (Temporary library) at 73º F and 78º F. Calculations demonstrate a savings of 3.44 kW and 8,300 kWh, which means a minimum dollar savings of $1,237 (using a minimum rate of $0.149 per kWh), could be achieved from changing the setting on the thermostat.

Low-Cost Measures

Lighting

- Remove and replace yellowed diffusers on lighting fixtures.
- Title 24 AB switch lighting circuits allow the user to control individual lamps in a fixture with more than one lamp; they are typically used with linear "tube" fluorescent lighting. They are a very efficient way to cut energy usage when there is no need for maximum lighting levels. If dual-switch circuits are installed, use them to adjust lighting levels. For example, in an area with day lighting from windows or skylights, switch off one circuit when the daylight levels provide sufficient lighting for the area.

HVAC

- Establish a maintenance contract for the furnace and air conditioner units.
- Change filters regularly.
- Repair or replace defective door and window seals.

Additional Savings Opportunities

City-Owned Street Lights and Traffic Signals

Given that there is much energy conservation and GHG reduction opportunities available in street lights and traffic signals, Monrovia's systems were analyzed for energy-efficiency and suitability for retrofits.

The Partnership would like to promote induction lighting as both innovative, and economically feasible as retrofits for existing Metal Halide street lights. Induction lighting is most known for its incredibly long lifetime. Since there are no electrodes or cathode coating to deplete, induction lighting can have lifetimes as long as 100,000 hours. Induction lighting is also able to endure tough weather and outdoor conditions due to its good vibration resistance. The City would benefit from reduced maintenance and replacement costs due to the longer lifetimes of induction lights. The crisp color and fade-resistance provided by induction lighting is a reliable source drivers can count on while viewing street lights. The payback in maintenance will more than offset the initial cost of induction lighting.

LED retrofits are another option the Partnership promotes as a replacement to the less energy-efficient Metal Halide street lights. LED lights also provide long life spans allowing them to be changed less frequently and also save costs. Although LED lights do not provide as much lumens per watt, they are highly energy-efficient and still offer a more pleasant spectrum of light than sodium lamps do. LED lights are typically twice as expensive as normal streetlights, but will save money in both the energy and maintenance costs saved. The cost of LED lights should continue to drop as supply for these products increase throughout the years.

New Construction

Title 24, the energy efficiency standards for residential and non residential buildings, was established in order to reduce energy consumption throughout California. One of the most significant ways to conserve energy is through utilizing the current, efficient technology and methods available in the market, which are mandated by Title 24.

In order to maximize the energy efficient standards on a building most architects/builders will follow LEED qualifications. Leadership in Energy and Environmental Design (LEED) is the next step above Title 24 and is based around a rating system stating the performance level of the green building. There are numerous categories and measurements within the rating scale that need to be met in order for the building to be authorized as a sustainable green building.

The Partnership would like to encourage the City of Monrovia to take the initiative and receive LEED certification on all new construction and major renovations. This will provide Monrovia with energy and cost savings in both the long-run and short-run. Instead of having to perform costly retrofits in the future by replacing older non-efficient equipment, city buildings will already be a step ahead and have the necessary energy efficient technology.

Monrovia City Buildings Status Update

The City of Monrovia worked fervently in Fiscal Year 2007-2008 to renovate and upgrade city facilities in order to conserve energy and decrease carbon emission. There are various projects the City is pursuing throughout all of their facilities and this section only includes those completed by May 2008. The City has accomplished the following measures:

- Placed 22 water free urinals throughout facilities in order to conserve water and improve sanitation.
- Common T-12 lighting has been switched out with either T-8 or T-5 lighting fixtures along with electronic ballasts in order to reduce wattage and increase visibility in multiple locations.
- Incandescent light bulbs have been replaced with CFL's (Compact Fluorescent Lamps) to also decrease wattage loads.

- Occupancy sensors have been installed to decrease lighting usage during unoccupied times.
- Cool roofs have been applied and are continually being considered for other locations with the purpose of preventing heat transmission into facilities.

Water Pumping Site Information

The water pumping and treatment is performed at six (6) facilities. Many of the processes are performed outside. There is limited building and coverings for equipment.

Providing water to businesses and residents of Monrovia is a service provided by the City. The water is generally pumped out of the ground with well pumps (50-300 HP) and booster pumps to holding tanks/reservoirs. As the city is located in the foothills of the San Gabriel Mountains a significant amount of pumping is required. The traditional process has been to first treat the water after pumped out of the ground to then be sent up to the reservoirs in the mountains. The water is then distributed from the reservoirs by gravity to the customers in the City. This process uses a large amount of pumping power since the water needs to be pumped from up to 450 feet below ground. All pumps are driven by electric motors and the natural gas driven pumps have been abandoned.

Replacing water pump motors with newer energy-efficient models will not only save energy but will also contribute to the efficiency of the water pumping system.

The water pumping facilities are generally not staffed. City staff visits the sites periodically. Pump testing is periodically provided by SCE's pump testing group.

The annual electrical usage for water pumping based on 5/11/06 report from SCE was 8,266,860 kWh.

Appendix E provides Energy Efficiency Measure and Site Location details for a full understanding of the suggested options.

Appendix F presents a pumping plant report that was completed by SCE in 2006 in order to display a cost analysis summary on the current water pumping system.

Water free urinals reduce water and sewer costs, maintenance and repair bills, and create more hygienic, odor-free restrooms. A patented, sealed cartridge eliminates the need for water, conserving an average of 40,000 gallons per unit each year. The purchase and installation of

water-free urinals is less expensive than manual and automatic flush units because flush valves and associated piping are not required. Maintenance costs and vandalism problems associated with flush valves are also eliminated. The City of Monrovia has installed 22 water free urinals up to date, which provide significant savings in electricity, natural gas, and carbon emissions as demonstrated in the table below.

Annual Savings:

Water:	Electrical	Natural Gas:	Carbon Emissions:
880,000 gallons	3,171.96 kWh	108.25 therms	3,806.4 lbs. of CO_2

Water Pumping Site Recommendations

2.2.4. No-Cost Measures

The city currently uses their SCADA system to not pump during the hours of 11:30 AM to 6:00PM during the summer months to assist the utility in controlling peak demands.

The city also minimizes pumping based on the use of level measurements in their tanks and reservoirs. The water usage of the customers can be matched closely to the water removed from the wells.

Demand Response

Monrovia has six water pumping locations. The pumps are controlled by a central SCADA system. The city is currently not operating pumps where possible during the noon to 6:00 PM period during the summer months as designated by SCE.

We believe a study should be initiated to determine the extent the system at all locations can participate in an SCE demand response program. Incentives are currently up to $250/kW for engineering/installation of the systems to be able to deliver these reductions at the request of SCE.

2.2.5. Low-Cost Measures

Customer Usage Reduction

- Establish a homeowner/business toilet exchange program
- Provide other water saving devices to homeowners/businesses
- Resident education

2.2.6. Higher-Cost Measures

Pump/Motor Upgrades

Water pump testing is provided periodically by SCE's pump testing group. They make recommendations on applicable pumps and this is attached in Appendix F. This shows annual energy usage per motor/pump and potential for annual energy savings. The details for the cost savings will need to be obtained from the SCE pump department.

The total savings shown are $64,017. Based on $.12/kWh the annual usage reduction is 533,475 kWh. This represents a 6.5% savings. The cost to implement was not provided by SCE pump testing. A similar program was implemented in South Pasadena and their payback was .9 years to 10 years.

Power Factor Correction

We investigated briefly Power Factor correction. Due to the fact the well pumps run generally at constant volumes except when the water table changes due to rainfall power factor was not taken any further during this audit. We looked at three pump reports with the following loading:

Pump/Motor	Motor Load (%)
Sta#1 Bst#4 300HP	91%
Booster #3 250HP	117.1%
Well#4 200HP	92.9%

Just for clarification a 200HP has the following power factors:

The impact of loading on power factor is as shown below:

Loading	Power Factor
One half	.85
Three-fourths	.89
Full	.90
120%	.86

The booster pumps do vary in volume in many cases and some have variable frequency drives. Generally the power factor is held over 90% with variable speed controllers.

We suggest that as the motors/pumps are tested the motor load % be reviewed for a one week period. If the loads go under three-fourths then a power factor study should be initiated. Also if overload conditions are near 120% then a study to evaluate the cost/benefits of correcting power factor.

Suggestions for Further Study

A considerable amount of water is consumed by landscaping throughout the city. In order to conserve water and decrease the amount of pumping power placed on pumps, recycled water could be allotted to landscaping and other areas that may be able to use it. The City of Monrovia does not currently provide recycled water to customers as it is not yet available through distribution channels. There have been discussions with Upper San Gabriel Valley Municipal Water District in the past, but the decision to bring recycled water to Monrovia was not approved. The Partnership recommends that the City of Monrovia readdress this topic with Upper San Gabriel Valley to examine their ability to transport recycled water into the City of Monrovia. Before deciding on this as an option, the City of Monrovia should perform a study on the comparisons of efficiency between trucking in water versus hosting an on-site reservoir.

Renewable Energy

Intergy has worked with Southern California Edison to identify what percentage of their peak electric load comes from renewable energy. SCE then provided a statement indicating that preliminary data shows in 2006 they delivered about 13 billion kilowatt-hours of renewable energy, 17 percent of its total power deliveries. Furthermore SCE is targeting to have renewable energy contracts that, when fully operational, will represent 3 percent more of its customers' energy needs by 2010 to hit 20 percent total. **SCE's additional 3 percent reduction by 2010 contributes to Monrovia's 2015 goal; leaving an additional 7 percent for Monrovia to reduce to meet its goal.**

In order to achieve an additional goal of 7 percent with minimal cost and quick payback periods for the City of Monrovia, it is important that they choose projects sensibly. There will only be particular projects that will suit Monrovia's needs in a particular timeframe. In order to ensure that this takes place, the City should engage in a cost benefit analysis or a lifecycle analysis for any renewable energy projects they would like to pursue. The cost benefit analysis will enable the City of Monrovia to determine the cost effectiveness of pursuing a 7% goal of renewable energy and if this objective is realizable. Provided below is a table listing the certain elements a project should entail before the City of Monrovia moves forward with it.

Topic	Question to Ask	Rating Points*
Mission/Vision	Does this project relate/help achieve with the City's plans or goals?	3
Land Area Available	Is there land/space available for this project?	3
Financial Capability	Are there any loans or financial assistance available	3

	for project?	
	Are there any other pressing projects the budget should focus on besides this one?	3
	Is the payback period practical for the project or will more efficient technology be available by the time the project is paid off?	3
Legal	Are there any legal issues conflicting with this project?	4
Timing	Will the weather permit for this project to be completed in a timely manner?	2
Perception	Will the community and other members of the city agree with this project taking place?	3
	If they are not in agreement at this time, how much time/effort will it take to educate them on the importance of this project?	2
Resources	Has any other City done this before and did they benefit from it?	3
Risk	What could be the outcome if this project is not completed successfully?	4

*33 points possible from rating scale

If Project receives a total of 27 points or above: Move forward with project
between 20 and 26 points: Correct some issues before progressing
below 19 points: Progression is not recommended

A current project the City is examining is a photovoltaic system. Although solar energy technologies are a great resource of renewable energy by transferring sunlight into electricity, a photovoltaic system is not always the best option. A great advantage of photovoltaic systems is that they do not produce emissions or incur any costs during operation, thus leading to a cleaner energy source. However, these systems are known for having either long payback periods or other difficulties. This project should follow the rating system above to look further into the feasibility of constructing a photovoltaic system. The City has already identified some of the answers, but the Partnership recommends other topics be covered as well before moving ahead with this project.

Transportation Information

Given that 43 percent of greenhouse gases derive from transportation, a major portion of California legislation related to the environment and carbon emission focus on this sector. The only way to essentially reach goals established by AB32 or other types of bills is by finding transportation solutions. Not only are harmful emissions mounting, but also gasoline prices are soaring causing an increased demand on a renewable fuel source. It is important for the City of Monrovia to acquire fleet vehicles as well as motivate their residents to utilize zero or low emission vehicles that will be able to suit their needs.

There are a number of options available in the marketplace today, but there are advantages and disadvantages to each one. ***Appendix G*** will provide detailed information regarding each of the options along with their pros and cons.

Transportation City Goals

The City of Monrovia's fleet information was gathered in order to conduct an audit on the carbon emissions and provide recommendations on decreasing this number. The calculated number of vehicles included in this fleet audit was one hundred (100) passenger cars, fourteen (14) trucks, and two (2) hybrid trolleys. These vehicles are used by the police, water, public transit, and fire departments. The estimated annual mileage is based on FY 2006-2007, the chosen baseline year, with additional information on of the fleets included in Appendix H.

City Accord Action 14: Implement programs that phase down sulfur emission in diesel and gasoline fuels by 50 percent concurrent with using advanced emission controls on all buses, taxis, and public fleets to reduce particulate matter and smog-forming emissions from those fleets by 50 percent by 2015.

Particulate matter and smog-forming emissions are important to define in order to understand what the City Accord Action is aimed at accomplishing. Particulate matter, also known as PM, is liquid droplets of acids, untreated chemicals, metals, and soil or dust elements. These particles can lead to health problems when consumed by the general public through the throat and nose into the lungs to then damage the heart or cause lung cancer. Automobile gas emissions in the air are one of the major ways particulate matter is caused. By decreasing the amount of particulate matter, the City is creating a healthier environment for their citizens.

Smog-forming emissions are those contributing to air pollution by combining a combustion product and gaseous emission. Nitrogen oxides and various hydrocarbons experiencing photochemical reactions are an example of a smog-forming emission. Particles such as soil, dust, and various exhaust particles may mix with the ozone and create a brownish, thick haze. Smog also poses health risks as particulate matter does, but also damages crops, rubber, and

other materials. As Monrovia is located in Southern California where smog has been a growing concern, it is vital for Monrovia to contribute to finding any solution to the issue.

The year 2020 was included in the CO_2 goal due to its important relation with AB32. This bill includes other greenhouse gases in the chart and not just carbon dioxide, but also methane, nitrous oxide (NOx), Sulfur Oxide (Sox), and Particulate Matter (PM). These sources of pollution are commonly derived from the transportation segment in which City fleet vehicles are included. A goal of reducing Monrovia's fleet carbon emissions by approximately 25 percent before 2020 was used in conjunction with AB32's stated amount.

City Fleet Baseline → Goals

	2007 CO2	2020 CO2 Goal	2007 PM10	2015 PM Goal	2007 SOx	2015 SOx Goal	2007 NOx	2015 NOx Goal
TOTAL PASSENGER	999,093.61	749,320.21	76	38.13	9.73	4.86	1,095.28	547.64
TOTAL TRUCK	216,682.25	162,511.69	66	33.09	1.91	0.95	1,823.64	911.82
TOTAL CONTRACTED	990.795.79	743,096.84	331	165.63	9.56	4.78	9,129.10	4,564.55
GRAND TOTALS	**1,215,775.86**	**1,654,928.74**	**474**	**236.85**	**21.20**	**10.60**	**12,048.02**	**6,024.01**

*See **Appendix H** for back up details and calculation formulas. ^Contracted Fleet include Refuse and Street Sweepers*

Transportation Recommendations

The City of Monrovia is involved with the San Gabriel Valley Council of Government's Energy and Environment Committee in order to coordinate educational workshops on renewable fuels with AQMD (Air Quality Management District). This acknowledges the importance the City of Monrovia has already placed on transportation and finding a sustainable solution. It is recommended for the City to continue researching the various options with transportation specialists on finding the right vehicle for their department's needs.

Conservation is the most reliable and simple way for the City of Monrovia to reach their goal. The city should ensure that each employee is using the smallest vehicle possible and limiting their non-essential travel. A no-idling policy should also be adapted by the city to ensure employees are not wasting fuel and greenhouse gases at unnecessary times.

In order to help meet the greenhouse gas reduction goal, the Partnership would like to recommend the use of hybrids as a viable renewable fuel option for the present moment. Hybrids produce decreased emissions during operation with the additional battery powered motor. Not only do the majority of hybrids have three times (3x) the amount of gas mileage available compared to regular vehicles, but also do not idle with the help of the electric motor. This renewable fuel source can provide for a multitude of needs ranging from quick engine power for a police car to heavy duty utility trucks for a fire department.

These vehicles can cost approximately $7,000 more than the average vehicle, which could be costly for the city to afford. One way the City of Monrovia can afford this expense is to reassess the number of fleet they realistically need and cut down if possible. Another could be concentrating at first on replacing old, inefficient vehicles then assigned to employees who drive the most to maximize the results. The Partnership recommends the City of Monrovia to replace at least half of their fleet vehicles with hybrids by the year 2030.

As this is a living document, the plan recognizes the need to reassess the future options available that may be more suitable for the City of Monrovia. Until that time comes, the hybrids are the most viable option.

Other emissions reduction opportunities

Recognizing that Monrovia is located in Los Angeles County, a strong reduction opportunity exists in capitalizing on the infrastructure already set in place as well as be an active role model for the other 9.6 million people in the area. The Metro Rail, specifically it's Gold Line, provides an easy, low cost transportation system in which Monrovia residents can take advantage of. Other available options may be Amtrak, Metrolink, locating convenient ridesharing groups through Southern California Ride Share, or by riding the local bus system. The City of Monrovia should encourage local residents to make the most out of these resources available.

The city employees should be the first to take part in increasing the amount of ridesharing or other methods of transportation to reduce carbon emissions from commuting. The City of Monrovia should pursue a goal of 20% of employees to take part in carpooling, riding a bicycle, or taking public transportation to work. The Partnership recommends an incentive available in order to motivate the targeted 45 employees (20% of 225 employees) for choosing a renewable method. The City has already integrated their employees into a 4/10 work schedule, which removes a day from them commuting to work. The Partnership recommends this schedule to continue with all city employees.

Decreased Energy Dependence

The basic issue for Monrovia and other cities is what they will do about the ongoing Energy Crisis. Monrovia needs to establish a Community Vision, which is then translated into goals that can help them become more sustainable. There are other communities, like colleges and universities that are doing just that. Note the diagram below that outlines what the new "paradigm" is: relying less on a central gird to providing local community power generation through renewables. The concept is called "agile energy systems" (see Clark and Bradshaw, 2004) and encourages communities to rely more on renewable energy/photovoltaic's while still linked to the grid for redundancy and back-up if needed.

Consider one example: the American Association of Sustainable Higher Education. Over 1,000 American colleges and universities have joined the organization and made the above vision a firm commitment. Each campus has its own specifics goals and objectives, but they have agreed to move ahead aggressively with this vision. The college and university community(s) is very similar to a small town and city. In short, there are strong parallels and hence lessons to be learned and implemented.

The LA Community College District (LACCD), with its nine campuses throughout LA County, has such a program. The idea is to use renewable energy for power generation (solar for example; see planning diagram below) along with other power sources such as wind (small wind as part of the building design) and geothermal among others. The campuses average about 2-3 MW per site so with the installation of that amount of solar (which is currently being done --- see below for East LA College) the demand is met as well as planned for future demand increases. Colleges are similar to City government building centers (City Hall, Court Houses, Fire and Police Stations etc.) as well as office building complexes, shopping malls, and residential communities.

One key element and concern, in the case of LACCD, and other communities is to implement US Green Building Standards called Leadership in Energy, Environment and Design (LEED). This standard has become very popular (it has five levels of ranking each building) and has now expanded somewhat into "neighborhoods" or clusters of buildings.

Similarly, there is a national Clean Cities organization. Monrovia should join and learn what it can do to accomplish its vision (the one above or another) or that of the Clean Cities Association. Over 350 American cities and towns have signed on to participate in the program. Monrovia would join and work with the Clean Cities national program to get ideas and share programs, policies and expertise with other cities. Certainly, Monrovia should consider registering with the California Climate Registry to set up an annual process to measure (see base load model below) their "carbon footprint" and hence from which to reduce it through energy programs, incentives, strategies and conservation.

Monrovia should also consider setting a strong goal of having 10% renewable energy within the community by 2010 or another date certain in the near term. This will lead the community by being pro-active and aggressive. The State of California and Los Angeles Department of Water and Power (LADWP) as well as Southern California Edison both have their goal as 20% by 2010. This is very well possible by enacting in some creative and aggressive ways. Edison is at 17% now (2008) so that it appears it will exceed the 20% goal before 2010. LADWP is another story. However, recently (early June 2008) the senior management and Board have taken dramatic steps to meet the 20% goal by 2010.

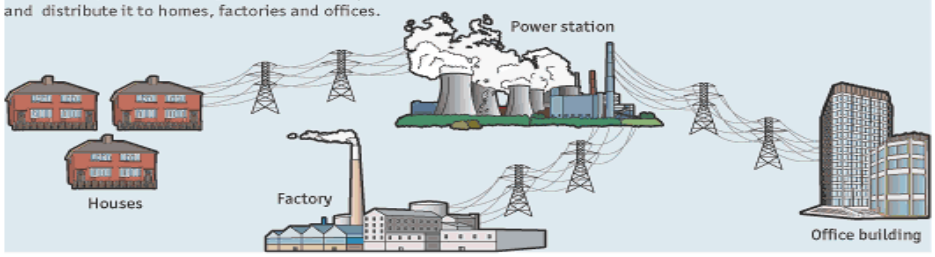
The first way this has been done by both Edison and LADWP only buying "green power" or the percentage to meet their goals. The other significant way they have met this goal is by reducing energy use through conservation and efficiency methods: light blubs, meters for the home and office, turn off lights and power, purchase LED lights for public areas among other things. Thirdly, Monrovia can start a Solar Roof Program following the example of Santa Monica, San Francisco and Berkeley who already have them. One creative approach from Berkeley is for the home and business owner to contract to take a percentage of their monthly power bill and allocate to the costs for solar systems. Finally, the City needs to cerate education and training programs which involves the public schools, City and private sector facility staff, include an annual public event like an "eco or green fair" during the year for the entire community. There are other activities and programs that might best suit Monrovia which can be developed too.

Agile Energy Systems as illustrated in the Economist Journal from WW Clark and T Bradshaw, Agile Energy Systems: global lessons from the California energy crisis, Elsevier Press 2004: combination of grid connected energy but with far more generation coming from on-site power in communities, homes and clusters of buildings.

The shape of grids to come?

Conventional electrical grid

Centralised power stations generate electricity and distribute it to homes, factories and offices.

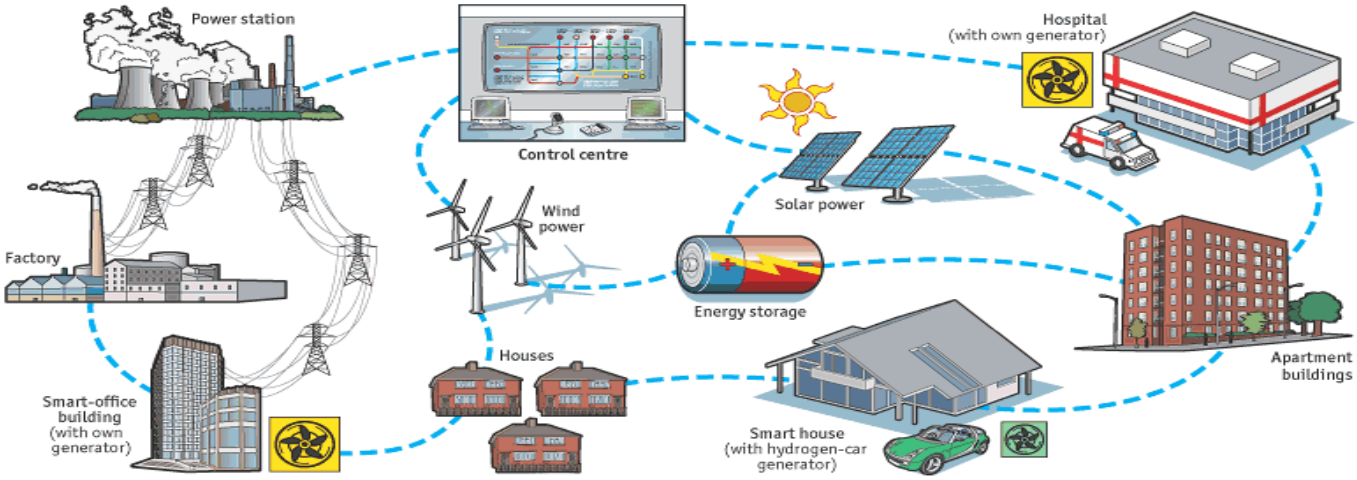


Energy internet

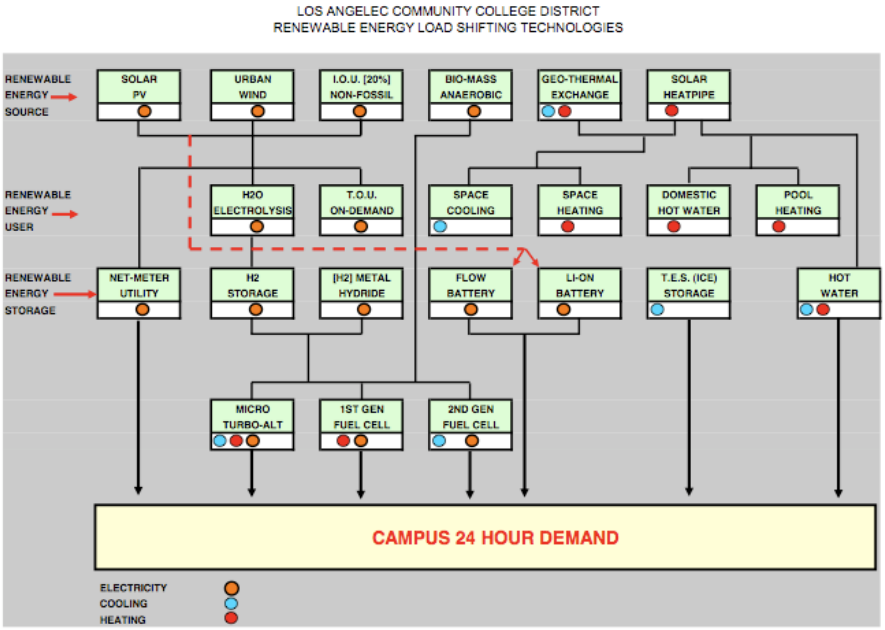
Many small generating facilities, including those based on alternative energy sources such as wind and solar power, are orchestrated using real-time monitoring and control systems.

Offices or hospitals generate their own power and sell the excess back to the grid. Hydrogen-powered cars can act as generators when not in use. Energy-storage technologies smooth out fluctuations in supply from wind and solar power.

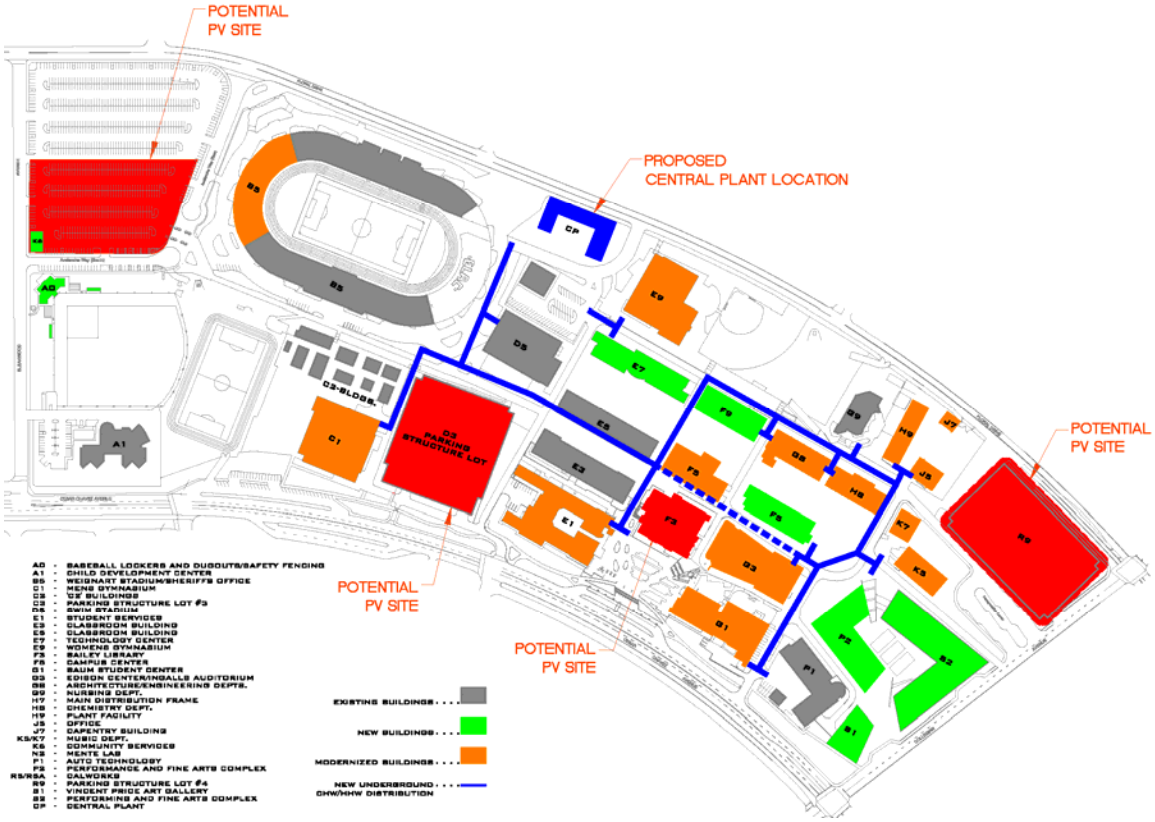
Distributing power generation in this way reduces transmission losses, operating costs and the environmental impact of overhead power lines.



Sources: *The Economist*; ABB



East LA College Campus Plan (LACCD)



4. Potential carbon emission reduction projects summary…

The City of Monrovia set a strong goal of achieving a 25% reduction in greenhouse gas emissions by 2030 as seen below in their City Accord Action 3. This is a difficult goal, but could be achieved if the city acts accordingly.

In terms of electrical usage that emits greenhouse gas, the city will need to reduce their kWh by 3,386,698 (25% from baseline of 13,546,794 kWh in FY2007). The Partnership has recommended numerous retrofits throughout the city facilities that will accomplish a savings of 161,253 kWh. This means that the City will have to heavily rely on the local community to decrease their kWh usage as well in order to meet this goal. If half of the household reduce their electricity usage by 10% the City will meet this goal. In order for this to occur, the City of Monrovia needs to generate thorough energy awareness throughout the community by hosting events, visiting schools, or other types of programs.

The city will also need their citizen's help in order to reduce gas emissions. A reduction of 3,875 therms (25% from baseline of 15,503 therms in FY2007) is the target to help meet the overall greenhouse gas goal. Besides replacing the city facilities HVAC equipment with more energy efficient equipment and installing Intellicon's, they will also need to educate the importance of saving gas and how to do so throughout the community.

By replacing at least half of the fleet vehicles with hybrids, one-sixth ($1/6^{th}$) of the reduction of 303,943 CO2 will be met for the greenhouse gas goal. This means that it is important to also focus on the use of each vehicle. The city needs to ensure that all vehicles are driven when necessary and the most efficient vehicle for each job is used at all times. The fleet portion of this goal can be met, but changes need to be made in the amount of usage by all vehicles.

City Accord Action 3: Adopt a citywide greenhouse gas reduction plan that reduces the jurisdiction's emissions by twenty-five percent by 2030*, and which includes a system for accounting and auditing greenhouse gas emissions. *(*Note: 2015 reduction was goal was set at 10%)*

There are many funding strategies available today for the listed projects in this plan. As seen above, the utilities, such as Southern California Edison have rebate programs (San Gabriel Valley EnergyWise Partnership) for energy efficiency projects. Federal Tax incentives exist too but expire at the end of 2008. The 30% tax credit for companies is very attractive and being used by communities and colleges when they go out to bid and contract with companies for energy demand and generation services using renewable power sources. The for-profit companies can take and use the Federal Tax Credits.

Per California Government Codes and Proposition 96, Communities can ask the voters to pass bond measures. Many colleges have done so to upgrade and "green" their campuses. Another even more significant strategy is to use long term Power Purchase Agreements (PPA) which is legal agreements / contracts between the organizations to buy power from a company for 10-20 years. Often the PPA can be paid off sooner since the energy savings can be used to reduce the time of the contract. Along with this legal contract, there are economic and accounting analytical tools called "life cycle analysis" which can provide details as to the Return on Investment (ROI) and measure the time along with "externalities" (e.g. other costs) to pay for the renewable energy systems.

A more recent strategy has come from the Clinton Climate Initiative (CCI) in Washington DC whereby private companies that contract for energy services are identified and screened in order to bid and contract for renewable energy and demand management services to non-profit or government organizations. This approach also includes low interest financing and bank support to communities. Soon some pilot projects will be identified and tested in Southern California as well as other regions in the USA.

5. Conclusion and Recommendation

The City of Monrovia has demonstrated an exceptional willingness to conserve energy, reduce the emission of Green House Gases (GHG), and become a greener city via the implementation of several measures. These measures include the replacement of inefficient hardware in favor of energy-efficient models within city facilities and behavior modification of city staff. These measures so far have yielded significant and measurable energy savings and reduction of GHG emissions. These energy savings and corresponding GHG reductions have been quantified with the use of utility consumption data obtained before and after the energy-efficient hardware was installed in Monrovia's city facilities. The difference in energy usage between the relevant baselines (FY2004 and FY2007) establishes the integrity and soundness of the recommendations contained herein.

The accomplishment of these goals has required that every level of Monrovia's governance structure support and work together towards this common good. Monrovia's Mayor and City Council working alongside city staff have made this effort a success thus far. In order to make this into a city-wide success the City must explore ways to effectively involve Monrovia's citizenry to adopt greener lifestyles by conserving water and becoming energy-efficient.

The creation of the Green Team has added an element of organized structure so often required in these city-wide efforts to helping conserve our environment. Comprised of representatives from each of the City's departments the Green Team provides guidance and recommendations to the Public Works Department on how each respective department can contribute to the City's energy conservation goals.

A Green Team concept can be further expanded to include Monrovia's community leaders and volunteers from the various council districts. This city-wide Green Team would then explore ways to outreach to Monrovia's residents and encourage their participation in a greener lifestyle. Monrovia's population as per the 2000 Census data shows 13,957 housing units and approximately 40,000 residents. If the city-wide community Green Team were successful in its outreach efforts and realized an average savings of 10% in both water and energy conservation in each household this would translate into significant resource conservation and GHG emissions reduction. Based on average consumer use this would mean a total yearly water savings of 76.2 million gallons, 9.5 MWh of electricity, and 558,280 therms of natural gas. This would result in CO_2 emissions reduction of approximately 8 million pounds per year! This does not include the non-residential utility accounts for the Monrovia business community.

Despite Monrovia's status as an Energy Leader, it is also recognized that the City can do more to further its energy conservation goals and reduce its Carbon Footprint. For this reason the San Gabriel EnergyWise Partnership and the City of Monrovia have created this Energy Action Plan. This Energy Action Plan will also serve as a model which other cities in the San Gabriel Valley and elsewhere can adopt and implement. Change will not happen overnight and will require that all cities collectively work together in solving the Global Warming issue. The adoption of similar plans by other cities will help establish formal and realizable energy conservation and GHG reduction goals.

As the energy conservation industry grows so does the innovation and technology associated with the lighting and cooling systems often used in city facilities. During the last ten years there has been a push to introduce newer and more energy efficient technologies in these areas. This effort has given rise to what is known as *The Market Transformation* of energy-efficient equipment. Market Transformation has been promoted by the federal and state government as well as the utility companies to reduce the number of new generating plants in our communities.

The advent of newer technologies in lighting and cooling systems coupled with the continuous innovations in these areas allows for additional energy conservation opportunities. At this point in time, for example, the Market Transformation of tube lighting is well underway with many city facilities and businesses retrofitting their lighting systems from T12/magnetic ballasts to T8 with electronic ballasts. Continuous technological advancements in lighting systems have placed into the marketplace T5 lighting systems capable of engaging in demand response activities, daylight harvesting ballasts, internet driven lighting controls, induction lamps, and reduced wattage T8 lamps-just to name of few. The technologies allow for cities such as Monrovia that have already carried out the T12 to T8 retrofits to establish additional energy goals. As time progresses the Market Transformation of these technologies will drive down their prices and thus, make them more readily accessible.

The same concept applies to the efficiency of HVAC technology. Current Title 24 Standards require for the installation of HVAC units that have a minimum SEER 13 (Seasonal Energy Efficiency Ratio) in all residential and non-residential new construction and remodels. These standards will of course change as Title 24 is further updated in the coming years. This will

provide cities such as Monrovia the opportunity to conserve additional energy and further reduce cooling costs.

This Energy Action Plan for the City of Monrovia is a living document. It is meant to establish energy conservation and GHG reduction goals during the next 22 years. It also establishes a current baseline by which to compare progress in meeting the goals as outlined herein. City staff will continuously monitor all progress in the future years and re-define goals as it becomes necessary.

APPENDIX A

Monrovia City Environmental Accords

ENERGY

Action 1: Adopt and implement a policy to increase the use of renewable energy to meet ten percent of the city's peak electric load by 2015.

Action 2: Adopt and implement a policy to reduce the city's peak electric load by ten percent within seven years through energy efficiency, shifting the timing of energy demands, and conservation measures.

Action 3: Adopt a citywide greenhouse gas reduction plan that reduces the jurisdiction's emissions by twenty-five percent by 2030, and which includes a system for accounting and auditing greenhouse gas emissions.

WASTE REDUCTION

Action 4: Establish a policy to achieve seventy-five percent diversion to waste disposal methods by 2015.

Action 5: Adopt a Municipal Code Ordinance that reduces the use of a disposable, toxic, or non-renewable product category by at least fifty percent by 2015.

Action 6: Implement "user-friendly" recycling and composting programs, with the goal of reducing by twenty percent per capita solid waste disposal by 2015.

URBAN DESIGN

Action 7: Adopt a policy that mandates a green building rating system standard that applies to all new municipal buildings.

Action 8: Adopt urban planning principles and practices that advance higher density, mixed use, walkable, bikeable and disabled-accessible neighborhoods, which coordinate land use and transportation with open space systems for recreation and ecological restoration.

Action 9: Adopt a policy or implement a program that creates environmentally beneficial jobs throughout the community.

URBAN NATURE

Action 10: Ensure that there are accessible public parks, trails or recreational open space within half-a-mile of every city resident by 2015.

Action 11: Conduct an inventory of existing canopy coverage in the city; and, then establish a goal based on ecological and community considerations to plant and maintain canopy coverage in not less than fifty percent of all available sidewalk planting sites.

Action 12: Adopt a Municipal Code Ordinance, in compliance with local, state and federal laws and regulations, which protects critical habitat corridors and other key habitat characteristics (e.g. water features, and shelter for wildlife and use of native species, etc.) from unsustainable development.

TRANSPORTATION

Action 13: Develop and implement a policy which expands affordable public transportation coverage within a quarter-mile of all city residents in ten years.

Action 14: Implement programs that phase down sulfur emission in diesel and gasoline fuels by fifty percent concurrent with using advanced emission controls on all buses, taxis, and public fleets to reduce particulate matter and smog-forming emissions from those fleets by fifty percent by 2015.

Action 15: Implement a policy to reduce the percentage of commute trips by single occupancy vehicles by ten percent by 2015.

ENVIRONMENTAL HEALTH

Action 16: Annually, identify one product, chemical, or compound that is used within the city (with a focus on specific areas used by children and youth) that represents a risk to human health and reduce or eliminate its use by the municipal government.

Action 17: Promote wellness and fitness when planning or redesigning city facilities.

WATER

Action 18: Adopt and implement policies to reduce per capita water demand by ten percent by 2015 and thirty-five percent by 2030.

Action 19: Protect the ecological integrity of the city's primary drinking water sources (i.e., water ways and associated ecosystems).

Action 20: Adopt municipal wastewater management guidelines and reduce the volume of untreated wastewater discharges by ten percent in by 2015.

Action 21: Increase groundwater recharge by five percent by 2020.

Monrovia City Electrical Usage
Historical, Baseline and Goals

APPENDIX B

Building / Station	Building / Station Street Address	2004 Fiscal KW Usage	2004 Fiscal ** KWH Usage	2004 Fiscal Cost»	2004 CO2 (lbs.)^	2007 Fiscal KW Usage	2007 Fiscal ** KWH Usage	2007 Fiscal Cost»	2007 CO2 (lbs.)^	2004 v 2007% KWH Reduction	2015 Fiscal KW Goal #	2015 Fiscal KWH Goal #	2015 Fiscal Cost»	2015 CO2 Goal (lbs.)^
Community Center	Community Center 119 W Palm Ave.	83.91	283,600.00	$42,256.40	340,320	72.99	246,720	$36,761.28	296,064	13%	65.69	222,048	$33,085.15	259,056
City Hall Annex	City Hall Annex 200 E Lime Ave.	9.50	32,113.75	$4,784.95	38,537	6.61	22,325	$3,326.43	26,790	30%	5.94	20,093	$2,993.78	23,441
Fire Station #2	Fire Station #2 2055 S Myrtle Ave.	27.61	93,337.50	$13,907.29	112,005	30.77	104,010	$15,497.49	124,812	-11%	27.69	93,609	$13,947.74	109,211
Library (old)	Library Park (old library) 1 Library	81.08	274,050	$40,833.45	328,860	67.72	228,887	$34,104.16	274,664	16%	60.95	205,998	$30,693.75	240,331
City Hall	City Hall 415 S. Ivy Ave.	97.74	330,375.00	$49,225.88	396,450	99.41	336,000	$50,064.00	403,200	-2%	89.47	302,400	$45,057.60	352,800
Police Station	Police Station 140 E Lime Ave.	253.54	856,950.00	$127,685.55	1,028,340	181.47	613,360	$91,390.64	736,032	28%	163.32	552,024	$82,251.58	644,028
Corporate Yard	Corporate Yard 600 S Mountain Ave.	53.57	181,050.00	$26,976.45	217,260	33.40	112,880	$16,819.12	135,456	38%	30.06	101,592	$15,137.21	118,524
Historical Museum	Historical Museum 742 E. Lemon Ave.	17.2	15,160.00	$2,258.84	18,192	22.80	24,920	$3,713.08	29,904	-64%	20.52	22,428	$3,341.77	26,166
Youth Center	Youth Center 845 E. Olive Ave.	9.11	30,800.00	$4,589.20	36,960	18.58	62,800	$9,357.20	75,360	-104%	16.72	56,520	$8,421.48	65,940
Boys & Girls Club ++	Boys & Girls Club ++ 602 S. Shamrock	11.49	38,850.00	$5,788.65	46,620	13.11	44,320	$6,603.68	53,184	-14%	11.80	39,888	$5,943.31	46,536
Canyon Park Facilities	Mulitple locations	10.19	34,437.00	$5,131.11	41,324	10.19	34,456	$5,133.94	41,347	0%	9.17	31,010	$4,620.55	36,179
Other Structures	Mulitple locations	29.92	101,120.00	$15,066.88	121,344	43.63	147,474	$21,973.63	176,969	-46%	39.27	132,727	$19,776.26	154,848
Parking Lots	Mulitple locations	272.89	922,355.00	$137,430.90	1,106,826	163.75	553,460	$82,465.54	664,152	40%	147.37	498,114	$74,218.99	581,133
Street Lights	LS-1 Rate	4.34	14,637.00	$2,180.91	17,564	5.02	16,972	$2,528.83	20,366	-16%	4.52	15,275	$2,275.95	17,821
Street Lights	LS-1 All Night Rate	247.32	835,943.00	$124,555.51	1,003,132	248.04	838,374	$124,917.73	1,006,049	0%	223.24	754,537	$112,425.95	880,293
Street Lights	LS-2 Rate	297.11	1,004,232.00	$149,630.57	1,205,078	297.11	1,004,232	$149,630.57	1,205,078	0%	267.40	903,809	$134,667.51	1,054,444
Street Lights	LS-3 Rate	56.59	191,298.00	$28,503.40	229,558	63.79	215,610	$32,125.89	258,732	-13%	57.41	194,049	$28,913.30	226,391
Traffic Signals	Mulitple locations	73.15	247,238.00	$36,838.46	296,686	75.69	255,816	$38,116.58	306,979	-3%	68.12	230,234	$34,304.93	268,607
	TOTAL (excluding water pumps)	**1,623.53**	**5,487,546.25**	**$817,644.39**	**$6,585,055.50**	**1,438.64**	**4,862,616.00**	**$724,529.78**	**$5,835,139.20**	**11%**	**1,294.78**	**4,376,354**	**$652,076.81**	**5,105,747**
Water Pumping / Reservoir +	Water Pumping / Reservoir + 2655 S Myrtle Ave.	1,292.03	4,367,046	$650,689.85	5,240,455	1,355.49	4,581,569	$682,653.78	5,497,883	-5%	1,219.94	4,123,412	$614,388.40	4,810,647
Water Pumping / Reservoir +	Water Pumping / Reservoir + 510 S Mountain Ave.	492.25	1,663,807	$247,907.24	1,996,568	500.05	1,690,180	$251,836.82	2,028,216	-2%	450.05	1,521,162	$226,653.14	1,774,689
Water Pumping / Reservoir +	Water Pumping / Reservoir + 347 May Ave.	263.39	890,243	$132,646.21	1,068,292	367.59	1,242,470	$185,128.03	1,490,964	-40%	330.84	1,118,223	$166,615.23	1,304,594
Water Pumping / Reservoir +	Water Pumping / Reservoir + 2610 S California Ave.	238.44	805,921	$120,082.23	967,105	247.62	836,956	$124,706.44	1,004,347	-4%	222.86	753,260	$112,235.80	878,804
Water Pumping / Reservoir +	Water Pumping / Resevroir + 715 Ridgeside Dr.	64.10	216,655	$32,281.60	259,986	65.40	221,038	$32,934.66	265,246	-2%	58.86	198,934	$29,641.20	232,090
Water Pumping / Reservoir +	Water Pumping / Reservoir + 601 Cloverleaf Dr.	29.56	99,920.00	$14,888.08	119,904	33.13	111,965	$16,682.79	134,358	-12%	29.81	100,769	$15,014.51	117,563
	WATER PUMPING TOTALS	**2,379.76**	**8,043,592.00**	**$1,198,495.21**	**$9,652,310.40**	**2,569.28**	**8,684,178.00**	**$1,293,942.52**	**$10,421,013.60**	**-7.96%**	**2,312.36**	**7,815,760.20**	**$1,164,548.27**	**9,118,386.90**
	GRAND TOTAL	**4,003.30**	**13,531,138.25**	**$2,016,139.60**	**$16,237,365.90**	**4,007.93**	**13,546,794.00**	**$2,018,472.31**	**$16,256,152.80**	**-0.12%**	**3,607.13**	**12,192,114.60**	**$1,816,625.08**	**14,224,133.70**

* Usage adjusted as increase by 25% to account for change in operating days/times. Starting July 1, 2005 days of operation increased from 4 to 5 days/week with operating hours 7:00-6:00; and lighting & HVAC hours 6:00-7:00

** Note: data compiled from actual utility bills

.+ City is currently doing Summer demand reduction during 12noon - 6:00pm

.++ This is a City Building but the facility is not City run

10% reduction
^ 12.5% reduction
» Assume $0.149 rate

FORMULA: (amount of kWh / 1000) * 1200

Monrovia City Natural Gas Usage
Historical, Baseline and Goals

APPENDIX C

Building(s) Address	2004 Therms Usage	2004 Total Bill	2007 Therms Usage	2007 Total Bill	2004 vs 2007 % Therm Reduction	2004 vs 2007 % Bill Reduction	2015 Therm Goal	2015 Total Bill Estimated^
Community Center 119 W Palm Ave.	1,878	$ 1,880.30	1,541	$ 1,916.21	18%	-2%	1386.9	$1,724.59
City Hall Annex 200 E Lime Ave.	307	$ 400.41	368	$ 541.30	-20%	-35%	331.2	$487.17
Fire Station #2 2055 S Myrtle Ave.	1,824	$ 1,848.45	1,105	$ 1,421.05	39%	23%	994.5	$1,278.95
Library Park (old library) 315 S Myrtle Ave.	2,943	$ 2,675.52	2,167	$ 2,487.33	44%	44%	1950.3	$2,238.60
City Hall/Police Station/Fire Station #1 415 S Ivy Ave.	11,957	$ 9,558.12	7,883	$ 7,731.95	34%	19%	7094.7	$6,958.76
Corporate Yard 600 S Mountain Ave.	5,381	$ 4,573.61	1,783	$ 2,049.72	67%	55%	1604.7	$1,844.75
Historical Museum 742 E. Lemon Ave.	430	$ 522.43	158	$ 297.36	63%	43%	142.2	$267.62
Youth Center 845 E. Olive Ave.	*	*	498	$ 682.74	*	*	448.2	$614.47
Water Pump 510 S. Mountain	0	$ 129.17	*	*	*	*	*	*
Boys & Girls Club 602 S. Shamrock	*	*	*	*	*	*	*	*
	24,719	**$21,588**	**15,503**	**$17,128**	**37%**	**21%**	**13,953**	**$15,414.89**

Note: All numbers reported are based on actual Utility Bill Records
* Bills missing; insufficient data to report
^Estimated by decreasing 2007 total bill by 9%

Table 1 HVAC Energy Efficiency Measure Recommendations Summary

Building	Energy Efficiency Measure Code	Number of Units	Measure Description	Annual Electricity Savings (kWh)	Annual Cost Savings*	Estimated Installation Costs	Estimated Program Incentives**	Net Cost to Monrovia	Simple Payback Period (years)
Multiple Buildings	HVAC-CM	64	Install IntelliCon	89,984	$10,800	$38,208	$12,597	$25,611	2.4
Replace HVAC Units									
Recommendation Totals		**64**		**89,984**	**$10,800**	**$38,208**	**$12,597**	**$25,611**	**2.4**

Table 2 Lighting Energy Efficiency Measure Recommendations Summary

Building	Energy Efficiency Measure Code	Number of Units	Measure Description	Annual Electricity Savings (kWh)	Annual Cost Savings*	Estimated Installation Costs	Estimated Program Incentives**	Net Cost to Monrovia	Simple Payback Period (years)
Corporate Yard	CY-L-1	70	Upgrade T-12 fixtures to T-8 fixtures with electronic ballasts	6,594	$788	$5,790	$659	$5,131	6.5
Corporate Yard	CY-L-2	1	Replace halogen/incandescent lamps with CFLs	134	$16	$11	$11	$0	0
Corporate Yard	CY-L-3	2	Replace Metal Halide with Highbay T-5 fixtures with electronic ballasts	248	$30	$225	$25	$200	6.7
Youth Center	YC-L-1	8	Replace halogen/incandescent lamps with CFLs	770	$92	$112	$77	$35	0.3
Historical Museum	HM-L-1	2	Upgrade T-12 fixtures to T-8 fixtures with electronic ballasts	50	$6	$8	$5	$3	0.5
Historical Museum	HM-L-2	160	Replace halogen/incandescent lamps with CFLs & Candalabaras	7,307	$876	$2021	$731	$1290	1.5
Police Department	PD-L-1	25	Upgrade T-12 fixtures to T-8 fixtures with electronic ballasts	5,983	$718	$1900	$598	$1,302	1.8
Police Department	PD-L-2	10	Replace halogen/incandescent lamps with CFLs	2,216	$266	$113	$113	$0	0
City Hall	PD-L-1	49	Replace halogen/incandescent lamps with CFLs/Candalabara	6,244	$749	$673	$624	$49	0.06

Building	Energy Efficiency Measure Code	Number of Units	Measure Description	Annual Electricity Savings (kWh)	Annual Cost Savings*	Estimated Installation Costs	Estimated Program Incentives**	Net Cost to Monrovia	Simple Payback Period (years)
Fire Station #2	FS-L-1	62	Upgrade T-12 fixtures to T-8 fixtures with electronic ballasts	4,462	$535	$2,492	$446	$2,046	3.8
Fire Station #2	FS-L-2	22	Replace halogen/incandescent lamps with CFLs	2,731	$328	$242	$273	$0	0
Fire Station #2	FS-L-3	5	Replace Incandescent Exit Sign with LED Exit Signs	1,183	$142	$370	$118	$252	1.7
City Hall Annex	CHA-L-1	2	Upgrade T-12 fixtures to T-8 fixtures with electronic ballasts	377	$45	$70	$37	$32	0.7
City Hall Annex	CHA-L-2	9	Replace halogen/incandescent/halide lamps with CFLs	1,007	$121	$314	$100	$213	1.7
Community Center	CC-L-1	91	Replace halogen/incandescent lamps with CFLs	16,194	$1,943	$986	$1,619	$0	0
Community Center	CC-L-2	9	Replace Incandescent Exit Sign with LED Exit Signs	1,024	$123	$585	$102	$483	3.9
Boy's & Girl's Club	BGC-L-1	30	Upgrade T-12 fixtures to T-8 fixtures with electronic ballasts	3,179	$382	$1,915	$317	$1,597	4.1
Boy's & Girl's Club	BGC-L-2	14	Replace halogen/incandescent lamps with CFLs	932	$112	$174	$93.20	$81	0.7
Boy's & Girl's Club	BGC-L-3	5	Replace Incandescent Exit Sign with LED Exit Signs	569	$68.33	$370	$56.90	$313	4.5
Multiple Buildings		33	Install Occupancy Sensors	10,065	$1,208	$3,465	$1,007	$2,458	2.0
Lighting Recommend-ation Totals		**609**		**71,269**	**$8,548**	**$21,836**	**$7,016**	**$15,484**	**1.8**
HVAC Recommendation Totals		**64**		**89,984**	**$10,800**	**$38,208**	**$12,597**	**$25,611**	**2.4**
Combined Totals		**673**	Lighting and HVAC	**161,253**	**$19,348**	**$60,044**	**$19,613**	**$41,095**	**2.1**

Lighting

T8 Lamp with Electronic Ballast

Replacing magnetically ballasted T12 linear fluorescent lamps with electronically ballasted T8 lamps reduces lighting energy consumption by 20%. The thinner T8 lamps are approximately 40% more efficient than the thicker T12 lamps. In addition, they generally last 20% longer than the older T12s.

This combination not only provides savings on your electricity bill, but also reduces operations and maintenance costs. It also makes a T12 to T8 retrofit one of the most cost effective upgrades; two-year payback is typical and payback in a year is common for businesses with long hours of operation.

Electronic Fluorescent Ballasts

New electronic ballasts are much more efficient than older magnetic ballasts for fluorescent lighting. Magnetic ballasts convert more of their input energy into heat, which creates two problems: extra energy consumption and extra heat for the HVAC system to handle.

There are two additional benefits to replacing magnetic ballasts with electronic units. Magnetic ballasts also produce noise due to the vibrations of the transformers and light flickering, which is especially noticeable when using a computer monitor. Electronic units eliminate the noise and the flicker.

Dimming ballasts allow the lighting levels to be adjusted, either with photocell, manual, or automatic controls. This control provides the perfect amount of lighting near windows and reduces energy wasted on excess lighting levels. Standard ballasts are not dimmable, but still provide all the other benefits described.

Compact Fluorescent Lamp (CFL)

Compact Fluorescent Lamps (CFLs) are five times as efficient as incandescent bulbs. They also last eight to ten times as long, and produce much less heat than incandescent lamps do when they are on. This, in turn, can help to reduce the cost to cool your building.

Although the most common types are the exposed spiral-tube models shown above, many have a plastic cover and look similar to incandescent lamps. There are even models that look and perform similar to parabolic reflector (PAR) lamps and decorative "flame" lamps.

Compact Fluorescent Lamps do contain mercury and can lead to soil and water pollution if thrown away in trashcan. The California Take-It-Back Partnership provides free and convenient ways to recycle CFLs in order to properly dispose them.

Daylight Harvesting

Daylight harvesting is a sustainable design technology that minimizes the load placed on lighting by effectively utilizing the natural light. When sunlight is strong as well as energy prices at their highest, digital photo sensors automatically respond by dimming the output lighting and rely more heavily on sunbeams.

Building occupants have the flexibility of various dimming levels to satisfy their comfort level. Not only does daylight harvesting save up to 60% on energy bills, but it also increases vision quality tremendously. Overall, daylight harvesting has remarkable potential to decrease energy costs and demand for electricity at peak times.

HVAC

Intellicon Hvac Cycle Manager

HVAC and refrigeration systems are designed for a maximum demand condition. Packaged systems with an on-off cycle process run constantly and efficiently when demand is at its maximum, such as a car under cruise control. When demand diminishes, the system cycles and loses efficiency, such as stop and go driving in a car.

IntelliCon extends HVAC or refrigeration off-cycles up to three minutes when demand is below maximum condition. Temperature changes only approximately 4/10th of a degree in the extended off-cycle. As equipment cycles on, that difference is made up in seconds and running time is reduced up to 20% with a reduced number of cycles. A micro-computer analyzes capacity vs. demand every second on a real-time basis to determine how much longer a compressor or burner can remain off during each off-cycle, and still maintain temperature when demand has diminished.

Cool Roofs

A cool roof is a roof made out of materials that reflect the sun's energy from the structure. Rather than soak up the sunrays and transfer heat into the building during hot summer days, the cool roof rejects rays allowing for a cooler building. The majority of roofs are made with dark-colored material that can reach up to 150-190ºF. This will lead to increased demand on energy for cooling purposes, reduced indoor comfort levels, increased wear and maintenance on roofs, as well as increased pollution.

In utilizing cool roofs with lighter-colored and high emissivity materials, temperatures on the roof stay up to 70ºF cooler than a common one. Cool roofs not only save energy by reducing the load on the HVAC system, but also save high maintenance costs and reduce air pollution. An increasing number of building codes, such as Title 24, are now mandating the use of cool roofs.

Programmable Thermostats

Programmable thermostats automatically adjust your home's temperature settings, allowing you to save energy while you're away or sleeping. Programmable thermostats are more convenient and accurate than manual thermostats and improve your home's comfort. They contain no mercury, save energy and save money on utility bills — when used properly, about $150/year. They are also better for the environment, since using less energy helps reduce greenhouse gas emissions associated with energy production.

Fire Station #2= 3 Analog Thermostats

City Hall Annex= 2 Analog Thermostats

VendingMiser

A VendingMiser consists of a motion sensor and the miser itself. The vending machine is plugged into the vending miser, which is attached to a wall and plugged into an outlet. The motion sensor is plugged into the vending miser.

If no one is near the vending machine for 15 minutes and the compressor is not running, the vending miser will shut off the machine. If someone walks by the machine, the motion sensor will sense the movement and send power back to the machine (lights turn on). The internal thermostat of the vending machine will then decide if the compressor needs to come on or not. In other words, the VendingMiser does not influence the internal thermostat or the compressor.

City Building Site Notes: Corporate Yard
Partnership Direct Incentives

	Pre-Retrofit Conditions					Post-Retrofit Conditions									
Building	Location	Fixture	Fixture Qty	Watts per fixture	Total Watts	Replacement Fixture	New Watts/ fixture	kW Demand Reduction	Total kW Demand	Operating Hours	kWh saved (kWh)	Cost Savings ($)	Installation Cost/fixture	Total Installed Cost ($)	Simple Payback
Corporate Yard	Elevator	1 Lamp F30 T12	2	39	78	1 Lamp F25 T8	22	0.017	0.034	2580	88	$10.53	$30.00	$60.00	5.7
600 S. Mountain	Work Desk	75 Watt Incandescent	1	75	75	23 Watt CFL	23	0.052	0.052	2580	134	$16.10	$11.00	$11.00	0.7
	NE Supply Storage	2 Lamp F96 T12	12	131	1572	2 Lamp F96 T8	99	0.032	0.384	2580	991	$118.89	$90.00	$1,080.00	9.1
	Garage Parts Area	2 Lamp F96 T12	4	131	524	2 Lamp F96 T8	99	0.032	0.128	2580	330	$39.63	$90.00	$360.00	9.1
	Garage Parts Area	2 Lamp F40 T12	1	84	84	2 Lamp F32 T8	58	0.026	0.026	2580	67	$8.05	$65.00	$65.00	8.1
	Garage	2 Lamp F96 T12	13	131	1703	2 Lamp F96 T8	99	0.032	0.416	2580	1,073	$128.79	$90.00	$1,170.00	9.1
	Garage	2 Lamp F40 T12	1	84	84	2 Lamp F32 T8	58	0.026	0.026	2580	67	$8.05	$65.00	$65.00	8.1
	Garage Upstairs Parts	2 Lamp F96 T12	2	131	262	2 Lamp F96 T8	99	0.032	0.064	2580	165	$19.81	$90.00	$180.00	9.1
	Garage Upstairs Parts	2 Lamp F40 T12	3	84	252	2 Lamp F32 T8	58	0.026	0.078	2580	201	$24.15	$65.00	$195.00	8.1
	Garage BreakRoom	4 Lamp F96 T12	1	262	262	4 Lamp F96 T8		0.262	0.262	2580	676	$81.12	$115.00	$115.00	1.4
	Garage Change Room	2 Lamp F40 T12	2	84	168	2 Lamp F32 T8	58	0.026	0.052	2580	134	$16.10	$65.00	$130.00	8.1
	Garage Car Wash & NW Tools Station	2 Lamp F96 T12	3	131	393	2 Lamp F96 T8	99	0.032	0.096	2580	248	$29.72	$90.00	$270.00	9.1
	Gas Filling Station	4 Lamp F40 T12	6	168	1008	4 Lamp F32 T8	116	0.052	0.312	2580	805	$96.60	$70.00	$420.00	4.3
	SE Storage Supply	4 Lamp F40 T12	3	168	504	4 Lamp F32 T8	116	0.052	0.156	2580	402	$48.30	$70.00	$210.00	4.3
	NW Supply	Metal Halides	2	300	600	High Bay T5	252	0.048	0.096	2580	248	$29.72	$225.00	$450.00	15.1
	SE Storage	2 Lamp F96 T12	17	131	2227	2 Lamp F96 T8	99	0.032	0.544	2580	1,404	$168.42	$90.00	$1,530.00	9.1
	Vending Machines	Fluorescent lamps	3		0	Vending Miser		0	0		0	$0.00		$0.00	
	Server Room	Occupancy Sensor	1		0	Occupancy Sensor						$85.00			
									Total Savings:		6,945	$833.44		$6,251.00	7.5

City Building Site Notes: Youth Center (Temporary Library)
Partnership Direct Incentives

	Pre-Retrofit Conditions					Post-Retrofit Conditions									
Building	Location	Fixture	Fixture Qty	Watts per fixture	Total Watts	Replacement Fixture	New Watts/ fixture	kW Demand Reduction	Total kW Demand	Operating Hours	kWh saved (kWh)	Cost Savings ($)	Installation Cost/fixture	Total Installed Cost ($)	Simple Payback
Youth Center	Back Entrance	75 Watt Incandescent	1	75	75	23 Watt CFL	23	0.052	0.052	2,000	104	$12.48	$9.00	$9.00	0.7
(Temp Library)	Entrance	75 Watt R40	7	75	525	20 Watt R40 CF	20	0.055	0.385	2,000	770	$92.40	$16.00	$112.00	1.2
843 E. Olive	Back Storage Room	Occupancy Sensor	1	0		Occupancy Sensor							$85.00		
	Break Room	Occupancy Sensor	1	0		Occupancy Sensor							$85.00		
	Kitchen Area	Occupancy Sensor	1	0		Occupancy Sensor							$85.00		
	Janitor's Closet	Occupancy Sensor	1	0		Occupancy Sensor							$85.00		
	Directors Room	Dual Occupancy Sens	1	0		Dual Occupancy Sensor							$85.00		
	Circulation Supervisor	Dual Occupancy Sens	1	0		Dual Occupancy Sensor							$85.00		
	Literacy Office	Dual Occupancy Sens	1	0		Dual Occupancy Sensor							$85.00		
									Total Savings:		770	$92.40		$112.00	1.2

City Building Site Notes: Historical Museum Partnership Direct Incentives

	Pre-Retrofit Conditions					Post-Retrofit Conditions									
Building	Location	Fixture	Fixture Qty	Watts per fixture	Total Watts	Replacement Fixture	New Watts/ fixture	kW Demand Reduction	Total kW Demand	Operating Hours	kWh saved (kWh)	Cost Savings ($)	Installation Cost/fixture	Total Installed Cost ($)	Simple Payback
Historical Museum	Office	3 Lamp F40 T12	2	126	252	3 Lamp F32 T8	82	0.044	0.088	1,032	91	$10.90	$67.00	$134.00	12.3
742 E. Lemon	Office Storage	3 Lamp F40 T12	4	126	504	3 Lamp F32 T8	82	0.044	0.176	1,032	182	$21.80	$67.00	$268.00	12.3
	Entrance Office	2 Lamp FB 40 U6 T12	1	91	91	2 Lamp FB32 U6 T8	51	0.04	0.04	1,032	41	$4.95	$75.00	$75.00	15.1
	Bottom Kitchen	2 Lamp FB 40 U6 T12	5	91	455	2 Lamp FB32 U6 T8	51	0.04	0.2	1,032	206	$24.77	$75.00	$375.00	15.1
	East Wing	75 Watt Incandescent	4	75	300	23 Watt CFL	23	0.052	0.208	1,032	215	$25.76	$11.00	$44.00	1.7
	East Wing	65 Watt R30	12	65	780	15 Watt R30 CFL	15	0.05	0.6	1,032	619	$74.30	$13.00	$156.00	2.1
	East Wing	25 Watt Candalabara	10	25	250	4 Watt Candalabara	4	0.021	0.21	1,032	217	$26.01	$13.00	$130.00	5.0
	East Wing	60 Watt Incandescent	10	60	600	13 Watt CFL	13	0.047	0.47	1,032	485	$58.20	$11.00	$110.00	1.9
	East Wing	2 Lamp F30 T12	2	62	124	2 Lamp F25 T12	48	0.014	0.028	1,032	29	$3.47	$40.00	$80.00	23.1
	Police East Wing	50 Watt R20	12	50	600	11 Watt R20 CFL	48	0.002	0.024	1,032	25	$2.97	$12.00	$144.00	48.4
	Police East Wing	60 Watt Incandescent	2	60	120	13 Watt CFL	13	0.047	0.094	1,032	97	$11.64	$11.00	$22.00	1.9
	West Wing	50 Watt R20	20	50	1000	11 Watt R20 CFL	11	0.039	0.78	1,032	805	$96.60	$12.00	$240.00	2.5
	West Wing	65 Watt R30	12	65	780	15 Watt R30 CFL	15	0.05	0.6	1,032	619	$74.30	$13.00	$156.00	2.1
	West Wing	2 Lamp F30 T12	2	62	124	2 Lamp F25 T12	48	0.014	0.028	1,032	29	$3.47	$40.00	$80.00	23.1
	West Wing	60 Watt Incandescent	1	60	60	13 Watt CFL	13	0.047	0.047	1,032	49	$5.82	$11.00	$11.00	1.9
	West Army	60 Watt Incandescent	6	60	360	13 Watt CFL	13	0.047	0.282	1,032	291	$34.92	$11.00	$66.00	1.9
	Main Center	2 Lamp F30 T12	4	62	248	2 Lamp F25 T12	48	0.014	0.056	1,032	58	$6.94	$40.00	$160.00	23.1
	Main Center	25 Watt Candalabara	30	25	750	4 Watt Candalabara	4	0.021	0.63	1,032	650	$78.02	$13.00	$390.00	5.0
	Main Center	60 Watt Incandescent	4	60	240	13 Watt CFL	13	0.047	0.188	1,032	194	$23.28	$11.00	$44.00	1.9
	Dressing Room	25 Watt Candalabara	2	25	50	4 Watt Candalabara	4	0.021	0.042	1,032	43	$5.20	$13.00	$26.00	5.0
	Dressing Room	60 Watt Incandescent	2	60	120	13 Watt CFL	13	0.047	0.094	1,032	97	$11.64	$11.00	$22.00	1.9
	Both Restrooms	60 Watt Incandescent	2	60	120	13 Watt CFL	13	0.047	0.094	1,032	97	$11.64	$11.00	$22.00	1.9
	Men's Bathroom	2 Lamp F40 T12 (bulbs	2	82	164	2 Lamp F32 T8	58	0.024	0.048	1,032	50	$5.94	$4.00	$8.00	1.3
	Hallway	75 Watt R40	19	75	1425	20 Watt R40 CFL		0.075	1.425	1,032	1,471	$176.47	$16.00	$304.00	1.7
	Closet	60 Watt Incandescent	1	60	60	13 Watt CFL	13	0.047	0.047	1,032	49	$5.82	$11.00	$11.00	1.9
	Stairwell	75 Watt R40	2	75	150	20 Watt R40 CFL		0.075	0.15	1,032	155	$18.58	$16.00	$32.00	1.7
	2nd Set of Stairs	100 Watt Incandescent	1	100	100	23 Watt CFL	23	0.077	0.077	1,032	79	$9.54	$11.00	$11.00	1.2
	Top of Stairs	60 Watt Incandescent	1	60	60	13 Watt CFL	13	0.047	0.047	1,032	49	$5.82	$11.00	$11.00	1.9
	1st Room Upstairs	100 Watt Incandescent	1	100	100	23 Watt CFL	23	0.077	0.077	1,032	79	$9.54	$11.00	$11.00	1.2
	2nd Room Upstairs	100 Watt Incandescent	1	100	100	23 Watt CFL	23	0.077	0.077	1,032	79	$9.54	$11.00	$11.00	1.2
	3rd Room Upstairs	100 Watt Incandescent	1	100	100	23 Watt CFL	23	0.077	0.077	1,032	79	$9.54	$11.00	$11.00	1.2
	4th Room Upstairs	60 Watt Incandescent	4	60	240	13 Watt CFL	13	0.047	0.188	1,032	194	$23.28	$11.00	$44.00	1.9
	5th Room Upstairs	100 Watt Incandescent	1	100	100	23 Watt CFL	23	0.077	0.077	1,032	79	$9.54	$11.00	$11.00	1.2
	Upstairs Bathroom	60 Watt Incandescent	1	60	60	13 Watt CFL	13	0.047	0.047	1,032	49	$5.82	$11.00	$11.00	1.9
	Upstairs Kitchen	60 Watt Incandescent	2	60	120	13 Watt CFL	13	0.047	0.094	1,032	97	$11.64	$11.00	$22.00	1.9
	Basement	75 Watt Incandescent	6	75	450	23 Watt CFL	23	0.052	0.312	1,032	322	$38.64	$11.00	$66.00	1.7
	Front Outside	25 Watt Candalabara	2	25	50	4 Watt Candalabara	4	0.021	0.042	1,032	43	$5.20	$13.00	$26.00	5.0
									Total Savings:		**7,922**	**$950.60**		**$3,211.00**	**3.4**

City Building Site Notes: Police Department
Partnership Direct Incentives

	Pre-Retrofit Conditions					Post-Retrofit Conditions									
Building	Location	Fixture	Fixture Qty	Watts per fixture	Total Watts	Replacement Fixture	New Watts/ fixture	kW Demand Reduction	Total kW Demand	Operating Hours	kWh saved (kWh)	Cost Savings ($)	Installation Cost/fixture	Total Installed Cost ($)	Simple Payback
Police Department 140 E. Lime Ave.	Gun Cleaning Room	60 Watt Incandescent	2	60	120	13 Watt CFL	13	0.047	0.094	4,380	412	$49.41	$11.00	$22.00	0.4
	Gun Cleaning Room	2 Lamp F40 T12	1	84	84	2 Lamp F32 T8	58	0.026	0.026	4,380	114	$13.67	$65.00	$65.00	4.8
	Gun Room	2 Lamp F96 T12	8	131	1048	2 Lamp F96 T8	99	0.032	0.256	4,380	1,121	$134.55	$90.00	$720.00	5.4
	Gun Room	100 Watt Incandescent	3	100	300	23 Watt CFL	23	0.077	0.231	4,380	1,012	$121.41	$11.00	$33.00	0.3
	Gun Room	R40 Halogen	5	75	375	20 Watt CFL	20	0.055	0.275	4,380	1,205	$144.54	$16.00	$80.00	0.6
	Dwn. Kitchen Hall	2 Lamp F40 T12	2	84	168	2 Lamp F32 T8	58	0.026	0.052	4,380	228	$27.33	$65.00	$130.00	4.8
	Telephone Room	2 Lamp F96 T12	2	131	262	2 Lamp F96 T8	99	0.032	0.064	4,380	280	$33.64	$90.00	$180.00	5.4
	Gym	2 Lamp F96 T12	6	131	786	2 Lamp F96 T8	99	0.032	0.192	8,760	1,682	$201.83	$90.00	$540.00	2.7
	A Room	2 Lamp F96 T12	1	131	131	2 Lamp F96 T8	99	0.032	0.032	8,760	280	$33.64	$90.00	$90.00	2.7
	Dispatch	2 Lamp FB40 T12	4	91	364	2 Lamp FB32 U6 T	51	0.04	0.16	8,760	1,402	$168.19	$75.00	$300.00	1.8
	Printer Area Office	2 Lamp FB40 T12	1	91	91	2 Lamp FB32 U6 T	51	0.04	0.04	8,760	350	$42.05	$75.00	$75.00	1.8
	Outside Evidence	2 Lamp F96 T12	2	131	262	2 Lamp F96 T8	99	0.032	0.064	4,380	280	$33.64	$90.00	$180.00	5.4
	Evidence Office	2 Lamp F96 T12	2	131	262	2 Lamp F96 T8	99	0.032	0.064	8,760	561	$67.28	$90.00	$180.00	2.7
	Evidence Gun Room	2 Lamp F40 T12	4	84	336	2 Lamp F32 T8	58	0.026	0.104	4,380	456	$54.66	$65.00	$260.00	4.8
	Evidence Storage	2 Lamp F96 T12	6	131	786	2 Lamp F96 T8	99	0.032	0.192	4,380	841	$100.92	$90.00	$540.00	5.4
	Outside Storage	2 Lamp F40 T12	4	84	336	2 Lamp F32 T8	58	0.026	0.104	8,760	911	$109.32	$65.00	$260.00	2.4
	Dispatch BR	Occupancy Sensor	1	0	0	Occupancy Sensor							$85.00	$85.00	
	Janitor's Downstairs	Occupancy Sensor	1	0	0	Occupancy Sensor							$85.00	$85.00	
	Electrical Switchboard	Occupancy Sensor	1	0	0	Occupancy Sensor							$85.00	$85.00	
	Kitchen	Occupancy Sensor	1	0	0	Occupancy Sensor							$85.00	$85.00	
	Interview & Report Room	Occupancy Sensor	2	0	0	Occupancy Sensor							$85.00	$170.00	
	Upstairs BRs	Occupancy Sensor	2	0	0	Occupancy Sensor							$85.00	$170.00	
	A Room	Occupancy Sensor	1	0	0	Occupancy Sensor							$85.00	$85.00	
	Outside Evidence	Occupancy Sensor	1	0	0	Occupancy Sensor							$85.00	$85.00	
	Evidence Office	Occupancy Sensor	1	0	0	Occupancy Sensor							$85.00	$85.00	
	Vending Machines	Fluorescent lamps	3		0	Vending Miser		0	0		0	$0.00		$0.00	
									Total Savings:		10,722	$1,286.67		$3,633.00	2.8

City Building Site Notes: City Hall
Partnership Direct Incentives

	Pre-Retrofit Conditions					Post-Retrofit Conditions									
Building	Location	Fixture	Fixture Qty	Watts per fixture	Total Watts	Replacement Fixture	New Watts/ fixture	kW Demand Reduction	Total kW Demand	Operating Hours	kWh saved (kWh)	Cost Savings ($)	Installation Cost/fixture	Total Installed Cost ($)	Simple Payback
City Hall 415 S. Ivy Ave.	Entry	25 Watt Condolabara	2	25	50	4 Watt Condolabora	4	0.021	0.042	2580	108	$13.00	$13.00	$26.00	2.0
	Entry Hallway	R20 Spotlight	4	50	200	R20 CFL	11	0.039	0.156	2580	402	$48.30	$12.00	$48.00	1.0
	Srvr. Rm. Downstair	2 Lamp F40 T12	1	84	84	2 Lamp F32 T8	58	0.026	0.026	2580	67	$8.05	$65.00	$65.00	8.1
	Downstairs South	R30 Spotlight	1	65	65	15 Watt R30 CFL	15	0.05	0.05	2580	129	$15.48	$13.00	$13.00	0.8
	Chamber Room	R40 Spotlight	30	75	2250	20 Watt R40 CFL	20	0.055	1.65	2580	4,257	$510.84	$16.00	$480.00	0.9
	Chamber Room	60 Watt Incandescants	12	60	720	13 Watt CFL	13	0.047	0.564	2580	1,455	$174.61	$11.00	$132.00	0.8
	Mens BR North	2 Lamp F20 T12	1	38	38	2 Lamp F17 T8	29	0.009	0.009	2040	18	$2.20	$39.00	$39.00	17.7
	Downstairs North	2 Lamp F20 T12	1	38	38	2 Lamp F17 T8	29	0.009	0.009	2580	23	$2.79	$39.00	$39.00	14.0
	Vending Machines	Fluorescent lamps	1		0	Vending Miser		0	0		0	$0.00		$0.00	
	Kitchen Breakroom	Occupancy Sensor	1		0	Occupancy Sensor						$85.00		$0.00	
	Community Development	Occupancy Sensor	1		0	Occupancy Sensor						$85.00		$0.00	
	Bathrooms North	Occupancy Sensor	2		0	Occupancy Sensor						$85.00		$0.00	
	Conference Downstairs	Occupancy Sensor	1		0	Occupancy Sensor						$85.00		$0.00	
	Finance Conference	Dual Occupancy Sensor	1		0	Dual Occupancy Sensor						$85.00		$0.00	
									Total Savings:		6,352	$762.27		$816.00	1.1

City Building Site Notes: Fire Station #2
Partnership Direct Incentives

	Pre-Retrofit Conditions					Post-Retrofit Conditions									
Building	Location	Fixture	Fixture Qty	Watts per fixture	Total Watts	Replacement Fixture	New Watts/ fixture	kW Demand Reduction	Total kW Demand	Operating Hours	kWh saved (kWh)	Cost Savings ($)	Installation Cost/fixture	Total Installed Cost ($)	Simple Payback
Fire Station #2 2055 S. Myrtle Ave.	Garage	2 Lamp F40 T12	30	84	2520	2 Lamp F32 T8	58	0.026	0.78	8760	6,833	$819.94	$65.00	$1,950.00	2.4
	Garage BR	3 Lamp F40 T12	1	126	126	3 Lamp F32 T8	82	0.044	0.044	2,040	90	$10.77	$67.00	$67.00	6.2
	Craftsmen Room	2 Lamp F40 T12	2	84	168	2 Lamp F32 T8	58	0.026	0.052	3,612	188	$22.54	$65.00	$130.00	5.8
	Weight Room	2 Lamp F40 T12	6	84	504	2 Lamp F32 T8	58	0.026	0.156	8,760	1,367	$163.99	$65.00	$390.00	2.4
	Classroom	4 Lamp F40 T12	2	168	336	4 Lamp F32 T8	110	0.058	0.116	3,612	419	$50.28	$70.00	$140.00	2.8
	Class BR	2 Lamp F40 T12	1	84	84	2 Lamp F32 T8	58	0.026	0.026	2,040	53	$6.36	$65.00	$65.00	10.2
	Back Office	4 Lamp F40 T12	2	168	336	4 Lamp F32 T8	110	0.058	0.116	3,612	419	$50.28	$70.00	$140.00	2.8
	Room Server	2 Lamp F40 T12	2	84	168	2 Lamp F32 T8	58	0.026	0.052	3,612	188	$22.54	$65.00	$130.00	5.8
	Front Office	2 Lamp F40 T12	3	84	252	2 Lamp F32 T8	58	0.026	0.078	8,760	683	$81.99	$65.00	$195.00	2.4
	TV Room	2 Lamp F40 T12	3	84	252	2 Lamp F32 T8	58	0.026	0.078	3,612	282	$33.81	$65.00	$195.00	5.8
	Upstairs Bathroom	2 Lamp F40 T12	2	84	168	2 Lamp F32 T8	58	0.026	0.052	1,800	94	$11.23	$65.00	$130.00	11.6
	Bedroom #1	2 Lamp F40 T12	1	84	84	2 Lamp F32 T8	58	0.026	0.026	1,800	47	$5.62	$65.00	$65.00	11.6
	Bedroom #1	60 Watt Incandescent	2	60	120	13 Watt CFL	13	0.047	0.094	1,800	169	$20.30	$11.00	$22.00	1.1
	Bedroom #2	2 Lamp F40 T12	1	84	84	2 Lamp F32 T8	58	0.026	0.026	1,800	47	$5.62	$65.00	$65.00	11.6
	Bedroom #2	60 Watt Incandescent	2	60	120	13 Watt CFL	13	0.047	0.094	1,800	169	$20.30	$11.00	$22.00	1.1
	Bedroom #3	2 Lamp F40 T12	1	84	84	2 Lamp F32 T8	58	0.026	0.026	1,800	47	$5.62	$65.00	$65.00	11.6
	Bedroom #3	60 Watt Incandescent	2	60	120	13 Watt CFL	13	0.047	0.094	1,800	169	$20.30	$11.00	$22.00	1.1
	Bedroom #4	2 Lamp F40 T12	1	84	84	2 Lamp F32 T8	58	0.026	0.026	1,800	47	$5.62	$65.00	$65.00	11.6
	Bedroom #4	60 Watt Incandescent	2	60	120	13 Watt CFL	13	0.047	0.094	1,800	169	$20.30	$11.00	$22.00	1.1
	Bedroom #5	60 Watt Incandescent	2	60	120	13 Watt CFL	13	0.047	0.094	1,800	169	$20.30	$11.00	$22.00	1.1
	Bedroom #6	2 Lamp F40 T12	1	84	84	2 Lamp F32 T8	58	0.026	0.026	1,800	47	$5.62	$65.00	$65.00	11.6
	Bedroom #6	60 Watt Incandescent	2	60	120	13 Watt CFL	13	0.047	0.094	1,800	169	$20.30	$11.00	$22.00	1.1
	Bedroom #7	2 Lamp F40 T12	1	84	84	2 Lamp F32 T8	58	0.026	0.026	1,800	47	$5.62	$65.00	$65.00	11.6
	Bedroom #7	60 Watt Incandescent	2	60	120	13 Watt CFL	13	0.047	0.094	1,800	169	$20.30	$11.00	$22.00	1.1
	Bedroom#8	60 Watt Incandescent	1	60	60	13 Watt CFL	13	0.047	0.047	1,800	85	$10.15	$11.00	$11.00	1.1
	Bedroom#8	150 Watt Incandescent	1	150	150	13 Watt CFL	13	0.137	0.137	1,800	247	$29.59	$11.00	$11.00	0.4
	Outside Storage	2 Lamp F40 T12	4	84	336	2 Lamp F32 T8	58	0.026	0.104	1,800	187	$22.46	$65.00	$260.00	11.6
	Storage	2 Lamp F40 T12	4	84	336	2 Lamp F32 T8	58	0.026	0.104	2,040	212	$25.46	$65.00	$260.00	10.2
	Outside Apparatus	60 Watt Incandescent	1	60	60	13 Watt CFL	13	0.047	0.047	500	24	$2.82	$11.00	$11.00	3.9
	Throughout Facility	40 Watt Incandescent	5	40	200	13 Watt CFL	13	0.027	0.135	8,760	1,183	$141.91	$74.00	$370.00	2.6
	Vending Machine	Flourescent Bulbs	1			Vendingmizer									
	Weight Room	Dual Occupancy Sensor	1			Dual Occupancy Sensor							$85.00		
	Server Room	Dual Occupancy Sensor	1			Dual Occupancy Sensor							$85.00		
	Chiefs Back Office	Dual Occupancy Sensor	1			Dual Occupancy Sensor							$85.00		
									Total Savings:		**7,183**	**$862.02**		**$3,049.00**	**3.5**

City Building Site Notes: City Hall Annex
Partnership Direct Incentives

	Pre-Retrofit Conditions					Post-Retrofit Conditions									
Building	Location	Fixture	Fixture Qty	Watts per fixture	Total Watts	Replacement Fixture	New Watts/ fixture	kW Demand Reduction	Total kW Demand	Operating Hours	kWh saved (kWh)	Cost Savings ($)	Installation Cost/fixture	Total Installed Cost ($)	Simple Payback
City Hall Annex	Front Area	60 Watt Incandescent	1	60	60	13 Watt CFL	13	0.047	0.047	2580	121	$14.55	$11.00	$11.00	0.8
200 E. Lime Ave.	Front Area	100 Watt Incandescent	1	100	100	27 Watt CFL	27	0.073	0.073	2,580	188	$22.60	$15.00	$15.00	0.7
	Kitchen	4 Lamp F40 T12	2	172	344	4 Lamp F32 T8	99	0.073	0.146	2,580	377	$45.20	$70.00	$140.00	3.1
	Bathroom	100 Watt Incandescent	1	100	100	27 Watt CFL	27	0.073	0.073	2,580	188	$22.60	$15.00	$15.00	0.7
	Tito's Office	60 Watt Incandescent	1	60	60	13 Watt CFL	13	0.047	0.047	2,580	121	$14.55	$11.00	$11.00	0.8
	Back Hallway	60 Watt Incandescent	2	60	120	13 Watt CFL	13	0.047	0.094	2,580	243	$29.10	$11.00	$22.00	0.8
	Stair Closet	90 Watt Incadenscent	1	90	90	23 Watt CFL	23	0.067	0.067	200	13	$1.61	$11.00	$11.00	6.8
	Front Lawn	100 Watt Metal Halide	2	100	200	65 Watt CFL Outdoor	65	0.035	0.07	3,620	253	$30.41	$120.00	$240.00	7.9
	Bathroom	Occupancy Sensor	1			Occupancy Sensor							$85.00	$85.00	
	Redevelopment Room	Occupancy Sensor	1			Occupancy Sensor							$85.00	$85.00	
									Total Savings:		1,384	$166.07		$454.00	2.7

City Building Site Notes: Community Center
Partnership Direct Incentives

	Pre-Retrofit Conditions					Post-Retrofit Conditions									
Building	Location	Fixture	Fixture Qty	Watts per fixture	Total Watts	Replacement Fixture	New Watts/ fixture	kW Demand Reduction	Total kW Demand Reduction	Operating Hours	kWh saved (kWh)	Cost Savings ($)	Installation Cost/fixture	Total Installed Cost ($)	Simple Payback
Community Center	Entrance area	R30 Halogen flood	15	65	975	R30 CFL	15	0.05	0.75	4316	3237	$388.44	$13.00	$195.00	0.5
119 W. Palm Ave.	Monroe Room	R30 Halogen flood	25	65	1625	R30 CFL	15	0.05	1.25	4316	5395	$647.40	$13.00	$325.00	0.5
	Monroe Closet	Incandescent lamp	1	60	60	13 Watt CFL	13	0.047	0.047	200	9.4	$1.13	$5.00	$11.00	9.8
	Key Dalton Room	R30 Halogen flood	28	65	1820	R30 CFL	15	0.05	1.4	4316	6042.4	$725.09	$13.00	$364.00	0.5
	Restroom-Hall	R30 Halogen flood	6	65	390	R30 CFL	15	0.05	0.3	4316	1294.8	$155.38	$13.00	$78.00	0.5
	Senior Room	R30 Halogen flood	9	65	585	R30 CFL	15	0.05	0.45	4316	1942.2	$233.06	$13.00	$117.00	0.5
	Facilities restrms	R30 Halogen flood	5	65	325	R30 CFL	15	0.05	0.25	4316	1079	$129.48	$13.00	$65.00	0.5
	Front outside	R30 Halogen flood	2	65	130	R30 CFL	15	0.05	0.1	4316	431.6	$51.79	$13.00	$26.00	0.5
	Exit signs-bldg	15 Watt Inc Exit sign	9	15	135	LED Exit Sign	2	0.013	0.117	8760	1024.92	$122.99	$65.00	$585.00	4.8
	Photo Room	Occupancy Sensor	1		0	Occupancy Sensor		0	0			$0.00	$85.00	$85.00	
	Restroom-Iris	Occupancy Sensor	1		0	Occupancy Sensor		0	0			$0.00	$85.00	$85.00	
	Janitors Room	Occupancy Sensor	1		0	Occupancy Sensor		0	0			$0.00	$85.00	$85.00	
									Total Savings:		17,219	$2,066.32		$1,826.00	0.9

City Building Site Notes: Boy's & Girl's Club
Partnership Direct Incentives

	Pre-Retrofit Conditions					Post-Retrofit Conditions									
Building	Location	Fixture	Fixture Qty	Watts per fixture	Total Watts	Replacement Fixture	New Watts/ fixture	kW Demand Reduction	Total kW Demand	Operating Hours	kWh saved (kWh)	Cost Savings ($)	Installation Cost/fixture	Total Installed Cost ($)	Simple Payback
Boy's & Girl's Club	Asst Director	4 Lamp F40 T12-2B	2	168	336	4 Lamp F32 T8-2B	110	0.058	0.116	1560	180.96	$21.72	$70.00	$140.00	6.4
602 S. Shamrock	Games Room	3 Lamp F40 T12	15	126	1890	3 Lamp F32 T8	82	0.044	0.66	1,560	1029.6	$123.55	$67.00	$1,005.00	8.1
	Front Desk	2 Lamp F40 T12	1	84	84	2 Lamp F32 T8	58	0.026	0.026	1,560	40.56	$4.87	$65.00	$65.00	13.4
	Kitchen area	2 Lamp F40 T12	4	84	336	2 Lamp F32 T8	58	0.026	0.104	1,560	162.24	$19.47	$65.00	$260.00	13.4
	Director-Operation	4 Lamp F40 T12-2B	1	168	168	4 Lamp F32 T8-2B	110	0.058	0.058	1,560	90.48	$10.86	$70.00	$70.00	6.4
	Kitchen area	4 Lamp F40 T12	1	168	168	2 Lamp F32 T8-refl	58	0.11	0.11	1,560	171.6	$20.59	$70.00	$70.00	3.4
	Copy Machine	4 Lamp F40 T12	1	168	168	2 Lamp F32 T8-refl	58	0.11	0.11	1,560	171.6	$20.59	$70.00	$70.00	3.4
	LIT Room	2 Lamp F40 T12	3	84	252	2 Lamp F32 T8	58	0.026	0.078	1,560	121.68	$14.60	$65.00	$195.00	13.4
	Restrooms	2 Lamp F40 T12	4	84	336	2 Lamp F32 T8	58	0.026	0.104	1,560	162.24	$19.47	$65.00	$260.00	13.4
	Closet	Incandescent lamp	1	60	60	CFL	13	0.047	0.047	400	18.8	$2.26	$11.00	$11.00	4.9
	Upper Office	4 Lamp F40 T12-2B	3	168	504	4 Lamp F32 T8-2B	58	0.11	0.33	1,560	514.8	$61.78	$70.00	$210.00	3.4
	Learning Center	4 Lamp F40 T12-2B	7	168	1176	4 Lamp F32 T8-2B	58	0.11	0.77	1,560	1201.2	$144.14	$70.00	$490.00	3.4
	Stairwell	Incandescent lamp	3	60	180	CFL	13	0.047	0.141	1,560	219.96	$26.40	$11.00	$33.00	1.3
	Upper restroom	Incandescent lamp	1	60	60	CFL	13	0.047	0.047	1,560	73.32	$8.80	$11.00	$11.00	1.3
	Attic	Incandescent lamp	1	60	60	CFL	13	0.047	0.047	1,560	73.32	$8.80	$11.00	$11.00	1.3
	Sports Supply	R40 Halogen	1	75	75	20 Watt R40 CFL	20	0.055	0.055	1,560	85.8	$10.30	$16.00	$16.00	1.6
	Computer area	R40 Halogen	3	75	225	20 Watt R40 CFL	20	0.055	0.165	1,560	257.4	$30.89	$16.00	$48.00	1.6
	Building	Inc. Exit signs	5	15	75	LED Exit Sign	2	0.013	0.065	8,760	569.4	$68.33	$74.00	$370.00	5.4
	Attic storage	Incandescent lamp	2	75	150	CFL	23	0.052	0.104	1,560	162.24	$19.47	$11.00	$22.00	1.1
	Chair Stock area	Incandescent lamp	2	75	150	CFL	23	0.052	0.104	400	41.6	$4.99	$11.00	$22.00	4.4
	Vending Machines	Fluorescent lamps			0	Vending Miser		0	0		0	$0.00		$0.00	
									Total Savings:		5,168	$620.14		$3,239.00	5.2

City Building Site Notes: Water Pumping Locations
Partnership Direct Incentives

City of Monrovia - Water Pump Facilities - Lighting

Existing Conditions								Post-Retrofit Conditions										
Building	Location	Type	Fixture	Fixture Qty	Watts per fixture	Total kWatts	Total kWh	Replacement Fixture	New Watts/fixture	Total kW	kW Demand Reduction	Total kW Demand Reduction	Operating Hours	kWh saved (kWh)/yr	Cost Savings ($)/yr	Installation Cost/fixture	Total Installed Cost ($)	Simple Payback
Water Dept	Well 6 Bldg	Fluorescent	2 Lamp F40 34W T12	12	72	0.864	52.704	2 Lamp F32 T8	54	0.648	0.018	0.216	61	13	$1.58	$44.00	$528.00	333.9
Water Dept	Well 6 - Storage Bldg	Fluorescent	2 Lamp F40 34W T12	8	72	0.576	35.136	2 Lamp F32 T8	54	0.432	0.018	0.144	61	9	$1.05	$44.00	$352.00	333.9
Water Dept	Well 2 Bldg	Fluorescent	2 Lamp F40 34W T12	3	72	0.216	13.176	2 Lamp F32 T8	54	0.162	0.018	0.054	61	3	$0.40	$44.00	$132.00	333.9
Water Dept	Chlorine Bldg	Fluorescent	2 Lamp F96 60W T12	2	123	0.246	44.772	2 Lamp F32 T8	59	0.118	0.064	0.128	182	23	$2.80	$88.00	$176.00	63.0
Water Dept	Chlorine Bldg	Fluorescent	2 Lamp F40 34W T12	1	72	0.072	13.104	2 Lamp F32 T8	54	0.054	0.018	0.018	182	3	$0.39	$44.00	$44.00	111.9
Water Dept	2610 California	Fluorescent	2 Lamp F40 34W T12	2	72	0.144	8.784	2 Lamp F32 T8	54	0.108	0.018	0.036	61	2	$0.26	$44.00	$88.00	333.9
Water Dept	2610 California	Fluorescent	2 Lamp F40 34W T12	6	72	0.432	26.352	2 Lamp F32 T8	54	0.324	0.018	0.108	61	7	$0.79	$44.00	$264.00	333.9
												Total Savings:		61	$7.27		$1,584.00	217.8

SCE Hydraulic/Industrial Services

SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL® Company

Customer: CITY OF MONROVIA

Cost Analysis Summary

Pumping Plant Name / Test Date	Pump Location	CSS Service Account #	Rate	kWh / Month	kWh / Year	kWh / Acre Ft.	Annual Acre Ft.	kWh Cost	Avg $ / Acre Ft.	Annual Cost	Test Eff. %	Impr. Eff %	Impr. kWh/ Acre Ft	Impr. Annual Cost	Est. $ Annual Savings
STA#1 BST #4 4/24/2006	2655 S MYRTLE AVENUE	000-0111-86	TOU-8	69,524	834,288	317	2,635	0.09417	$29.81	$78,565	61%	74%	261	$64,892	$13,673
WELL 6 4/17/2006	2655 SO. MYRTLE AVE.	000-0111-86	TOU-8	64,274	771,288	317	2,437	0.09417	$29.81	$72,632	62%	72%	271	$62,247	$10,385
WELL # 3 4/17/2006	2655 S MYRTLE AVE	001-1642-46	TOU-PA-B	42,541	510,492	279	1,829	0.09184	$25.64	$46,884	58%	72%	224	$37,548	$9,335
MAY BST. 3-3 5/1/2006	347 MAY AVENUE	000-0111-88	TOU-PA-5	21,124	253,488	481	527	0.08063	$38.80	$20,439	47%	69%	325	$13,814	$6,625
TOWER BSTR 1-1 4/24/2006	2655 S MYRTLE AVENUE	001-1642-46	PA-2	5,877	70,524	34	2,086	0.10593	$3.58	$7,471	10%	60%	6	$1,281	$6,190
TOWER BSTR 1-2 4/24/2006	2655 S MYRTLE AVENUE	001-1642-46	PA-2	5,597	67,164	35	1,947	0.10593	$3.65	$7,115	10%	60%	5	$1,125	$5,990
MAY BST. 3-1 5/1/2006	347 MAY AVENUE	000-0111-88	TOU-PA-5	22,426	269,112	411	655	0.08063	$33.13	$21,699	54%	69%	321	$16,961	$4,738
MAY BST. 3-2 5/1/2006	347 MAY AVENUE	000-0111-88	TOU-PA-5	29,239	350,868	367	956	0.08063	$29.58	$28,290	62%	69%	329	$25,341	$2,950
BOOSTER 3 4/24/2006	2655 S MYRTLE AVENUE	001-1642-46	TOU-PA-B	10,064	120,768	347	348	0.09184	$31.87	$11,091	61%	70%	304	$9,707	$1,384
CLOVERLEAF 4-4 5/8/2006	601 CLOVERLEAF	001-1642-42	TOU-PA-A	4,209	50,508	538	94	0.11393	$61.25	$5,754	60%	72%	446	$4,778	$976
CLOVERLEAF 4-5 5/8/2006	601 CLOVERLEAF	001-1642-42	TOU-PA-A	4,270	51,240	527	97	0.11393	$59.99	$5,838	62%	72%	450	$4,986	$852
RIDGESIDE 4-1 5/8/2006	715 RIDGESIDE DRIVE	000-0111-90	TOU-PA-B	5,383	64,596	332	195	0.08445	$28.05	$5,455	57%	65%	291	$4,783	$672
RIDGESIDE 4-2 5/8/2006	715 RIDGESIDE DRIVE	000-0111-90	TOU-PA-B	3,296	39,552	326	121	0.08445	$27.52	$3,340	60%	65%	302	$3,093	$247

APPENDIX G:
Renewable Fuels

Hybrids

A hybrid car is a normal, fuel efficient car that has two motors – an electric motor and a gasoline powered motor. It also has a special system to capture braking energy to store in an onboard battery. Hybrids are vehicles that combine an internal combustion engine with an electric motor as the power source. Add a sophisticated transmission and powerful batteries and it's a recipe that makes the most of gasoline, the one fuel that's available in all fifty states--at more than 180,000 stations. Hybrids utilize the electric motor and battery storage to maximize the fuel economy from standard gasoline-burning engines.

The reason for two motors is in the strengths and weaknesses of both types. Specifically, electric motors use no energy during idle – they turn off – and use less than gas motors at low speeds. Gas motors do better at high speeds and can deliver more power for a given motor weight. That means during rush hour stop and go driving, the electric motor works great and, as an added benefit, does not produce any exhaust thus reducing smog levels. A hybrid cuts emissions by 25% to 35% over even the most fuel efficient gas powered models. At higher speeds – above 40 mph - the gas motor kicks in and gives that peppy feel so many car owners look for when driving on the highway.

Hybrid Pros

- Environment: Depending upon the design and usage, hybrids can boast up to 30 percent fuel savings (sometimes more) over a comparable gasoline vehicle. And that translates into less greenhouse gases spewed into the environment also. Best of all, hybrids are designed for ease of use--just hop in and go.
- Efficiency: The gas motor charges the batteries while it’s running so a hybrid never needs to be plugged in.
- Incentives: The tax incentive in the U.S. is another powerful motive – it can reduce your cost up to $3,400 depending on the cost of the vehicle.
- Taken as a whole, hybrids offer a mixed bag of issues, when it comes to their environmental considerations. They offer greater fuel efficiency and fewer greenhouse gas and particular emissions than conventional cars.

Hybrid Cons

- Environment: Still run on gasoline, a finite and (some say) diminishing resource.
- Cost: more money to buy and ultimately maintain than conventional cars.
- Performance: The electric batteries add weight to the car (reducing its efficiency) and are very costly (both financially and environmentally) to produce and dispose of.

Green car enthusiasts generally accept hybrids as a positive step forward in greener personal transportation, but not as a long-term solution for a greener future. Experts think in the end, hybrids are probably a transition technology. Hydrogen or methane fuel cell powered cars are probably the cars of the future.

Plug-In Hybrids (PHEV)

Plug-in hybrid electric vehicles are hybrid cars with an added battery. As the term suggests, plug-in hybrids - which look and perform much like "regular" cars - can be plugged in to a 120-volt outlet (for instance each night at home, or during the workday at a parking garage) and charged. Plug-ins run on the stored energy for much of a typical day's driving - depending on the size of the battery up to 60 – 100 miles per charge, far beyond the commute of an average American - and when the charge is used up, automatically keep running on the fuel in the fuel tank. A person who drives every day a distance shorter than the car's electric range would never have to dip into the fuel tank.

Plug-In Hybrid Pros

- Efficiency and Cost: You don't have to plug it in, but when you do your car essentially becomes an electric vehicle with a gas-tank backup. So you'll have a cleaner, cheaper, quieter car for your local travel, and the gas tank is always there should you need to drive longer distances. PHEVs are meant to plug-in at night. In many areas of the country, overnight power is available at a lower cost. As PHEVs start to enter the marketplace, we'll see increasing support from electric utilities, as they'll offer reduced nighttime rates to incentivize off-peak charging. In some areas where wind and hydropower is wasted at night, the rate can be as low as 2-3 cents per kWh. That's 20-25 cents a gallon.
- Foreign Dependency: Most of the energy used by plug-ins comes from electricity and not from gasoline. That electricity can be generated efficiently and cleanly from America's abundant domestic energy resources, thus greatly reducing our dependence on imported oil. Unlike in the 1970s, when much of our electricity was generated from oil, today only 2% of our electricity is generated from oil.
- Performance: The plug-in hybrid drive system is compatible with all vehicle models and does not entail any sacrifice of vehicle performance or driver amenities. A mid size plug-in can accelerate from 0 to 60 miles per hour at less than 9 seconds, sustain a top speed of 97 mph and maintain 120 mph for about two minutes even with a low battery.
- Availability: For people looking for the most effective way to end our addiction to oil, PHEVs have make sense because carmakers can build them now, with today's technology and using today's infrastructure. The nationwide electrical grid is only 3% petroleum-fueled, whereas transportation is almost completely powered by oil -- 60% of which comes from foreign sources (and growing). Adoption of plug-in hybrids will transfer the overwhelming majority of our miles driven to nearly oil-free

electricity. If all vehicles were plug-in hybrids we would cut our oil needs by 55%, nearly enough to eliminate foreign sources altogether.

PHEV Con

- Cost: Plug-ins estimated retail price is higher than that of corresponding conventional vehicles. The difference in price depends on the size of the battery but the vehicles typically are 10-20% more than a regular hybrid. The gap is being narrowed through incentives, subsidies and rebates. In addition there are opportunities to gain access to car-pool lanes, spend less time at gas stations, get home backup power, lower maintenance costs, and, most importantly, benefit society by reducing oil imports, greenhouse gases and pollution.

Fuel-Cell

FCVs represent a far-reaching different approach from vehicles with conventional internal combustion engines. Like battery-electric vehicles, FCVs are powered by electric motors. But while battery electric vehicles use electricity from an external source (and store it in a battery), FCVs create their own electricity. Fuel cells onboard the vehicles create electricity through a chemical process using hydrogen fuel and oxygen from the air.

FCVs can be fueled with pure hydrogen gas stored onboard in high-pressure tanks. They also can be fueled with hydrogen-rich fuels; such as methanol, natural gas, or even gasoline; but these fuels must first be converted into hydrogen gas by an onboard device called a "reformer."

FCV Pros

- Environment: Fueled with pure hydrogen emit no pollutants; only water and heat; while those using hydrogen-rich fuels and a reformer produce only small amounts of air pollutants.
- Performance: Can be twice as efficient as similarly sized conventional vehicles and may also incorporate other advanced technologies to increase efficiency.

FCV Cons

- Availability: Before FCVs make it to the market, significant research and development is required to decrease cost and advance performance. Effective and efficient ways to produce and store hydrogen must be still found.

Biodiesel

Biodiesel is a non-toxic, renewable and clean burning alternative fuel produced from agricultural resources such as vegetable oils. In the United States, most biodiesel is made from soybean oil; however canola oil, sunflower oil, recycled cooking oils, and animal fats are also used. Biodiesel contains no petroleum, but it can be blended at any level with petroleum diesel to create a biodiesel blend. The number after the B is the percentage of biodiesel in your fuel. So B20 = 20% biodiesel, 80% petroleum diesel. B100 is 100% biodiesel.

Biodiesel Pros:

- Environment: Safe, biodegradable, nontoxic and reduces air pollutants, such as particulate matter, carbon monoxide, carbon dioxide and hydrocarbons. Biodiesel is made from oil that comes from plants and CO2 is the only greenhouse gas that you get when you burn biodiesel. Plants absorb CO2 and convert it to O2. The amount of CO2 converted while the plant was alive offsets any CO2 that is released when biodiesel is burned. Thus there is no new CO2 added to the atmosphere.
- Foreign Dependency: As an alternative to diesel, it can help reduce U.S. dependence on foreign oil. Biodiesel also provides significant greenhouse gas (GHG) emission reductions; B100 reduces lifecycle greenhouse gas emissions by more than 50 percent, while B20 reduces GHG emissions by at least 10 percent.
- Performance: Diesel engines offer better fuel mileage than gasoline vehicles and can significantly reduce the environmental cost of running a vehicle. The cost is generally slightly higher than the price of regular diesel. Although biodiesel can cost more than petrodiesel, diesel drivers can transition to biodiesel without purchasing new vehicles. In the case of fleets, managers can transition to biodiesel without acquiring new spare parts inventories or rebuilding refueling stations. In addition, vehicles have similar horsepower and torque as conventional diesel when running on biodiesel.

Biodiesel Cons:

- Environment: Increase in NOx.
- Performance: Some older diesel vehicles may experience clogging with higher concentrations of biodiesel because of its ability to loosen deposits built up in the engine. On average, there is about a 10% reduction in power. In other words, it takes about 1.1 gallons of biodiesel to equal 1 gallon of standard diesel.
- Availability: In 2004, 25 million gallons of B100 were sold. By 2005, that number had tripled. Today, approximately 600 fleets nationwide use biodiesel blends in their diesel engines, and biodiesel is available in its various blends at approximately 800 locations across the United States. A complete list of stations is available at www.biodiesel.org. Though biodiesel isn't necessarily produced in all 50 states, it can be made available in all of them. There are three major ways to get biodiesel, with each particular method better suited for certain types of customers. Biodiesel can be purchased directly from the supplier, from a petroleum distributor, or from public pumps.

Compressed Natural Gas (CNG)

CNG is natural gas under pressure which remains clear, odorless, and non-corrosive. Natural gas, is a gas much like air, rather than a liquid like petroleum. It has been found to be one of the most environmentally friendly fuels, and its popularity is growing.

Although vehicles can use natural gas as either a liquid or a gas, most vehicles use the gaseous form. Most natural gas comes from three types of wells: natural gas-and-condensate wells, oil wells, and coal bed methane wells. Well-extracted natural gas requires a cleanup process before it can be used in vehicles or residences.

Because of its clean burning nature and the fact that it is not made from petroleum, as gasoline and diesel are, many automakers around the world are developing vehicles including cars, vans, buses and small trucks to run on natural gas.

CNG Pros:

- Economic benefit: The cost of CNG is almost a third of the cost of petrol in terms of calorific value resulting in substantial saving in fuel cost
- Environment friendly: The use of CNG as a fuel reduces vehicular exhaust emissions significantly. Carbon Monoxide emissions are reduced by 70 to 90% and Hydrocarbon emissions by 40 to 60% as compared to vehicles that use the conventional fuel - petrol. Carbon Dioxide emissions, a cause for global warming, are also reduced significantly by 10%
- 100% Income Tax Depreciation: Corporate Organizations, firms, etc. can claim 100% depreciation on a CNG Conversion Kit as this is a pollution controlling equipment.
- Flexibility and ease of use: The basic engine characteristics of a vehicle are retained while converting it to run on CNG. The vehicle therefore is capable of running either on Petrol or CNG at the flick of a switch on its dashboard.
- Foreign Dependency: Currently more than 99 percent of the natural gas used in the United States comes from domestic or other North American sources. However, increasing demand for natural gas in power plants will require new supplies from non-North American countries, increasing our dependence on foreign sources of energy. The Energy Information Administration (EIA) predicts that, by 2025, more than 15 percent of our natural gas supplies will be imported from countries other than Canada and Mexico.

CNG Cons:

- Space and Performance: Loss of luggage space is the biggest disadvantage of the CNG. CNG cylinders take up a lot of storage space and generally have to be placed in the trunk of the car. The body of the cylinders has to be made of good grade steel capable of handling the roughs and toughs of traveling.
- Cost: cost of conversion is also another major determining factor.
- Performance: CNG may slightly hamper vehicle performance.

- Limited Availability: With the consumption of CNG increasing nationwide 145 percent over the past six years, the fueling infra-structure for natural gas vehicles continues to grow. In 2005, California has more than 200 CNG fueling stations. In Southern California alone, there are more than 100 public fueling stations in major metropolitan areas from Los Angeles to the Mexican border. Another 50 stations are now under construction.

Ethanol

Ethanol is made from the fermentation of a U.S. grown, renewable feed crop such as corn; often used with FFV (Flexible Fuel Vehicles) that run off of a blend of 85% ethanol with 15% gasoline and is somewhat cleaner burning than gasoline alone. The ethanol industry is putting its collective efforts into marketing a blend of ethanol called E85, so-named because it is 85 percent ethanol and 15 percent gasoline.

A promising supplement to gasoline, there are many sides to E85. For instance, when a flex-fuel Chevrolet Tahoe was tested running on E85 in 2006, its fuel economy dropped 27 percent overall, compared with running on gasoline. Likewise, there is debate over the net energy benefits of creating fuel from food crops, with some analysts questioning the energy return when factoring the petroleum used in farm machines and for transporting. Critics argue the fact that the 365 days one person could be fed on the corn needed to fill an ethanol-fueled SUV is not worth the gas savings.

Some stations sell E85 for less than gasoline, while others charge more, hitting consumers with a double-whammy: more fuel cost per gallon and less efficiency. Availability and pricing may change as competition heats up in the ethanol market. Today, only a small fraction of gas stations carry E85, but the number has been growing. However, building infrastructure to transport enough ethanol to fuel cars nationwide remains a challenge.

The price of ethanol will only continue to rise as increased pressure is placed on the demand for crops, which brings up the topic of how sustainable this option really is. As a result from the strain placed on farmers to expand agriculture is the harmful affect of land taken away from forests, which causes deforestation and increased global warming. An estimated 750,000 acres of Brazilian rain forest has been lost in the last six months in 2007 due to the increased demand on farming.

Monrovia City Fleet
Baseline and Goals

DEPARTMENT	VEHICLE	MODEL	Fuel Type	Est. Annual Mileage	Passenger or Delivery Truck	2007 CO2"	2020 CO2 Goal	2007 PM10^	2015 PM Goal	2007 SOx#	2015 SOx Goal	2007 NOx%	2015 NOx Goal
Public Works	Chevrolet	2500	Gas	19,400	Passenger	21,470.41	16,102.81	1.64	0.82	0.21	0.10	23.54	11.77
Public Works	Chevrolet	2500	Gas/Diesel	9,000	Passenger	9,960.50	7,470.38	0.76	0.38	0.10	0.05	10.92	5.46
Public Works	Chevrolet	2500	Gas	7,200	Passenger	7,968.40	5,976.30	0.61	0.30	0.08	0.04	8.74	4.37
Public Works	Chevrolet	2500	Gas	4,900	Passenger	5,422.94	4,067.20	0.41	0.21	0.05	0.03	5.95	2.97
Public Works	Chevrolet	3500	Gas	5,700	Passenger	6,308.32	4,731.24	0.48	0.24	0.06	0.03	6.92	3.46
Public Works	Chevrolet	3500	Gas	6,800	Passenger	7,525.71	5,644.28	0.57	0.29	0.07	0.04	8.25	4.13
Monrovia Police	Chevrolet	3500	Gas	2,700	Passenger	2,988.15	2,241.11	0.23	0.11	0.03	0.01	3.28	1.64
Public Works	Ford	Aerostar	Gas	6,500	Passenger	7,193.70	5,395.27	0.55	0.27	0.07	0.04	7.89	3.94
Monrovia Police	Chevrolet	Bonneville	Gas	7,000	Passenger	7,747.06	5,810.29	0.59	0.30	0.08	0.04	8.49	4.25
Monrovia Police	Chevrolet	Caprice	Gas	3,100	Passenger	3,430.84	2,573.13	0.26	0.13	0.03	0.02	3.76	1.88
Monrovia Police	Ford	Crown Victoria	Gas	25,500	Passenger	28,221.42	21,166.07	2.15	1.08	0.27	0.14	30.94	15.47
Monrovia Police	Ford	Crown Victoria	Gas	25,400	Passenger	28,110.75	21,083.06	2.15	1.07	0.27	0.14	30.82	15.41
Monrovia Police	Ford	Crown Victoria	Gas	17,000	Passenger	18,814.28	14,110.71	1.44	0.72	0.18	0.09	20.63	10.31
Monrovia Police	Ford	Crown Victoria	Gas	1,700	Passenger	1,881.43	1,411.07	0.14	0.07	0.02	0.01	2.06	1.03
Monrovia Police	Ford	Crown Victoria	Gas	8,800	Passenger	9,739.16	7,304.37	0.74	0.37	0.09	0.05	10.68	5.34
Monrovia Police	Ford	Crown Victoria	Gas	650	Passenger	719.37	539.53	0.05	0.03	0.01	0.00	0.79	0.39
Monrovia Police	Ford	Crown Victoria	Gas	5,000	Passenger	5,533.61	4,150.21	0.42	0.21	0.05	0.03	6.07	3.03
Monrovia Police	Ford	Crown Victoria	Gas	15,500	Passenger	17,154.20	12,865.65	1.31	0.65	0.17	0.08	18.81	9.40
Monrovia Police	Ford	Crown Victoria	Gas	22,500	Passenger	24,901.25	18,675.94	1.90	0.95	0.24	0.12	27.30	13.65
Monrovia Police	Ford	Crown Victoria	Gas	20,000	Passenger	22,134.45	16,600.84	1.69	0.84	0.22	0.11	24.27	12.13
Monrovia Police	Ford	Crown Victoria	Gas	23,500	Passenger	26,007.98	19,505.98	1.99	0.99	0.25	0.13	28.51	14.26
Monrovia Police	Ford	Crown Victoria	Gas	20,500	Passenger	22,687.81	17,015.86	1.73	0.87	0.22	0.11	24.87	12.44
Monrovia Police	Ford	Crown Victoria	Gas	24,000	Passenger	26,561.34	19,921.00	2.03	1.01	0.26	0.13	29.12	14.56
Monrovia Police	Ford	Crown Victoria	Gas	20,800	Passenger	23,019.83	17,264.87	1.76	0.88	0.22	0.11	25.24	12.62
Monrovia Police	Ford	Crown Victoria	Gas	22,000	Passenger	24,347.89	18,260.92	1.86	0.93	0.24	0.12	26.69	13.35
Monrovia Police	Ford	Crown Victoria	Gas	17,800	Passenger	19,699.66	14,774.74	1.50	0.75	0.19	0.10	21.60	10.80
Monrovia Police	Ford	Crown Victoria	Gas	10,000	Passenger	11,067.22	8,300.42	0.84	0.42	0.11	0.05	12.13	6.07
Monrovia Police	Ford	Crown Victoria	Gas	9,000	Passenger	9,960.50	7,470.38	0.76	0.38	0.10	0.05	10.92	5.46
Monrovia Police	Ford	Crown Victoria	Gas	7,800	Passenger	8,632.43	6,474.33	0.66	0.33	0.08	0.04	9.46	4.73
Monrovia Police	Ford	Crown Victoria	Gas	8,500	Passenger	9,407.14	7,055.36	0.72	0.36	0.09	0.05	10.31	5.16
Monrovia Fire Dept	Ford	Crown Victoria	Gas	19,000	Passenger	21,027.72	15,770.79	1.61	0.80	0.20	0.10	23.05	11.53
Monrovia Transit	Ford/Goshen	E350	Gas	20,000	Passenger	22,134.45	16,600.84	1.69	0.84	0.22	0.11	24.27	12.13
Monrovia Transit	Ford/Goshen	E350	Gas	20,000	Passenger	22,134.45	16,600.84	1.69	0.84	0.22	0.11	24.27	12.13
Public Works	Ford	Escape	Gas	2,400	Passenger	2,656.13	1,992.10	0.20	0.10	0.03	0.01	2.91	1.46
Monrovia Police	Ford	Excursion	Gas	7,700	Passenger	8,521.76	6,391.32	0.65	0.33	0.08	0.04	9.34	4.67
Public Works	Ford	Explorer	Gas	6,000	Passenger	6,640.33	4,980.25	0.51	0.25	0.06	0.03	7.28	3.64
Public Works	Ford	F150	Gas	5,900	Passenger	6,529.66	4,897.25	0.50	0.25	0.06	0.03	7.16	3.58
Public Works	Ford	F150	Gas	8,000	Passenger	8,853.78	6,640.33	0.68	0.34	0.09	0.04	9.71	4.85
Public Works	Ford	F150	Gas	7,000	Passenger	7,747.06	5,810.29	0.59	0.30	0.08	0.04	8.49	4.25
Public Works	Ford	F150	Gas	7,500	Passenger	8,300.42	6,225.31	0.63	0.32	0.08	0.04	9.10	4.55

Monrovia City Fleet
Baseline and Goals

DEPARTMENT	VEHICLE	MODEL	Fuel Type	Est. Annual Mileage	Passenger or Delivery Truck	2007 CO2"	2020 CO2 Goal	2007 PM10^	2015 PM Goal	2007 SOx#	2015 SOx Goal	2007 NOx%	2015 NOx Goal
Public Works	Ford	F150	Gas	7,500	Passenger	8,300.42	6,225.31	0.63	0.32	0.08	0.04	9.10	4.55
Public Works	Ford	F250	Gas	6,300	Passenger	6,972.35	5,229.26	0.53	0.27	0.07	0.03	7.64	3.82
Public Works	Ford	F250	Gas	0	Passenger	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Public Works	Ford	F250	Gas	8,000	Passenger	8,853.78	6,640.33	0.68	0.34	0.09	0.04	9.71	4.85
Public Works	Ford	F250	Gas	8,300	Passenger	9,185.80	6,889.35	0.70	0.35	0.09	0.04	10.07	5.04
Public Works	Ford	F250	Gas	4,000	Passenger	4,426.89	3,320.17	0.34	0.17	0.04	0.02	4.85	2.43
Public Works	Ford	F250	Gas	5,000	Passenger	5,533.61	4,150.21	0.42	0.21	0.05	0.03	6.07	3.03
Public Works	Ford	F250	Diesel	16,000	Passenger	17,707.56	13,280.67	1.35	0.68	0.17	0.09	19.41	9.71
Public Works	Ford	F350	Gas	150	Passenger	166.01	124.51	0.01	0.01	0.00	0.00	0.18	0.09
Public Works	Ford Valve	F350	Gas	4,000	Passenger	4,426.89	3,320.17	0.34	0.17	0.04	0.02	4.85	2.43
Monrovia Transit	Ford/Glaval	F350	Gas	20,000	Passenger	22,134.45	16,600.84	1.69	0.84	0.22	0.11	24.27	12.13
Monrovia Transit	Ford/Glaval	F350	Gas	20,000	Passenger	22,134.45	16,600.84	1.69	0.84	0.22	0.11	24.27	12.13
Monrovia Transit	Ford/Glaval	F350	Gas	20,000	Passenger	22,134.45	16,600.84	1.69	0.84	0.22	0.11	24.27	12.13
Monrovia Fire Dept	Ford	F350	Gas	4,500	Passenger	4,980.25	3,735.19	0.38	0.19	0.05	0.02	5.46	2.73
Public Works	Ford	F450	Gas	2,600	Passenger	2,877.48	2,158.11	0.22	0.11	0.03	0.01	3.15	1.58
Public Works	Ford	F450	Gas	1,000	Passenger	1,106.72	830.04	0.08	0.04	0.01	0.01	1.21	0.61
Monrovia Transit	Ford/Glaval	F450	Gas	20,000	Passenger	22,134.45	16,600.84	1.69	0.84	0.22	0.11	24.27	12.13
Monrovia Transit	Ford/Glaval	F450	Gas	20,000	Passenger	22,134.45	16,600.84	1.69	0.84	0.22	0.11	24.27	12.13
Monrovia Transit	Ford/Glaval	F450	Gas	20,000	Passenger	22,134.45	16,600.84	1.69	0.84	0.22	0.11	24.27	12.13
Monrovia Transit	Ford/Glaval	F450	Gas	20,000	Passenger	22,134.45	16,600.84	1.69	0.84	0.22	0.11	24.27	12.13
Monrovia Fire Dept	Ford	F450	Gas	10,500	Passenger	11,620.58	8,715.44	0.89	0.44	0.11	0.06	12.74	6.37
Public Works	Chevrolet	Impala	Gas	4,700	Passenger	5,201.60	3,901.20	0.40	0.20	0.05	0.03	5.70	2.85
Public Works	Chevrolet	Impala	Gas	3,700	Passenger	4,094.87	3,071.15	0.31	0.16	0.04	0.02	4.49	2.24
Public Works	Chevrolet	Impala	Gas	2,500	Passenger	2,766.81	2,075.10	0.21	0.11	0.03	0.01	3.03	1.52
Monrovia Police	Chevrolet	Impala	Gas	3,900	Passenger	4,316.22	3,237.16	0.33	0.16	0.04	0.02	4.73	2.37
Monrovia Police	BMW	Motorcycle	Gas	4,600	Passenger	5,090.92	3,818.19	0.39	0.19	0.05	0.02	5.58	2.79
Monrovia Police	BMW	Motorcycle	Gas	4,200	Passenger	4,648.23	3,486.18	0.35	0.18	0.05	0.02	5.10	2.55
Monrovia Police	BMW	Motorcycle	Gas	4,000	Passenger	4,426.89	3,320.17	0.34	0.17	0.04	0.02	4.85	2.43
Monrovia Police	Chevrolet	Oldsmobile	Gas	1,200	Passenger	1,328.07	996.05	0.10	0.05	0.01	0.01	1.46	0.73
Public Works	Ford	Ranger	Gas	10,500	Passenger	11,620.58	8,715.44	0.89	0.44	0.11	0.06	12.74	6.37
Public Works	Ford	Ranger	Gas	10,700	Passenger	11,841.93	8,881.45	0.90	0.45	0.12	0.06	12.98	6.49
Public Works	Chevrolet	S10	Gas	14,300	Passenger	15,826.13	11,869.60	1.21	0.60	0.15	0.08	17.35	8.67
Public Works	Chevrolet	S10	Gas	6,100	Passenger	6,751.01	5,063.25	0.52	0.26	0.07	0.03	7.40	3.70
Public Works	GMC Topkick	Sewer Jet	Diesel	6,400	Passenger	7,083.02	5,312.27	0.54	0.27	0.07	0.03	7.76	3.88
Monrovia Fire Dept	Chevrolet	Suburban	Gas	5,000	Passenger	5,533.61	4,150.21	0.42	0.21	0.05	0.03	6.07	3.03
Monrovia Fire Dept	Chevrolet	Suburban	Gas	6,000	Passenger	6,640.33	4,980.25	0.51	0.25	0.06	0.03	7.28	3.64
Monrovia Police	Mazda	SUV	Gas	1,500	Passenger	1,660.08	1,245.06	0.13	0.06	0.02	0.01	1.82	0.91
Monrovia Police	Chevrolet	Tahoe	Gas	8,600	Passenger	9,517.81	7,138.36	0.73	0.36	0.09	0.05	10.43	5.22
Monrovia Police	Chevrolet	Tahoe	Gas	20,800	Passenger	23,019.83	17,264.87	1.76	0.88	0.22	0.11	25.24	12.62
Monrovia Fire Dept	Chevrolet	Tahoe	Gas	10,750	Passenger	11,897.27	8,922.95	0.91	0.45	0.12	0.06	13.04	6.52
Public Works	Ford	Taurus	Gas	5,300	Passenger	5,865.63	4,399.22	0.45	0.22	0.06	0.03	6.43	3.22
Public Works	Ford	Taurus	Gas	1,500	Passenger	1,660.08	1,245.06	0.13	0.06	0.02	0.01	1.82	0.91
Public Works	Ford	Taurus	Gas	2,700	Passenger	2,988.15	2,241.11	0.23	0.11	0.03	0.01	3.28	1.64
Public Works	Ford	Taurus	Gas	3,100	Passenger	3,430.84	2,573.13	0.26	0.13	0.03	0.02	3.76	1.88
Monrovia Fire Dept	Ford	Taurus	Gas	5,300	Passenger	5,865.63	4,399.22	0.45	0.22	0.06	0.03	6.43	3.22
Community Developme	Ford	Taurus LX	Gas	3,000	Passenger	3,320.17	2,490.13	0.25	0.13	0.03	0.02	3.64	1.82

Monrovia City Fleet
Baseline and Goals

DEPARTMENT	VEHICLE	MODEL	Fuel Type	Est. Annual Mileage	Passenger or Delivery Truck	2007 CO2»	2020 CO2 Goal	2007 PM10^	2015 PM Goal	2007 SOx#	2015 SOx Goal	2007 NOx%	2015 NOx Goal
Community Developme	Ford	Taurus LX	Gas	3,700	Passenger	4,094.87	3,071.15	0.31	0.16	0.04	0.02	4.49	2.24
Community Developme	Ford	Taurus LX	Gas	3,300	Passenger	3,652.18	2,739.14	0.28	0.14	0.04	0.02	4.00	2.00
Community Developme	Chevrolet	Trailblazer	Gas	2,500	Passenger	2,766.81	2,075.10	0.21	0.11	0.03	0.01	3.03	1.52
Monrovia Police	Dodge	Truck	Gas	6,500	Passenger	7,193.70	5,395.27	0.55	0.27	0.07	0.04	7.89	3.94
Monrovia Police		Truck	Gas	200	Passenger	221.34	166.01	0.02	0.01	0.00	0.00	0.24	0.12
Monrovia Police	Ford	Truck	Gas	1,000	Passenger	1,106.72	830.04	0.08	0.04	0.01	0.01	1.21	0.61
Monrovia Fire Dept	Ford	Truck	Gas	3,500	Passenger	3,873.53	2,905.15	0.30	0.15	0.04	0.02	4.25	2.12
Public Works	Chevrolet	W35	Gas	7,100	Passenger	7,857.73	5,893.30	0.60	0.30	0.08	0.04	8.61	4.31
Public Works	Chevrolet	W35	Gas	2,700	Passenger	2,988.15	2,241.11	0.23	0.11	0.03	0.01	3.28	1.64
Public Works	Chevrolet		Gas	10,400	Passenger	11,509.91	8,632.43	0.88	0.44	0.11	0.06	12.62	6.31
Public Works	Chevrolet		Gas	400	Passenger	442.69	332.02	0.03	0.02	0.00	0.00	0.49	0.24
Monrovia Police	Jeep		Gas	4,700	Passenger	5,201.60	3,901.20	0.40	0.20	0.05	0.03	5.70	2.85
Monrovia Police	Jeep		Gas	3,900	Passenger	4,316.22	3,237.16	0.33	0.16	0.04	0.02	4.73	2.37
Monrovia Police	Jeep		Gas	2,900	Passenger	3,209.49	2,407.12	0.24	0.12	0.03	0.02	3.52	1.76
					TOTAL PASSENGER	**999,093.61**	**749,320.21**	**76.26**	**38.13**	**9.73**	**4.86**	**1,095.28**	**547.64**

Passenger Emissions Formula

*» Carbon Formula= 1.106 * miles*
*^PM10 Formula= 0.0000844737286703835 * miles*
*# SOx Formula=0.0000107776826234627 * miles*
*% NOx Formula= 0.00121327577468235 * miles*

The source for emission factors for the fleet was the SCAQMD – EMFAC2007 (Version 2.3) Emission Factors for On-Road Passenger Vehicles & Delivery Trucks
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html

Passenger Vehicles (pounds/mile)	
NOx	0.00
SOx	0.00
PM10	0.00
CO2	1.11

Public Works	Freightliner	5 Yd Dump	Diesel	4,100	Truck	11,162.07	8,371.55	3.73	1.87	0.11	0.05	102.85	51.42
Public Works	Freightliner	5 Yd Dump	Diesel	2,800	Truck	7,622.88	5,717.16	2.55	1.27	0.07	0.04	70.24	35.12
Monrovia Fire Dept	E-One Pumper	Arerial	Gas	5,500	Truck	14,973.51	11,230.13	5.01	2.50	0.14	0.07	137.96	68.98
Monrovia Police		Armored Truck	Gas	500	Truck	1,361.23	1,020.92	0.46	0.23	0.01	0.01	12.54	6.27
Public Works	Thomas	Caterpillar	Die	1,200	Truck	3,266.95	2,450.21	1.09	0.55	0.03	0.02	30.10	15.05
Monrovia Fire Dept	E-One Pumper	Cyclone I	Gas	4,500	Truck	12,251.05	9,188.29	4.10	2.05	0.12	0.06	112.88	56.44
Monrovia Fire Dept	E-One Pumper	Cyclone I	Gas	5,500	Truck	14,973.51	11,230.13	5.01	2.50	0.14	0.07	137.96	68.98
Monrovia Fire Dept	E-One Pumper	Cyclone II	Gas	6,300	Truck	17,151.47	12,863.61	5.73	2.87	0.17	0.08	158.03	79.02
Monrovia Fire Dept	E-One Pumper	Cyclone II	Gas	10,000	Truck	45,984.25	34,488.18	9.10	4.55	0.26	0.13	250.84	125.42
Public Works	Freightliner	Dump truck	Diesel	3,900	Truck	10,617.58	7,963.18	3.55	1.77	0.10	0.05	97.83	48.91
Public Works	Freightliner	Dump truck	Diesel	3,200	Truck	8,711.86	6,533.89	2.91	1.46	0.08	0.04	80.27	40.14
Public Works	Caterpillar Freightliner	Sewer	Diesel	6,300	Truck	17,151.47	12,863.61	5.73	2.87	0.17	0.08	158.03	79.02
Monrovia Fire Dept	Westates	Tender	Gas	700	Truck	1,905.72	1,429.29	0.64	0.32	0.02	0.01	17.56	8.78
Public Works	Flatbed		Gas	4,000	Truck	10,889.82	8,167.37	3.64	1.82	0.11	0.05	100.34	50.17
Monrovia Transit	E-Bus	Hybrid Trolley	Hybrid/Propone /Electric	7,100	Truck	19,329.44	14,497.08	6.46	3.23	0.19	0.09	178.10	89.05
Monrovia Transit	E-Bus	Hybrid Trolley	Hybrid/Propone /Electric	7,100	Truck	19,329.44	14,497.08	6.46	3.23	0.19	0.09	178.10	89.05
					TOTAL TRUCK	**216,682.25**	**162,511.69**	**66.17**	**33.09**	**1.91**	**0.95**	**1,823.64**	**911.82**

Trucks Emissions Formulas

*» Carbon Formula= 2.72245618801793 * miles*
*^PM10 Formula= 0.000910202418149708 * miles*
*# SOx Formula= 0.0000262645473893946 * miles*
*% NOx Formula=0.0250844541049676 * miles*

The source for emission factors for the fleet was the SCAQMD – EMFAC2007 (Version 2.3) Emission Factors for On-Road Passenger Vehicles & Delivery Trucks
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html

Delivery Trucks (pounds/mile)	
NOx	0.02508445
SOx	0.00002626
PM10	0.00091020
CO2	2.72245619

Monrovia City Fleet
Baseline and Goals

DEPARTMENT	VEHICLE	MODEL	Fuel Type	Est. Annual Mileage	Passenger or Delivery Truck	2007 CO2"	2020 CO2 Goal	2007 PM10^	2015 PM Goal	2007 SOx#	2015 SOx Goal	2007 NOx%	2015 NOx Goal
Contracted Fleet:													
ATHENS (Solid Waste)													
	Cummins	421	Diesel	16,891		45,984.25	34,488.18	15.37	7.69	0.44	0.22	423.69	211.85
	Cummins	425	Diesel	15,067		41,019.25	30,764.44	13.71	6.86	0.40	0.20	377.95	188.97
	Cummins	93	Diesel	16,275		44,307.97	33,230.98	14.81	7.41	0.43	0.21	408.25	204.12
	Cummins	461	Diesel	15,113		41,144.48	30,858.36	13.76	6.88	0.40	0.20	379.10	189.55
	Cummins	15	Diesel	26,782		72,912.82	54,684.62	24.38	12.19	0.70	0.35	671.81	335.91
	Cummins	165	Diesel	26,447		72,000.80	54,000.60	24.07	12.04	0.69	0.35	663.41	331.70
Total				116,577		317,369.57	238,027.18	106	53.05	3.06	1.53	2,924.21	1462.11
MUNICIPAL REFUSE				29,765		81,033.36	60,775.02	27.09	13.55	0.78	0.39	746.63	373.32
STREET SWEEPER				100,238		272,893.56	204,670.17	91.24	45.62	2.63	1.32	2,514.42	1257.21
BURTEC WASTE				780		2,123.52	1,592.64	0.71	0.35	0.02	0.01	19.57	9.78
GRAND TOTAL:				**363,935**		**990,795.79**	**743,096.84**	**331.25**	**165.63**	**9.56**	**4.78**	**9,129.10**	**4,564.55**

	2007 CO2	2020 CO2 Goal	2007 PM10	2015 PM Goal	2007 SOx	2015 SOx Goal	2007 NOx	2015 NOx Goal
TOTAL PASSENGER	999,093.61	749,320.21	76	38.13	9.73	4.86	1,095.28	547.64
TOTAL TRUCK	216,682.25	162,511.69	66	33.09	1.91	0.95	1,823.64	911.82
TOTAL CONTRACTED	990.795.79	743,096.84	331	165.63	9.56	4.78	9,129.10	4,564.55
GRAND TOTALS	**1,215,775.86**	**1,654,928.74**	**474**	**236.85**	**21.20**	**10.60**	**12,048.02**	**6,024.01**