

# City of Lancaster Energy Master Plan

December 15<sup>th</sup>, 2009

## City of Lancaster Efficiency Opportunity

10% Electricity Reduction =

- ✓ \$100,000 in annual utility bill savings
- ✓ Utility-paid cash incentives for implementing energy efficiency projects
- ✓ Improved usability / comfort in our offices, fire / police stations, and other city buildings
- ✓ Environmental benefits equivalent to taking 225 cars off the road per year
- ✓ Positive PR in the community

## Our Mission

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Energy costs are an enormous expense for our nation's cities; energy is often one of the largest line items in a city's budget. In order to significantly reduce such costs and improve energy efficiency, the City of Lancaster participated in the CitySmart Pilot Project sponsored by PPL. The program helped us identify energy efficiency opportunities in our buildings, which will help us to:

- ✓ **Improve Working Environments**
- ✓ **Reduce Energy Expenditures**
- ✓ **Boost the Local Economy (through upgrade projects)**
- ✓ **Enhance Community Relations**

The program provided us with technical assistance to identify potential efficiency gains in our city buildings. Whether we are retrofitting an existing building or incorporating energy-efficiency technologies into new construction, we will identify and implement cost-effective projects that will allow us to use energy more efficiently. In addition, the CitySmart Pilot Project sponsored by PPL helped us form this long-term strategy to address rising energy costs. As part of our participation and with assistance from the program, we have prepared this Energy Master Plan to outline where we are today and what steps we will undertake to improve the efficiency of our buildings in 2009 and beyond.

## Strategies for Improvement

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- ✓ By adopting certain energy management best practices, we can mobilize and coordinate our efforts toward reducing energy costs
- ✓ By adhering to the listed efficiency strategies, we can minimize the life-cycle cost associated with our energy-consuming equipment

## Commitment

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The Energy Master Plan is an adaptable, evolving document. It is a starting point for consensus and uniform action, which will ensure that all appropriate departments and parties are informed of and involved in our plans. Because it will adapt to changing needs and new information, it will never be "final" or concrete; however, approval of this plan will allow us to plan effectively and efficiently in terms of funding, personnel availability, and other restraints.

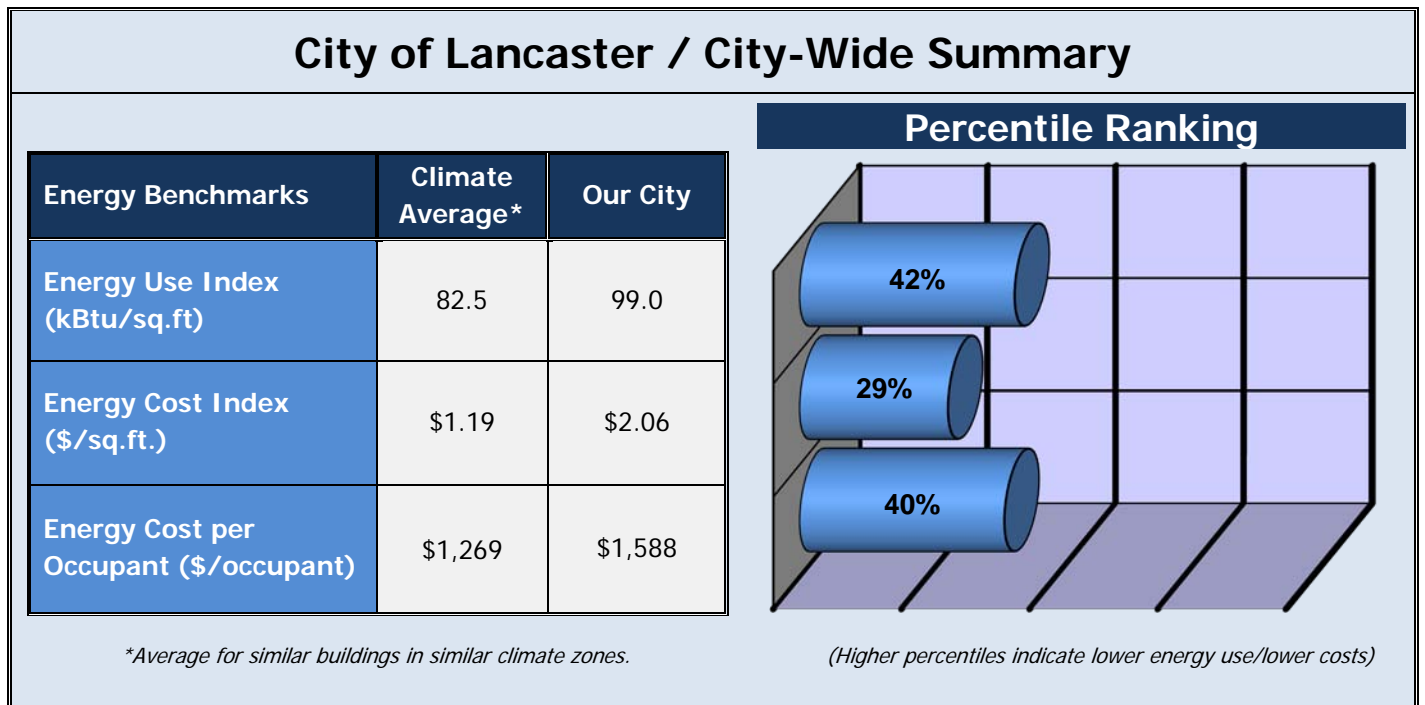
## Project Implementation

- ✓ We have identified upcoming efficiency opportunities (e.g., older cooling systems, new construction), as well as “low-hanging fruit” (e.g., inefficient T12 lighting systems)
- ✓ PPL may be able to pay us cash incentives for incorporating energy efficiency into equipment replacement/installation (e.g., lighting, HVAC) at our facilities
- ✓ We have recognized a few of our energy-related accomplishments

## Current Assessment

Based on the utility bills and building information we provided, the CitySmart Pilot Project compared our energy use to other buildings in similar climate zones. The benchmarking process revealed our city buildings are performing slightly below average overall. We have attached more detailed assessments of each individual building in the Appendix.

- ✓ Our city is performing in the 42<sup>nd</sup> percentile overall
- ✓ By reducing our current electricity consumption by 10 percent, we could save an estimated \$100,000 in annual utility bills at the facilities included in the benchmarking analysis.



In addition to facility performance benchmarking, our energy management methods were also scrutinized against recognized “best practices” in the following key focus areas: Funding & Procurement, Planning & Decision-Making, Communication & Coordination, Evaluation & Assessment, Energy-Related Management Systems, Personnel & Skills, and Incentives. Strengths in each category, along with short- and long-term strategies for improvement, are identified in the appendix.

## Set Goals

The goal of implementing the Energy Master Plan is to avoid spending more money on energy than necessary. We attempted to quantify the “bottom-line effect” of improving the energy performance of our buildings. For the eleven

buildings & solid waste treatment plant that we included in the benchmarking analysis, the chart below estimates how much reducing our electricity consumption would save us on electricity utility bills.

Annual Electricity Consumption (kWh)	Percent Reduction	Electricity Saved (kWh)	Our City's Blended Rate	Annual Electricity Bill Savings
16,500,000	10%	1,650,000	\$0.06 per kWh	\$100,000
	20%	3,300,000		\$200,000
	30%	4,950,000		\$300,000

To illustrate savings potential in more specific terms, we sampled a lower-performing building. The CitySmart Pilot Project staff helped us compare our building's electricity usage to the average of other fire / police stations in our climate zone. The chart below indicates that we can save considerably on our utility bills by moving to an average consumption level.

Building Name	Square Feet	Annual Electricity Cost		Annual Savings
		Our Building	Climate Avg	
Police Station	60,000	\$2.35/sq.ft.	\$0.85/sq.ft.	\$90,000

## Create Action Plan

In benchmarking our procedures against recognized "best practices," we confirmed a number of areas in which we want to improve our energy management methods. The appendix provides a complete breakdown of short- and long-term steps toward improving energy management in each focus area. However, the table below identifies the highest priority "next steps" for the City of Lancaster:

Focus Area	Target Audience	Priority Item
Planning	City Council	Ask the Public Works Committee to monitor monthly energy costs and provide strategic direction on energy performance goals.
Energy-Related Management	Energy Management Staff	Develop written design guidelines and minimum efficiency specifications for energy-consuming equipment for both new construction & renovation / improvement projects
Evaluation and Assessment	Facilities Staff	Define performance metrics for evaluating our future energy management successes
Funding and Procurement	Financial Decision-Makers	Develop a budget line item or defined process for budgeting energy-efficiency improvement opportunities

By continuing to refine our energy management practices at all organizational levels, we will ensure that we are getting the most out of our existing equipment and facilities. We will also position ourselves to identify, evaluate, and move forward with new energy efficiency investments on shorter timelines.

New construction, renovations, routine change-outs, and outdated and/or failing equipment all present opportunities to increase energy efficiency in our buildings. Unfortunately, many potential efficiency opportunities are left unrealized or

delayed considerably. When less efficient equipment is installed or left in place, we incur higher utility costs over the life of the equipment. By taking the “life-cycle cost” and “cost of delaying efficiency” into consideration during our project evaluations, we will equip ourselves to make sound financial decisions.

Working with the CitySmart Pilot Project, we have identified the strategies listed below for achieving energy efficiency. We will evaluate the feasibility of each strategy separately, and consider incorporating into written guidelines or minimum specifications for energy-consuming equipment. By having our own target design specifications, we will ensure that energy efficiency is always a consideration in our buildings.

Measure	Energy Efficiency Strategy
Lighting	25% improvement over the lighting power density (LPD) guidelines put forth by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1 2004
	30-40 foot-candles in office settings, per the guidelines of the Illumination Engineering Society of North America (IESNA) Lighting Handbook, 9 <sup>th</sup> Edition
	High-performance T8 lamps w/ premium efficiency ballasts in hallways, offices
	High-bay fluorescents (T5, T8) in bay areas, multi-purpose rooms, and other applicable areas
	Automatic lighting controls (occupancy sensors, automatics daylight controls, time clock controls) and adjustable lighting level strategies (Bi-level switching)
HVAC	System size closely matches the actual building loads, thus increasing operating efficiency, reducing operating costs, and extending equipment service life
	Improvement over minimum equipment efficiencies specified in ASHRAE 90.1 2004
	Usage of demand control ventilation
Roofing	ENERGY STAR®-labeled Cool Roof materials
	Increased insulation value on roofing systems
Window	Thermo pane, low-emissivity glass, thermal break frames

## Implement Action Plan

Consistent with the action plans above, we have identified specific energy reduction projects. The CitySmart Pilot Project helped us conduct walk-through energy audits at the Police Station and Recreation Center. We will investigate the projects listed below in more detail in the future; however for now we have identified several potential opportunities to incorporate energy efficiency into our organization. Appendix A lists these projects with capital costs calculated for each and the projects have been prioritized based on a cost benefit analysis.

Building(s)	Energy Efficiency Opportunity	General Description of Opportunity	Est Payback (Yrs)	Est 7-Year Savings Potential
City Hall	Upgrade electrical and mechanical systems	Overall replacement for systems as part of City Hall renovations project	5	\$80,000

Building(s)	Energy Efficiency Opportunity	General Description of Opportunity	Est Payback (Yrs)	Est 7-Year Savings Potential
Police Station	Upgrade Lighting	Replace existing fixtures with high-efficiency "Super T8" lighting systems	2.2	\$80,000
Police Station	Replace Motors	Replace existing motors with high-efficiency motors	4.9	\$12,000
Police Station	Add Variable Frequency Drives	Add variable frequency drives to the large motors to reduce consumption when not operating at full load	1.7	\$75,000
Police Station	Control Vending Machines	Add vending misers to beverage machines	1.8	\$1,400
Police Station	Reduce Heating	Control interior temperatures more closely, reduce reheat that causes high natural gas bills in summer	0.1	\$100,000
Recreation Center	Upgrade Lighting	Replace existing T8s with "Super T8" lighting and replace metal halides with high-bay T5 HO systems	3.0	\$20,000
Recreation Center	Control Gym Lighting	Add occupancy sensors to the high-bay T5 HO lighting systems	6.4	\$3,000
Recreation Center	Control Vending Machines	Add vending misers to beverage machines	1.4	\$1,400
Recreation Center	Add Roof Insulation	Apply foam roofing material to raise "R" value of roof, lowering both heating and cooling costs	5.2	\$60,000
Recreation Center	Replace Rooftop Units	When replacing units, replace current electric heating units with gas-fired equipment (\$25,000 is <u>only</u> to cover incremental cost for changeover)	4.1	\$42,000
Various City Buildings	Upgrade Lighting	Replace all T12 lighting in city buildings with "Super T8" lighting systems. Replace all existing metal halides with high-bay T5 HO systems.	<3.0	Significant Potential

In addition to the energy and maintenance cost savings that will result from a given project, PPL will pay us cash incentives to offset some of the implementation cost. We will contact them before implementing any projects to learn more about eligibility, incentive amounts, verification process, etc.

## Recognizing Achievements

In addition to participating in the CitySmart Pilot Project sponsored by PPL, we have already taken a number of steps to reduce our city's energy use:

Upgraded to more efficient fluorescent lighting & HVAC systems in many buildings  
Upgraded all our city traffic signals to LED lights  
We already observe over 50% of recognized best practices in energy management

Because of these and other previous initiatives, we scored highly in the following areas in our benchmarking results:

- ✓ In 2008, 7 out of 12 city buildings scored above average in the energy performance benchmarking process
- ✓ In 2008, our City Hall scored 64 and Southern Market Center scored 63 (on a scale of 1-100) using the EPA Energy Star Portfolio Manager tool

We anticipate that by implementing projects identified through this Energy Master Plan and adopting energy management best practices, we will continue to improve our energy performance and reduce expenditures, which will allow more of our budget to be spent where it should – improving our citizens' daily lives.

## Endorsement

Although we will seek approval of individual projects and expenditures separately, we request a review and endorsement of this plan. This will ensure that the Public Works Department has a clear understanding of the input, concerns, and support of the City Manager, City Council, and management.

### The following people contributed to this plan:

Charlotte Katzenmoyer – Director of Public Works  
Dave Schaffhauser – Facility Manager  
Doug R Connell – Utilities Supervisor  
Leslie Fordham – Public Arts Manager  
Donna Jessup – Operations Supervisor  
Patrick Hopkins – Business  
Pat Brogan – Chief of Staff  
John Holden – Conestoga Water Treatment Plant -Production Superintendent  
Robert Ruth – City Engineer / Deputy Director  
Mike Thomas – Susquehanna Water Treatment Plant Supervisor  
Jeff Madonna – Electrical Maintenance Supervisor  
Councilman Tim Roschel – Council person and IEW electrician

### Prepared and Submitted by:

\_\_\_\_\_ Date \_\_\_\_\_  
Charlotte Katzenmoyer, Director of Public Works

### Endorsed by:

\_\_\_\_\_ Date \_\_\_\_\_  
J. Richard Gray, Mayor

\_\_\_\_\_ Date \_\_\_\_\_  
Louise B. Williams, City Council President

\_\_\_\_\_ Date \_\_\_\_\_  
Tim J. Roschel, Public Works Committee Chair, City Council



**Funding & Procurement**

Finding funds to improve existing buildings is always a challenge. Energy reduction projects, however, are often cost-effective and can even be self-funding. Nevertheless, we also understand that many funding or financing options for energy projects may have a level of complexity or risk not ideally suited for our city buildings.

**Existing Strengths**

- We have funding available for energy-efficiency improvement projects in this year’s budget (through flexibility in capital budget as needed)
- We incorporated the cost of not doing the project (e.g. maintaining the status quo) into our calculations when evaluating energy-efficiency projects (LED lighting retrofit project)
- We have management support to identify and install energy efficiency-improvements quickly (if justified)
- We have departmental criteria and authority for approving improvement projects (eg. Less than one year payback)
- We have a list of potential vendors to perform energy assessments and for other energy-related products and services

**Short-term Action Items**

- Take full advantage of the available incentive dollars through PPL Energy Efficiency Programs to make our energy improvement projects even more cost effective
- Establish a budget line item or a defined process for budgeting energy-efficiency improvement expenditures
- Establish a strategic plan for budgeting energy-efficiency improvements for the next 2-5 years

**Long-term Action Items**

- Continue to investigate other funding options beyond using City Council approved capital budgets (such as grants, loans, performance contracts, lease purchase agreements, etc)
- Establish an Energy Conservation Fund or another revolving mechanism to ensure that funds are reinvested into additional energy-efficiency improvements

## Planning and Decision-Making

We understand that inefficiency is often the result of low priority for building and operating high-performance buildings. We strive to place more importance on our planning regarding new building design, energy reduction projects in existing buildings, and our daily operational activities that impact energy performance.

### Existing Strengths

- Our City Administration and City Council has made reducing energy costs a stated priority
- We have made recommendations to the Mayor and City Council for energy performance goals
- We have a list of energy-efficiency improvements completed at our city within the last five years
- We have identified additional energy improvement opportunities, but not yet implemented them

### Short-term Action Items

- Develop a written energy action plan for the next 1-5 years that includes performance goals, benchmarks, and other metrics regarding energy use and costs
- Ask the City Administration and/or City Council to monitor monthly energy costs
- Ask the City Administration and/or City Council to provide written strategic direction for energy performance goals
- Establish a written energy policy or mission statement (usually <1 page)
- Determine the financial criteria (payback, ROI, IRR) to consider when making decisions on energy-efficiency improvements

### Long-term Action Items

- Have a regular review of goals, plans, and successes to date compared to the plan
- Determine the non-financial criteria (e.g. lighting quality, IAQ, environmental) to consider when making decisions on energy-efficiency improvements
- Establish written guidelines for building operations (such as building usage, operating hours, personal refrigerators/heaters and plug loads), and enforce them regularly

## Communication and Coordination

Energy costs are a significant expenditure and some portion is a controllable cost. To successfully manage energy costs, the Public Works department needs to communicate regularly and effectively with the Mayor, City Council, and other Department Heads.

### Existing Strengths

- Our departmental, facility, administration, and senior city managers view energy costs as a controllable expense
- We provide reports to our Department Heads on energy use and cost at least quarterly
- Our citizens and taxpayers have taken an interest in the energy efficiency and/or environmental impact of our city buildings

### Short-term Action Items

- Provide reports to the Mayor and/or City Council on energy use and cost at least quarterly (for buildings, not just wastewater treatment plants)
- Setup regular meetings between our facilities staff and City management staff to discuss energy performance
- Ensure that energy use, costs, and improvements are routinely addressed at staff meetings (e.g. Department Heads, Executive Staff)

### Long-term Action Items

- Communicate the importance of managing energy costs and the priority for energy performance to building-based staff (e.g., Department Heads, managers, employees, custodians)
- Establish an Energy Awareness Program for Department Heads, custodial staff, and/or building occupants

## Evaluation, Assessment, and Monitoring

We need to establish a baseline and maintain ongoing benchmarks of how our buildings perform so we can determine the value of making improvements. This will allow us to recommend priorities for building improvements in an environment of limited resources (funding & staff).

### Existing Strengths

- We know: 1) the energy operating cost of each building, 2) how each building ranks by various energy performance metrics, 3) how each building compares both within and outside our city
- We have prioritized facilities with the highest energy use for assessment and improvement
- We review utility bills for useful information on energy use and costs
- We know the systems (examples: chillers, boilers, kitchens, natatorium) within our facilities that are the highest cost to operate
- We have conducted building “walk-through” opportunity-assessment surveys to identify energy saving opportunities in our facilities

### Short-term Action Items

- Evaluate the building performance benchmarking reports from the CitySmart Pilot Project that compare our buildings to others in our climate zone and across the U.S.
- Establish Key Performance Factors for building operations
- Define performance metrics for evaluating our future energy management successes
- Monitor daily or monthly energy use to look for variations from the normal energy use, and then analyze and resolve the causes of those variations

### Long-term Action Items

- Revisit the CitySmart Pilot Project best practices questionnaire in 2010 and beyond to evaluate and identify additional actions the city can take to improve our energy performance
- Track energy use for each large energy-using system for multiple years
- Complete additional energy audits on our larger facilities as needed
- Conduct an investment-grade audit in a facility when necessary

## Energy Management Processes

Given the importance, complexity, and cost of energy utilization in the city, we strive to have management policies and procedures that promote effective energy management.

### Existing Strengths

- We commission new equipment and facilities with testing and verification of performance at startup (as we did at the new Police Station)
- We have written performance specifications and Operating & Maintenance procedures/manuals for each major energy-using system (example: chillers, boilers)
- We monitor and adjust system operations when occupancy, demands, or loads are reduced (examples: temperature setbacks, lighting controls)

### Short-term Action Items

- Specify that office lighting levels be at 30 - 40 foot-candles for retrofits and new construction to ensure that rooms are not overlit
- Strive to purchase higher efficiency (15 or 16+ SEER) A/C equipment when replacing existing units
- Perform "retro-commission" of older & high-operating cost systems over last few years (e.g. every 5-7 years)
- Develop written design guidelines and minimum efficiency specifications for energy-consuming equipment for renovation and improvement projects
- Develop written design guidelines and minimum efficiency specifications for energy-consuming equipment for new construction

### Long-term Action Items

- Consider adopting the following operating practices: 1) Establish HVAC set points to "lock out" thermostats, 2) Charge for personal use refrigerators, microwaves, etc, 3) Use software to turn off computers not in use
- Research additional opportunities for improving energy performance, such as installing LED signs, ENERGY STAR roofs, increased levels of insulation, occupancy sensors, more effective control systems, solar film for windows, solar water heating systems for large domestic hot water loads, and solar panels for electricity
- Develop a process for continuous learning about new energy-efficiency technologies and best energy management practices

## Personnel and Skills

Our city must employ personnel with adequate time and appropriate skills to manage energy performance and costs. Moreover, our staff needs to have the responsibility, accountability, incentives, and time to consistently tackle the challenges of effective energy management.

### Existing Strengths

- Our city employs personnel that have the skills to identify opportunities and manage energy use effectively
- Our energy management personnel have the required authority and management relationships to perform the job effectively
- Our city has clearly defined job performance and accountability for our key energy management personnel
- Our city supports opportunities for our energy management personnel to receive awards and industry recognition for exemplary accomplishment

### Short-term Action Items

- Identify ways that we can increase the amount of time that our energy management personnel have to focus on improving buildings' energy performance
- Make a single individual responsible for the energy performance of all our facilities
- Assign energy management responsibilities to building-based personnel (example: janitorial, energy coordinator, Dept. Heads)

### Long-term Action Items

- Provide training and advancement opportunities for our key energy management personnel
- Encourage our energy management personnel to regularly attend industry training and/or conferences outside the city
- Provide recognition and/or incentives for exemplary energy performance for energy management personnel (awards, prizes)

## Priority and Incentives

We want to fully utilize all technical support, incentives, rebates, grants and other external resources that are available. Moreover, we will ensure that we understand the city's priorities, communicate with all stakeholders related to energy management, and address priorities in our planning and actions.

### Existing Strengths

- Our city has prioritized the need to improve energy efficiency and reduce costs
- Our city has identified the personnel that must initiate action for energy efficiency to occur
- Our city has identified the personnel that must endorse and approve action for energy efficiency
- The personnel that are involved with energy efficiency at our city have clear incentives to act toward reducing energy costs
- We have applied for or received financial assistance from outside sources in the last five years

### Short-term Action Items

- Take full advantage of the available incentive dollars through PPL Energy Efficiency Programs to make our energy improvement projects even more cost effective
- Work to get qualifying buildings labeled as ENERGY STAR by the U.S. EPA
- Provide the City Council with information in advance regarding upcoming needs and targeted projects

### Long-term Action Items

- Establish a formal process to track the availability of incentives and financial/technical assistance for energy projects, taking maximum advantage of such opportunities
- Apply for recognition for energy performance practices/improvements