

City of Broken Arrow Energy Master Plan

September 8th, 2011

City of Broken Arrow Efficiency Opportunity

10% Energy Reduction for
Facilities Benchmarked
through the PSO Model
Cities Program =

- ✓ \$43,000 in annual energy cost savings
- ✓ Utility-paid cash incentives for implementing energy efficiency projects
- ✓ Improved usability / comfort in our offices classrooms, and other city buildings
- ✓ Environmental benefits equivalent to taking 78 passenger vehicles off the road each year
- ✓ Positive public relations in the community, including press releases and incentive check presentations for any projects completed in the Model Cities Program

Our Mission

Energy costs are an enormous expense for our nation's cities; energy is the second largest operating expense for the City of Broken Arrow. In order to significantly reduce these costs and improve energy efficiency, the City of Broken Arrow is participating in the PSO Model Cities Program. The no-cost program will assist in identifying energy efficiency opportunities in our city buildings, and help us to:

Improve Learning Environments

Reduce Energy Expenditures

Boost the Local Economy (through upgrade projects)

Enhance Community Relations

The program provides technical and financial assistance for efficiency upgrades. Whether we retrofit an existing building or incorporate energy-efficient technologies into new construction, we will identify and implement cost-effective projects that will allow us to use energy more efficiently. In addition, the PSO Model Cities Program will help us form a 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 2011 and beyond.

Strategies for Improvement

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

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 energy efficiency improvement projects but have not yet implemented them (Examples: Light, HVAC, and Controls).
- ✓ PSO will pay us cash incentives for incorporating energy efficiency into equipment replacement/installation (e.g., lighting, HVAC) at our facilities by 10/31/2011 (all projects must be post inspected by this date)

Current Assessment

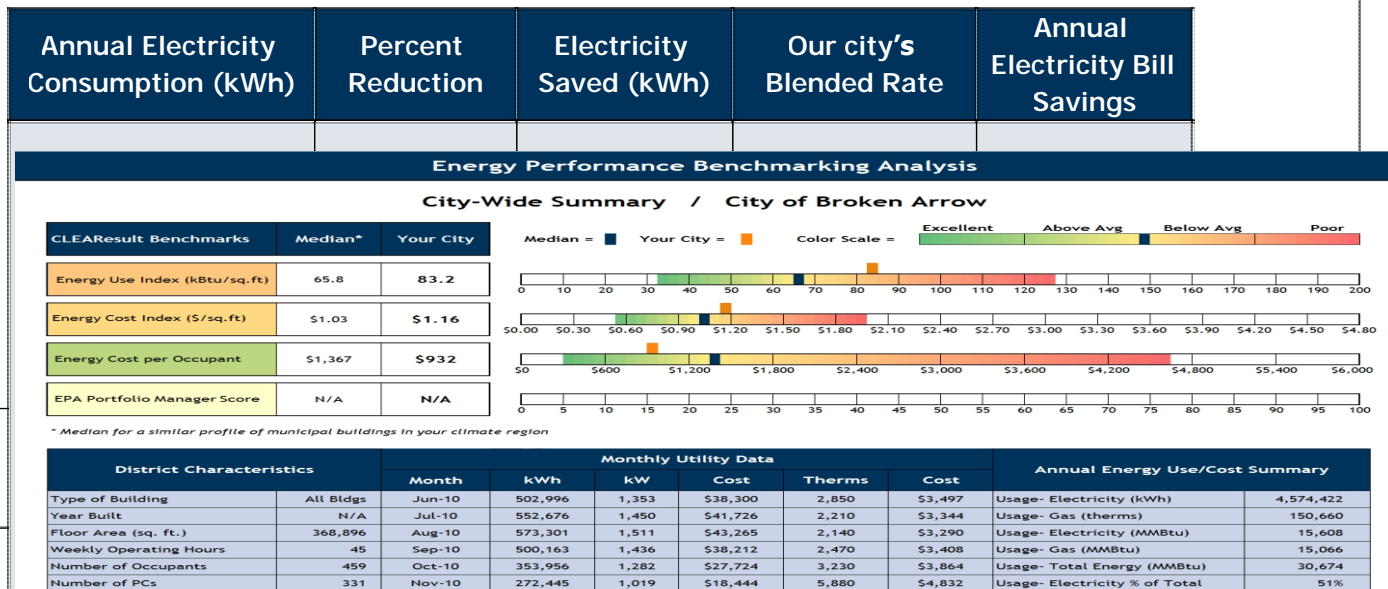
Based on the utility bills and building information we provided, the Model Cities Program compared our energy use to other city facilities in Oklahoma and the U.S. The benchmarking process revealed that our buildings are performing below average overall. More detailed assessments of each individual building can be found in the Benchmarking Report Appendix.

- ✓ Our city is paying 13 cents per square foot more than the median, which costs us approximately \$49,000 in annual energy costs.
- ✓ By reducing our current electricity consumption by 10 percent, we could save an estimated \$32,000 in annual electricity bills at the buildings 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 Management, and Personnel & Skills. Strengths in each category, along with 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 24 buildings that we included in the benchmarking analysis, the chart below estimates how much reducing our electricity consumption would save us on electricity utility bills.



		20%	914,884			\$64,041
		30%	1,372,326			\$96,062

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 Broken Arrow:

Focus Area	Target Audience	Priority Item
Communication and Coordination	Energy Management/ Facilities Personnel	Establish an Energy Awareness Program that includes participation for staff and custodial staff. Award performance and create accountability among peers.
Evaluation and Assessment	Management, City Council, Energy Management/ Facilities Personnel	Develop an Energy Management Committee that meets quarterly to discuss progress, brainstorm ideas, help support the Energy Awareness Program and prepare reports for City Council review.
Funding and Procurement	Management, City Council, Energy Management/ Facilities Personnel	Explore setting up a conservation fund to invest a portion of achieved energy savings into additional energy management measures or training.
Energy Management	Energy Management/ Facilities Personnel	Develop and enforce written guidelines that outline operating rules (such as building usage, operating hours, personal refrigerators/heaters, and plug loads)

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 the energy efficiency of 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 Model Cities Program, 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
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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 th 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

Operation and Maintenance

Attention to operation and maintenance provides the most rapid means of reducing consumption and costs in most buildings. Not only do correct procedures aid in the proper utilization of the facility's equipment (heating, cooling, ventilation, etc.) and the energy involved, but they also help to maintain the attractiveness and increase the longevity of the building itself. We have identified the O&M strategies listed below to help us achieve our energy efficiency goals.

O&M Opportunities	
Off-Hour	• First round savings when building is unoccupied
	• After-hours, Weekends, Holidays
Computers & Office Equipment	• Computers
	• Monitors
	• Printers
	• Scanners
Unnecessary Lighting	• Offices
	• Common areas
	• Display
	• Exterior
	• Photocell maintenance

O&M Opportunities	
HVAC Systems	• Temperature Settings
	• System Scheduling
	• Ventilation
	• Sensor Locations
	• Obstructions to airflow
	• System maintenance
Exhaust Fans	• Meeting Rooms, Bathrooms, Maintenance Closets
	• Off at night
Door & Window Operation	• Blinds closed at night
	• Close doors and windows
	• Weather-stripping
Water Usage	• Drips and Leaks
	• Temperatures
	• Aerators

Incentives Available

In addition to the energy and maintenance cost savings that will result from a given project, PSO will pay us cash incentives to offset some of the implementation cost. The incentive amounts from PSO are determined by the number of kilowatts saved as indicated below, subject to some limits (which we do not expect to exceed) for all projects *completed by October 31, 2011*.

Energy Efficiency Measure(s)	Amount per kW & kWh Saved
Energy Efficiency Lighting, Premium Efficiency Motors, High-Efficiency Heating & Cooling Equipment, and	\$235/kW \$0.046/first year kWh

Endorsement

concerns, and support of the City Mayor, City Council, and management.

The following people contributed to this plan:

Dave Wooden, City Manager	Steve Arant, Street/Storm Water Director
Kenneth Schwab, City Engineer	Tracy Lee, PD Chief's Office
Jeff VanDolah, FD Chief	Jill Norman, Councilwoman
Scott Esmond, Parks Director	Richard Carter, Councilman
Michael Skates, Development Services Director	Jonnie Parks, Councilman
Tom Caldwell, Finance Director	Norman Stevens, Economic Development Director
Paul Rhodes, Water/Sewer Director	Mike Lester, Mayor
Brandon Berryhill, PD Deputy Chief	Craig Thurmond, Vice Mayor
Lee Zirk, General Services Director	

Prepared and Submitted by:

Date _____

Dave Wooden, City Manager

Endorsed by:

Date _____

Mayor Mike Lester, Ward 3

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

- We have management support to identify and install energy efficiency-improvements quickly (if justified)
- We have identified the individual who is driving our energy efficiency efforts
- 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
- Prioritize the need to improve energy efficiency and reduce costs in our City.
- Shift the cultural mindset of our administration, senior managers, and facilities staff to view energy costs as a manageable/controllable expense

Long-term Action Items

- Have a regular review of goals, plans, and successes to date compared to the plan
- Establish a written energy policy or mission statement that will help remind staff and community members that energy management is a priority for our City
- Explore the feasibility of hiring an energy manager or provide a current staff member the necessary tools, time and authority to be responsible for the energy performance of all our facilities

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

Short-term Action Items

- Evaluate the building performance benchmarking reports from the PSO Model Cities Program that compare our buildings to others in Oklahoma and across the U.S.
- Ask the Mayor, City Manager, and/or Council to monitor monthly energy use and costs
- 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
- Prioritize facilities with the highest energy use for assessment and improvement
- Conducted building "walk-through" opportunity-assessment surveys to identify energy saving opportunities in our facilities

Long-term Action Items

- Conduct inventory surveys to list all energy-using equipment in our facilities
- Conduct an investment-grade audit in a facility when necessary
- Evaluate the connection between building energy efficiency and building usability (examples: comfort, indoor air quality, lighting levels, noise)

Funding and 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.

Existing Strengths

- We have funding available for energy efficiency improvement projects in this year's budget

Short-term Action Items

- Take full advantage of the available incentive dollars through the 2011 PSO Model Cities Program 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
- Calculate and compare the cost of not doing the project (e.g. maintaining the status quo) when evaluating the value of energy-efficiency projects

Long-term Action Items

- Investigate other funding options beyond using City Council approved capital budgets (such as grants, loans, performance contracts, lease purchase agreements, etc.)
- Establish a strategic plan for budgeting energy efficiency improvements for the next 2 5 years
- Establish criteria and/or authority for approving improvement projects such as less than a year payback, or up to a specified dollar limit
- Compile a list of potential vendors to provide energy-related assessments, products and services

Communication and Coordination

Energy costs are a significant expenditure and some portion is a controllable cost. To successfully manage energy costs, the facilities department needs to communicate regularly and effectively with the City Manager, Mayor, City Council Members and other departments.

Existing Strengths

Short-term Action Items

- Provide reports to our Senior Management on energy use and cost at least quarterly
- Establish an Energy Awareness Program for all staff members including custodial staff

Long-term Action Items

- Compile a list of energy-efficiency improvements completed at our city within the last five years

Personnel and Skills

Our city must employ personnel with adequate 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

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

Long-term Action Items

- Create clearly defined job performance criteria and accountability for our key energy management personnel
- Provide training and conference opportunities related to energy management for our key energy management personnel
- Provide recognition and/or incentives for exemplary energy performance for energy management personnel (awards, prizes)

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 monitor and adjust system operations when occupancy, demands, or loads are reduced (examples: temperature setbacks, lighting controls)

Short-term Action Items

- Specify that classroom lighting levels be at 30 - 40 foot-candles for retrofits and new construction to ensure that rooms are not over-lit
- Strive to purchase higher efficiency (15 or 16+ SEER) A/C equipment when replacing existing units
- Develop written design guidelines and minimum efficiency specifications for energy-consuming equipment for new construction, renovations and improvement projects
- Commission new equipment and facilities with testing and verification of performance at startup preferably by a third party
- Perform "retro-commission" of older & high-operating cost systems over last few years

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
- Require contractors to provide us with written performance specifications and operating and maintenance procedures/manuals for all major energy-using systems (example: boilers, chillers)
- Establish written guidelines that outline operating rules (such as building usage, operating hours, personal refrigerators/heaters and plug loads), and enforce them regularly