Energy Efficiency for Cities

By: Jonathan Fisk

[Editor's Note: The issue of energy policy in Kansas has been at the forefront of debate in the Kansas Legislature this year. Regardless of the outcome of the particular issue involving the proposed coal plants in western Kansas, we believe that the overall issue of a statewide energy policy will be critical for a number of years to come. To that end, we are publishing a series of articles over the next few months which are intended to be informational in nature regarding the issues of production types, transmission, environmental impacts, and energy efficiency.]

Thomas A. Edison remarked that "Anything that won't sell, I don't want to invent. Its sale is proof of utility, and utility is success." In order for energy-efficiency efforts to be successful, its utility must be demonstrated to the public. Because consumers of energy are often centered in cities, local governments are taking the lead in encouraging more efficient use of energy resources. Effective local action, however, will require partnerships and collaboration with federal and state governments and their stakeholders.[1] In response, cities are, for example, developing innovative ways to improve energy efficiency in public and private buildings.

Cities

In order to understand the ways in which cities are addressing energy and related environmental issues, it is also important to recognize the other forces changing the modern city. The modern American city is a reflection of social, economic, and technological forces. These forces are also pushing cities to take action to improve the environment.

The economics of energy are reshaping the modern American city. In other words, the "well-being" of a city is represented by more than just its financial health. A city with polluted air and water is not as attractive as a city with clean air and water. The growing concern over global warming has also prompted a call to action to "improve the environment and reduce consumption of natural resources."[2] As such, energy economics and ecological concerns are changing the ways that municipalities approach improving their environment and reducing their energy consumption.

Many cities are looking for ways to reduce their "carbon footprint" or their total greenhouse gas emissions. Besides improving the environment, reducing energy consumption often leads to cost savings for taxpayers. Many cities are adopting the U. S. Mayors Climate Protection Agreement as a way to reduce their "carbon footprint." The agreement includes 850 American cities, representing all 50 states, including 11 Kansas communities:

City	Population (Certified as of 2007)
1. Fairway	3,832
2. Lansing	10,680
3. Lawrence	89,852
4. Merriam	10,790
5. Mission	9,743
6. Prairie Village	21,422
7. Roeland Park	6,951
8. Shawnee	59,958
9. Topeka	122,642
10. Westwood Hills	1,478
11. Kansas City, MO	363

The Agreement

The U.S. Mayors Council agreement calls for federal and state governments to enact policies and programs to reduce global warming pollution levels to 7% below 1990 levels by 2012. The group also supports legislation that would include timetables and a "cap and trade" system for emitting industries which requires members to meet the Kyoto Protocol targets. A cap and trade system already regulates sulfur dioxide emissions.

The following includes a number of tactics that local governments can use to reduce their energy consumption. Immediately, cities should inventory their global warming emissions and establish reduction goals as part of a comprehensive consumption-reduction plan. This should be done at the local level and should include relevant stakeholders (municipal leadership, chamber of commerce, major employers, citizen groups, state lawmakers).

Cities are also encouraged to adopt and enforce land-use policies known as "smart growth." Smart-growth policies are aimed at reducing urban sprawl, preserving open space, promoting walking and bike friendly communities, and reducing traffic congestion. Additionally, these policies can lead to the creation of new energy-smart and compact-design housing options, walkable neighborhoods, and distinct and attractive neighborhoods. These policies reduce costs. According to the Brookings Institution, compact compared to current growth patterns could reduce 25-year road building expenses by 12-26%; sewer/water outlay costs by 6-8%; and maintenance and service-delivery (total budget savings) outlay by 3.7%.[3] Municipal leaders might also focus on using green tags, developing "green" economic-development strategies, and evaluating and improving pump efficiency in water and wastewater operations. Finally, many cities are increasing and sustaining "healthy urban forests" and promoting tree planting.

Cities might also consider the adoption of policies favorable to the use of alternative, earth-friendly energy sources. Many cities, for example, are investing in waste-to-energy technology and other eco-friendly production methods (See *KGJ* April 2008 Edition). These initiatives may be used in conjunction with practices that increase energy efficiency of buildings, lighting, and conservation. In this regard, cities may purchase and run energy star equipment and pass building codes modeled after the U.S. Green Building Council's LEED program or similar policies. Also, the agreement addresses the use of fleet

vehicles. Municipalities may work toward decreasing the environmental impact of their fleet by improving the fleet's average fuel efficiency, reducing the number of city vehicles, minimizing engine idling, and increasing the use of bio-diesel vehicles.

The agreement also calls upon cities to increase recycling rates. Such a strategy can be very cost effective in view of increasing landfill costs. Recycling rates are likely to increase if the costs of landfills continue to increase. Finally, participating cities are undertaking efforts to educate the public, schools, professional associations, businesses, and industry about the effects of global warming and pollution. Most recycling programs collect ferrous metals, non-ferrous metals, glass, organics, paper, and plastics. In 2005, the State of Kansas had a recycling rate of 23% compared to a national rate of 30.4%.[4]

Energy Conservation Possibilities for Public/Private Buildings

The following is a summary of the Residential Energy Conservation Ordinance (RECO) of Berkeley, California. Although this summary is not an endorsement of the law, it points to some of the potential savings available to those who follow the standards. (As taken directly from RECO's online compliance guide[5]):

a) Toilets:
   i) 1.6 gallon/flush or flow reduction devices;
      (1) Annual Savings: $3.50 on water bills.
b) Showerheads:
   i) 3.0 gallon/minute flow rate
      (1) Annual Savings: $10.00 - $52.00 per unit installed.
c) Faucet aerators:
   i) 2.75 gal/minute flow rate for kitchens and bathrooms;
      (1) Annual Savings: $4.00/year per unit installed
d) Water Heater Blankets:
   i) Insulation wrap of R-12* value.
      (1) Annual Savings: $12.00 - $66.00
e) Hot & Cold Water Piping:
   i) Insulate the first two feet from the heater to R-3 value;
      (1) Annual Savings: $10.00 - $70.00.
f) Hot Water Piping in Pumped, Re-circulating Heating Systems:
   i) Insulate all pipes to R-3 value.
      (1) Annual Savings: $10.00 - $70.00
g) Exterior Door Weather-stripping:
   i) Permanently affix weather stripping and door sweeps or door shoes.
      (1) Annual Savings: $10.00 - $70.00 per door
h) Furnace Duct Work:
   i) Seal duct joints, add insulation wrap to R-3 value;
      (1) Annual Savings $88.00+
i) Fireplace Chimneys:
   i) Must have dampers, doors, or closures.
      (1) Annual Savings: $165.00+
j) Ceiling/Attic Insulation:
   i) Insulate to R-30 value or greater.
      (1) Annual Savings: $280.00

The ordinance especially notes the potential cost savings of lighting. It suggests replacing incandescent lighting with compact fluorescent lamps (CFL). Although these bulbs have higher up-front costs of $10-15, they last longer and use less energy. In fact, they often pay for themselves within one year, assuming today's electrical rates. More specifically, the RECO notes that if a city replaced a 60-watt standard bulb, it will likely save $30 in energy costs and reduce its carbon footprint by approximately 440 pounds of greenhouse gas emissions.

Block Grant Program

On December 19, 2007, President Bush signed into law the Energy Independence and Security Act (Public Law No 110-140). Although the Act addressed many issues outside the scope of this article, it did include a new $10 billion Energy Efficiency and Conservation Block Grant program modeled after the Community Development Block Grant Program. The energy block grant provides financial support to communities seeking to adopt or improve energy-efficiency programs. Typical of these programs are energy-efficiency efforts in public and private buildings and residences, energy audits, fuel conservation, building retrofits, the adoption of innovative planning and zoning policies that adopt "smart growth," and the use of alternative energy sources.

To be eligible, cities must have a population of at least 35,000 or be one of the 10 most populous cities in the state. The law appropriates $2 billion annually for five years (2008-2012), of which 68% is reserved for local governments (cities and counties), 28% for states, 2% for Indian tribes, and 2% for competitive grants to local governments not based on eligibility requirements.[6]

Kansas Energy Efficiency

Public policies that promote energy efficiency, reduce utility expenses, and benefit economic-development efforts have the potential to stimulate demand for local business and encourage investment in local communities. For example, city or county initiatives may lead to an increase in the sale of energy-efficiency technologies in their communities and they would then collect additional sales tax revenues. Additionally, if citizens experience a reduction in their utility costs, their discretionary income will increase, thereby boosting local economies.[7] Finally, the promotion of energy-efficiency technologies tends to be inexpensive and poses little risk to policymakers.

Currently, the State uses the 2006 version of the International Energy Conservation Code (IECC 2006) as its standard for new commercial and industrial structures (see K.S.A. 66-1227). The law, however, does not provide an enforcement provision. As a traditional home-rule state, Kansas generally allows cities and counties to enact regulations when state regulations are not uniformly preemptive.[8] As such, a number of cities have also adopted a variety of local building codes that include a varying degree of enforcement and/or inspection provisions.

FCIP

The Facilities Conservation Improvement Program (FCIP) is the state's strategy to encourage large-scale improvements in the energy efficiency of public buildings. Specifically, it authorizes public agencies (cities, counties, schools) to enter into energy-saving performance contracts. Generally, the agency secures tax-exempt financing and a low interest rate during the course of the loan. Specifically, "these energy savings leases are structured as tax-exempt in order to benefit public agencies. The interest paid by the Lessee is exempt from federal and Kansas income tax." The tax savings experienced by the Lessor is passed on to the Lessee in the form of reduced interest rates that may be as much as 3-5% points lower than taxable commercial leases." Larger projects (in excess of $5 million) are financed through bonds.

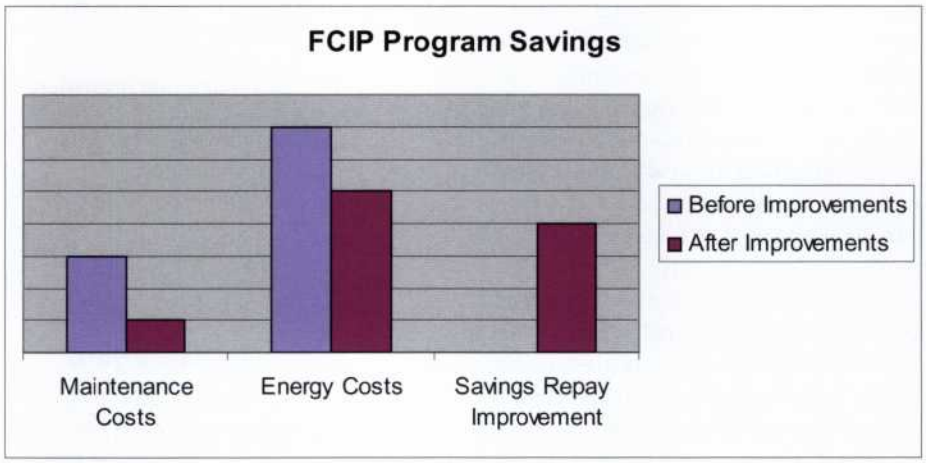
A typical FCIP program typically follows a template. A public agency and an energy-service company (ESCO) enter

into an agreement. The KCC (Kansas Corporation Commission) offers a standard agreement to four ESCOs, or the agency can negotiate directly with an ESCO. During negotiation, the ESCO will likely inspect the building and identify areas in which energy efficiency can be improved. The ESCO will eventually present to the public agency a package of improvements and their related costs. The costs, however, should be covered by the savings identified by the energy audit.

The initial funding for a project can generally be secured in one to three weeks. The energy-savings contract also guarantees the participating agency that savings will "meet or exceed" annual project costs. The ESCO is obliged to pay any difference. The contract length is usually between 10 and 15 years.

The graphic[9] to the right breaks down costs typically associated with building. Of note, the reader should notice a significant decrease in energy costs. It is important to note that, since this program is funded through energy savings, no public net expenditures are made, leading to many of these projects being undertaken during tight budget years. The ESCO is also obliged to provide the agency with training and long-term maintenance services so as to keep operation costs low. Simply put, these programs benefit public institutions. Public buildings consume electricity, and, by reducing their consumption, the overall demand of electrical supply is reduced. As a result, areas of grid congestion are slightly reduced, the need for new generation decreases, and the agency is able to spend less on utilities. Moreover, by consuming less, natural resources such as coal, oil, and natural gas are saved, and the quality of the environment improves.

Normally, projects fall into one or more of these areas: interior and exterior lighting retrofits, occupancy sensors, LED exit sign installations or retrofits, HVAC system upgrades or retrofits, conversion to variable air volume systems, fan and pump improvements or replacements, ground or water source heat pumps, variable speed motor drives, chiller replacements, cooling tower retrofits, heat recovery systems, boiler controls improvements, energy management/ building automation control systems, low water using toilets, urinals, low-flow aerators and showerheads, window retrofits, building insulation, on-site generation, motor replacements, and meter installation.



Despite the broad benefits listed above, the biggest beneficiaries are the organization's stakeholders. The public will enjoy services made possible in part by more-efficient, reliable, and newer technology. Employees will experience better lighting and air quality. Improvements in employee productivity and morale will likely follow. Fewer dollars will be needed for maintenance and upkeep at public buildings, likely making elected officials happy. In fact, many governing bodies can use these savings for other projects or tax relief.

The KCC found that many buildings experienced reductions of 15% to 35% in their utility costs. The KCC also estimated that the program saves $10 million annually for Kansas. During this time, approximately 22 million square feet of public building space has undergone ESCO improvements worth between $85 million and $110 million.[10]

Energy Savings

Many local governments are turning to LEED design and construction in an effort to reduce their energy costs and carbon emissions. The Leadership in Energy and Environmental Design (LEED) Green Building Rating System, administered by the U.S. Green Council, is an independent organization that oversees and certifies that a building meets specific environmental and sustainability goals and performance standards. It measures six areas of sustainability: "sustainable sites; water efficiency and/or usage; energy and atmosphere; materials and resources; indoor environmental quality; innovation and design process."[11] Through a point-awarding system, LEED classifies buildings into four progressive levels of certification: certified, silver, gold, and

Certification Fees	< than 50,000 Square Feet	50,000 - 500,000 Square Feet	> than 500,000 Square Feet
New Construction (Commercial Interiors, Core and Shell, and Schools)	Fixed Rate	Based on Sq. Ft.	Fixed Rate
Design Review			
Members	$1,250.00	$0.025/Sq. Ft.	$12,500.00
Non-Members	$1,500.00	$0.03/Sq. Ft.	$15,000.00
Construction Review			
Members	$500.00	$0.01/Sq. Ft	$5,000.00
Non-Members	$750.00	$0.015/Sq. Ft.	$7,500.00
Initial Certification Review			
Members	$1,250.00	$0.025/Sq. Ft.	$12,500.00
Non-Members	$1,500.00	$0.03/Sq. Ft.	$15,000.00

https://www.usgbc.org/ShowFile.aspx?DocumentID=1992

platinum. Also, the building must meet certain prerequisites before certification can be achieved.

LEED buildings cost more. The following table[12] shows the additional costs (costs additional to construction) of LEED certification. Besides these costs, the owner of the building should expect higher construction and related costs with the project. For example, just to register the building is costly: LEED members are charged $450.00, and non-members are charged $600.00

Reduced Energy Use in Green Buildings as Compared with Conventional Buildings

	Certified	Silver	Gold	Average
Energy Efficiency (above standard code)	18%	30%	37%	28%
On-Site Renewable Energy	0%	0%	4%	2%
Green Power	10%	0%	7%	6%
Total	**28%**	**30%**	**48%**	**36%**

Source: USGBC, Capital E Analysis

LEED FACTS *(Taken from USGBC State and Local Government Toolkit):*

- LEED has certified more than 1,325 projects and registered more than 10,300 projects;
- The United States Green Building Council reports that in 2008 the market for "Green" buildings and services is more than $12 billion;
- LEED reports that approximately 4 billion square feet of commercial structures are certified as meeting LEED standards;
- A quarter of LEED-certified projects are owned by local, state or the federal government;
- Every state has a LEED project, with 28 states adopting as its building code;
- More than 120 local governments have adopted LEED as a building code;
- The USGBC reports that, by cutting energy use by 30%, an agency can save nearly 50 cents per square foot;
- LEED buildings reduce operation and maintenance costs by 20% during the building's lifetime; and
- A Carnegie Mellon University study found that employee productivity increases 7% when buildings use better lighting control.[13]

The table at the top right uses LEED buildings standards to demonstrate the potential energy savings. It ranges from Certified to Gold, with Gold being the highest standard. It should be noted that, although certification is often expensive, energy-efficiency savings can be experienced. Each percentage point represents dollar savings.

Energy Efficiency Case Study[14]

The benefits of energy efficiency are environmental and financial. Perhaps this is best exemplified by examining Ann Arbor's Energy Fund. Beginning in the early 1980s, the City's energy plan called for conservation and improved efficiency. To this end, the City created and uses a municipal energy fund to fund improvement in municipally owned buildings. The City's experience demonstrates that energy efficiency can save money for cities. Initially, the cities invested $500,000 over five years to the fund and, through savings, it refills the fund annually. The city reports that the investments usually pay for themselves within 3 to 5 years, which has eliminated the need for further appropriations (after 2003).

The City's energy-related expenses are significant. The City owns approximately 60 facilities which have an annual energy bill of $4.5 million. However, the City found its $100,000 annual appropriation to be sufficient for it to finance energy-saving opportunities. The fund has paid for LED traffic and pedestrian signals, parking garage lights, street light improvements, and, in other cities, Christmas trees. Moreover, it has financed a new boiler, two electric vehicles, and solar demonstration projects. These efforts saved Ann Arbor during the 1999-2000 fiscal year nearly $20,000. Of that amount, more than $15,000 was re-invested in the energy fund that was made available the following year. By the end of the five-year cycle, a total of $79,400 was placed back into the fund. Finally, through this initiative, the City reduced its annual carbon dioxide emission by an average of 980 tons.

About the Author

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14 http://www.c40cities.org/bestpractices/energy/annarbor_fund.jsp