Energy Efficient Cities Initiative

GOOD PRACTICES IN CITY ENERGY EFFICIENCY

Ann Arbor, Michigan (USA) – Municipal Energy Efficiency Fund

Project title	Ann Arbor Municipal Energy Efficiency Fund
Sector(s)	Buildings and lighting
Type of project	Energy Efficiency Financing
City and country	Ann Arbor, Michigan, USA
City population	113,934 (2010)
Capital cost/initial investment	US$500,000
Total energy reduction	10.7 GWh cumulative savings over 10 years
Project status	Active

Project Summary

With the establishment of a long-term Municipal Energy Efficiency Fund, the City of Ann Arbor was able to overcome the lack of readily available energy efficiency (EE) financing and to demonstrate that municipal governments can play a leadership role in showcasing the value and benefit of EE to its citizens and communities. Savings estimates for projects completed in 10 years (1998-2008) demonstrate that these projects have cumulatively resulted in almost US$0.86 million in energy cost reductions, 10.7 GWh in energy savings, and approximately 8,000 tonnes of CO_2e. These projects have also improved the comfort and appearance of city facilities.

In 1988, Ann Arbor issued a US$1.4 million bond to finance various EE projects and retrofits at 30 city facilities. Savings from subprojects supported under the bond convinced the city to sustain its support for EE financing. Thus, once the bond was repaid in 1998, the city chose to retain the annual budget line item for bond repayment (but reduced it by 50 percent to about US$100,000 each year) for five years to create the initial US$500,000 capital for a municipal EE revolving fund. The Fund provides upfront capital for municipal EE projects, which is difficult for budget entities to mobilize on their own, and then collects 80 percent of the resulting energy cost savings for a period of five years. The Fund does not guarantee savings, but bases its repayments on estimates. This model of payment from savings has helped to motivate facility managers to move forward with the projects while becoming a self-sustaining mechanism (i.e., no additional appropriations are required).

The Fund has financed EE projects in several sectors, including light emitting diode (LED) traffic and pedestrian lights, street light improvements, parking garage lighting, a building-level boiler, two electric vehicles, and rooftop photovoltaic (PV) cells. More importantly, the Fund also demonstrates that EE can pay for itself in the long term. Success stories from projects funded through the Fund are used to create public awareness and motivate citizens and other organizations to adopt EE into their planning and programs. The Fund has been a low-cost mechanism which has been relatively simple to implement, but has yielded substantial impacts which have generated interest from other U.S. cities and municipalities around the world.

1. Introduction

Ann Arbor is a small city in the United States, located in the state of Michigan in Washtenaw County. With a total population of 113,934, spread across 27 square miles (70 km^2); the city is part of the Ann Arbor metropolitan statistical area (population of 347,563). The city is

home to the University of Michigan, which has drawn several high technology companies to the area through its resources and research and development program and continues to significantly shape the city's economy. Compared to the healthy economic profile of the Ann Arbor metropolitan area (GDP: US$17,943 million; GDP per capita: US$50,573), Ann Arbor City's population has a modest income profile, with the per capita income at US$26,419, and 16.6 percent of the population below the national poverty line.

Ann Arbor has few energy resources of its own, with no oil or gas wells, coal mines, or sources of geothermal steam. Consequently, almost all of the energy used within the city is purchased from elsewhere, resulting in a net drain on its economy. Given the limited energy supply, rising energy prices, a modest economy and limited resources, the local government of Ann Arbor has always been focused towards energy and environmental conservation.

The history of the Fund dates back to 1980, a time of heightened awareness about rising energy prices, increasing energy shortages, and growing concerns about the reliability of oil supply from foreign sources in the U.S. Recognizing the need for a local energy conservation effort, Mayor Louis Belcher appointed a 23-member Energy Steering Committee in April of 1980 to develop an Energy Plan for the city. In 1981, the city of Ann Arbor adopted an Energy Plan which called for the city to "promote energy conservation by using city facilities as a role model for the community."[1] The directives of the Energy Plan emphasized seven areas of energy conservation implementation that included the following:

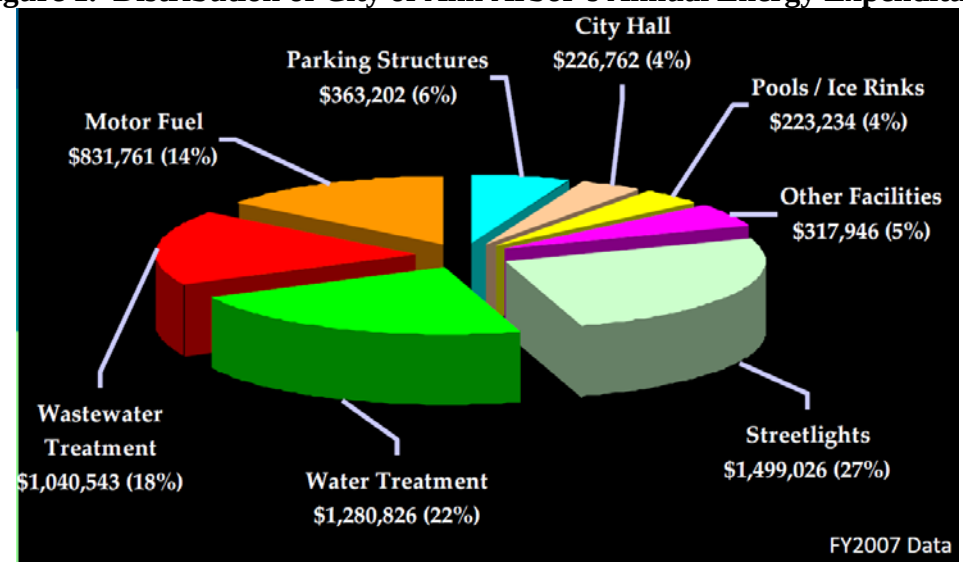
1. The Role of Government: Define the role of government in promoting and facilitating energy conservation through activities such as developing and maintaining an Energy Data System and a Community Energy Emergence Contingency Plan.
2. Transportation and Land Use: Assess the coordination of land use and transportation components of the city to promote EE.
3. Building Retrofit: Evaluate the retrofit of Ann Arbor's existing residential and non-residential buildings with energy conservation measures.
4. Renewable Resources: Explore ways to increase local use of solar, wind, and hydroelectric energy technologies and recycling opportunities.
5. New Construction and Site Design: Address issues of improved EE in buildings, protection of solar access, energy-conscious landscaping, and innovative building design.
6. Promotion and Education: Promote and improve the quality and availability of energy information, facilitating public input to the Energy Plan, and promotion of energy awareness.
7. Municipal Operations: Consider energy conservation possibilities in city operations.

The Energy Plan tasked the local government with a critical role in protecting the environment. The Government was mandated to take a lead role in energy reduction initiatives within the community by using city government as a role model. Faced with financial constraints and limited resources for EE finances, the city utilized its municipal bonding authority in 1988 to issue a US$1.4 million energy bond in order to comply with the directives of the Energy Plan. The bond was envisioned to be a self-sustaining source of funds for investment in EE retrofits in its 60 municipal facilities, which was paying $4.5-5.0 million annually on electric and natural gas consumption (Figure 1). The 60 facilities are a

[1] City of Ann Arbor (1981). City of Ann Arbor Energy Plan –Summary of Findings. Ann Arbor, Michigan.

small subset of the total government-owned buildings within the city limits, with the majority falling under the State or the County's jurisdiction and management.

Figure 1. Distribution of City of Ann Arbor's Annual Energy Expenditure



Source: Barnes, G., Geisler, N. & Deming, R. (2011).

Ultimately, the city's energy bond was a success. Energy efficiency retrofits were financed in 30 of the city's facilities and a portion of the energy cost savings were used to fully repay the bond obligations.

2. Project Description and Design

Following the bond's success, the city decided to sustain its efforts through the creation of a dedicated municipal EE revolving fund. In 1998, when the city fully repaid the bond, the bond repayment line item was retained in the city's budget to generate seed capital for the municipal energy efficiency fund. The city decreased the bond repayment amount by about 50 percent, to US$100,000 per year, over a five-year period to establish the Municipal Energy Fund with an initial capital base of US$500,000. The Fund's focus was solely on improving the EE of city operations and facilities and thereby reduction of energy operating costs.

Subproject eligibility criteria. Funding decisions are made after careful examination of the key project criteria: total energy saving potential, improvement of the facility environment and the educational or demonstrational value of the project. Only municipal facilities and services for which the city of Ann Arbor pays the utility bills, such as offices, street lighting, municipal swimming pools, fire stations, the airport, city hall etc., are eligible to apply to the Fund. Subprojects with energy saving payback of 3-5 years or less are preferred. All subprojects are expected to be able to demonstrate and educate citizens about energy savings and/or renewable energy benefits.

Fund administration. The Fund is administered by the city's Energy Office under the supervision of a three-person city staff board (typically from the Energy, Environmental and Parks departments) who approves funding, implements the projects, and often serves as project manager. EE projects are identified either from information from energy audits or site visits conducted by the Program Manager or through applications from facility managers

for projects requesting energy funds. The board reviews all applications and makes final decisions on what projects to fund each year.

Subproject financing is awarded on a first-come, first-serve basis and the implementation work is expected to be completed before the end of each fiscal year. Due to the relatively small size of Ann Arbor and a cooperative relationship across departments, little intra-department outreach is performed. Alternatively, departments contact the Energy Office on an ad hoc basis to relay an Energy Fund idea. The Energy Office absorbs administrative time and costs but, depending on the project, outside departments like Parks and Field Services may be involved to support the timely installation of new measures or improvements that will ultimately save them money. The selection of service providers and contractors is based on existing partnerships and prior experiences.

The Fund does not provide typical loans for eligible subprojects. Its capital is provided more like a project equity investment. Financing is provided and estimated energy savings determined, based on engineering estimates. The host facility is then required to provide 80 percent of the estimated energy savings in repayments back to the Fund. The Fund does not guarantee savings, so even if the actual energy savings are below the estimated levels, the client is still obligated to repay the agreed amount. This scheme allowed many high return subprojects to go ahead, as the Fund helps to overcome the major hurdle of the initial capital investment. Repayment starts the first year after the energy saving measures are installed. Thus, the Fund income depends on the level of energy savings for the individual subprojects and the financing costs vary for each investment. The remaining 20 percent energy cost savings is either reduced from the facility's future energy budget or applied to further improve the facility or its services.

While the Fund repayments are based on estimates, the Fund does try to track actual energy savings for the purposes of its subproject monitoring efforts. Upon completion of the subproject installation and two months of operations, the energy use for the host facility is measured and compared to three years of baseline energy data and the estimated energy savings. Whenever possible, energy savings are based on metered consumption at each facility with corrections for changes in utility costs, weather extremes, and other factors which may have influenced energy consumption during the year. In cases where it is not possible to identify the effect of a particular measure based on meter data, estimated savings are used. These savings are accrued through the end of the Fund's fiscal year (April - March) reported to the city Administrator for payment before the end of the city's fiscal year.

Outreach. The city regularly publicizes success stories from its EE programs and makes assistance available to the community from the Energy Office to businesses and homeowners who are interested in improving energy. Twenty percent of the annual total funds are allowed to be expended for public outreach efforts, like educational signage. Example outreach projects are those focusing on renewable energy with possible longer payback periods, rather than solely EE. For instance, the solar thermal pool heating system at the Fuller Park facility includes the "Sun Dragon," an artistic installation "at the mouth" of where the warmed water enters the pool (Figure 2).

Figure 2. Ann Arbor's Fuller Park "Sun Dragon" Solar Pool Heating Subproject

3. Cost, Financing, Benefits, and Effects

The Municipal Energy Fund was initially capitalized with US$500,000 over a five-year period. (The US$100,000 budgeted annual contribution to the Fund was discontinued after the fiscal year 2003-04.) From that point forward, the Fund has relied on payments from past subprojects to finance new ones. Financing cost accrual through its investments has allowed the Fund to grow during periods of slow project activity and the majority of the gains have been invested right back into future subprojects. As a result, the current value of the Fund has grown to about US$600,000, making it financially sustainable.

Between 1998-2008, the Fund financed 46 subprojects. These projects included LED traffic and pedestrian signals, street light improvements, parking garage lighting, boiler and cooling tower for the city hall, two electric vehicles and solar energy demonstration projects. The total costs incurred by the city on these 46 subprojects included retrofit costs of US$600,148 along with some administrative costs (10 percent). These projects resulted in cumulative energy savings of 10.7 GWh, which offset US$861,869 from the city budget's energy operating costs. The city also abated 7,925 tonnes of CO_2 emissions offsets for the city. The total cost savings yielded an internal rate of return (IRR) of 11 percent for the city and has encouraged them to consider taking on more high risk and capital-intensive projects in the future. Considering the fact that some subprojects related to measures that did not save energy directly, i.e., purchase of meters, software, etc., the IRR for actual EE subprojects was much higher. Most of these projects would not have been implemented in the absence of the Fund and, therefore, the annual savings are aggregated on a cumulative basis from the date of completion of the project.

Facility budgets are not impacted by the up-front costs of the energy improvements which are covered by the Fund. The EE retrofits resulted in continual reductions of the city's operating costs over time. The community also benefits in many other ways such as improved efficiency in city operations, improved indoor environmental quality of municipal facilities, increased citizen awareness and knowledge about benefits of EE and an overall enhancement in citizen support through demonstration of effective use of tax dollars. Finally, this program allowed the city to demonstrate energy leadership by showcasing successful implementation of energy-saving technologies which could easily be replicated by other citizens in their communities. Although the program does not actively track leverage or replication, anecdotal evidence suggests these benefits are positive as well.

4. Project Innovation

Energy efficiency measures can cost-effectively reduce operating expenses in municipalities, but the required combination of available capital and staff expertise (both technical and financial) is seldom found. The success of the Ann Arbor project demonstrates how making small but dedicated financial and human resources available to focus on energy conservation can have a significant impact in generating long-term energy and cost savings for the city.

The city of Ann Arbor is a small municipality that had a vision and desire to demonstrate leadership in the energy conservation arena, but lacked the supporting fiscal resources to support large-scale investments. Through the passing of a municipal bond and subsequent seeding of a dedicated Fund, the city was able to successfully implement a sustainable source of EE financing and help foster a culture of sustainable energy for more than 20 years.

Rather than provide loans or subsidies, the Fund's unique feature was to invest in EE subprojects and take 80 percent of the energy savings, thus allowing it to share in the many high return projects currently not being undertaken. This enabled the Fund to support some smaller projects, with payback periods of less than five years, to offset the costs of some larger, more expensive projects such as solar PV. A dedicated energy office, energy manager and an advisory energy commission to support the city's energy conservation efforts has also contributed to the success and growth of the city's energy conservation efforts.

5. Lessons Learned

The Ann Arbor Municipal Energy Fund is a sustainable model for financing municipal EE projects. The two critical components are an initial funding source and dedicated staff to support and coordinate the Fund and its investments and activities. The commercial nature of the Fund has allowed it to maintain and even grow its capital base while becoming financially sustainable. This concept of cost sharing has also proven to be important to the overall accountability of the organization and has helped prioritize EE over other investments.

According to city officials, one critical element in the long term success of the Fund has been the willingness of the administration to provide flexibility in the financial arrangements to facility managers in order to remain competitive with other funding agencies such as private banks. For example, the city's Airport facility was interested in using the fund for a lighting retrofit project with a payback period of less than five years, but was not willing to pay 80 percent of the energy savings over five years to the Fund. Thus, the city made an alternate financial settlement with the Airport that allowed the facility to use the fund and make payments according to the prevailing market interest rate. The continued stakeholder engagement and relationship building fostered by the Energy Office has allowed the Fund to have sustained support from the community. The annual reporting requirements and public demonstration of energy and cost savings from implemented EE retrofits have also helped to gain trust of the community that the Fund's money is judicially spent.

The city believes that the stakeholder engagement and public outreach efforts have been successful in demonstrating the value of EE to its citizens and the private sector. The city would like to be able to track spillover effects of the Fund and quantify the energy-saving impact of municipal efforts in the private sector. Due to lack of human resources, however, the city has not yet accomplished this goal. The city plans to put procedures and policies in place in order to estimate the Fund's tangential benefits and leverage them to expand the work implemented through the Fund in the future.

6. Financial Sustainability, Transferability, and Scalability

The Fund has been able to become financially sustainable within its first 10 years of operation. Due to the small size of the city and its energy implementation needs, the Fund has been able to support all the city's funding requests. According to city officials, without the existence of the Fund, Ann Arbor would not have been able to implement most of completed EE retrofits within its facilities. Further, by only supporting commercially viable projects, the investments made are sustainable and replicable as well, generating substantial cost savings for the city and revenues for the Fund.

Municipalities that are facing increasingly tight budgets, increasing energy costs, and an aging building stock increasingly view EE as an especially attractive opportunity to address its needs. However, a key challenge has been the first cost barrier which is hard for budget entities to mobilize given annual appropriations. Successful examples of government financing for EE projects are often limited to advanced technologies, unsustainable subsidies, or preference for projects at the state or the national level. The establishment of a municipal-level EE fund offers such municipalities a fairly simple and practical way to realize some of these EE opportunities without requiring large budget outlays or putting excess strains on existing institutions.

The successful implementation of the Municipal Energy Fund in Ann Arbor has influenced the foundation of a project called the "Cities of Promise" at the Michigan-based non-profit organization The Clean Energy Coalition. Using money from a US$4.4 million grant in 2010, the project is helping eight financially challenged cities conduct energy audits and implement EE retrofits. The resulting savings from completed building retrofits will be channeled into a Fund, which will be applied towards future energy projects.

Even though the scale of the fund and the EE retrofits funded through it have remained fairly modest, the sustained success has encouraged the Energy Office to implement more capital intensive energy projects in the future such as LEDs and advanced solar PV installations. The continued success of the project indicates that similar funds and much larger ones could be successfully set up and managed for cities with more aggressive EE implementation goals and objectives. Already a number of city officials from other states have visited Ann Arbor and requested information about setting up similar schemes.

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ANNEX: CITY AND PROJECT PROFILE

CITY PROFILE

1. Name of the City	**Ann Arbor, Michigan (USA)**
2. Area	**27 square miles (70 sq km)**
3. Population	**113,934 (in 2010)**
4. Population Growth Rate	**- 1.0 %**
5. GDP of the City	**US$17.89 billion (2009, Metro area)**
6. GDP Growth Rate	**2.0% (Metro area)**
7. GDP per Capita	**US$50,573 (2009, Metro area)**

PROJECT PROFILE

1. Project Title	**Ann Arbor Municipal Energy Efficiency Fund**
2. Sector	**Buildings and lighting**
3. Project Type	**Energy efficiency financing**
4. Total Initial Project Capital Cost	**US$500,000 (Revolving fund)**
5. Energy or Energy Cost Savings	**10.7 GWh cumulative savings over 10 years (US$0.9 million)**
6. Simple Payback	**NA**
7. Project Start Date	**1998**
8. Project End Date	**Active**
9. % of Project Completed	**NA**

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