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Projects from the Energy Saving Department, Aguascalientes, Aguascalientes, Mexico

Summary

The City of Aguascalientes started exploring energy efficiency opportunities in 1996, but it was only in 1999 that the Energy Saving Department (*Departamento de Ahorro de Energía*), under the Secretariat of Public Services and Ecology (*Secretaría de Servicios Públicos y Ecología*), was created. Currently, the department has six projects in progress: (1) energy efficiency in the public lighting system; (2) renewable energy procurement from small hydro; (3) energy generation from municipal landfills; (4) the PEPS program (Promoting an Energy-Efficient Public Sector); (5) an awareness campaign for all municipal departments and the general public; and (6) municipal building improvements.

The case of Aguascalientes is unique in terms of the diversity of projects involved, ranging from energy efficiency and renewable energy procurement to environmental education. The projects target a wide range of people, as much in the municipal corporation as the general public. Although the projects are not part of an official energy or climate action plan, they are all carried out by the municipality's Energy Saving Department, which gives them a programmatic coherence.

Through these projects, the City of Aguascalientes has been able to save considerable amounts of money, allowing the administration to invest in other programs that benefit the general public. The environmental outcomes are also quite significant, including energy savings and the mitigation of greenhouse gas emissions among other benefits. Aguascalientes is now considered a national leader in energy-efficiency projects.

The program's success is attributed to the dedication of the staff at the Energy Saving Department and to the many partnerships the department has been able to secure through the years. This program demonstrates how broad participation and a persevering staff can successfully bring about municipal energy improvements, even when facing considerable challenges such as the lack of financial resources and an uncooperative council.

Municipal Context and Background

The City of Aguascalientes is the capital of the state of the same name, located in western central Mexico. The city stands on the banks of the Rio Aguascalientes, 1888 meters above sea level and has a population of 723,043 according to the 2005 national census. Its main economic activities are agriculture, livestock, industry, trade, and tourism.

The City of Aguascalientes undertook its first energy efficiency pilot project in 1996. With the help of the Electric Power Saving Trust Fund (*Fideicomiso para el ahorro de Energía Electrica* or FIDE)[1], the City produced a first "load diagnostic" on the public street lighting network and subsequently installed dimmers in street lamps on certain avenues (López Rodríguez, 2007) . The resulting reduction in electricity consumption earned the City the 1998 FIDE National Energy Saving prize.

With this success, the program continued and expanded, surviving a change of municipal government.[2] The new administration decided to reinforce the concept of energy saving by creating the Energy Saving Department (*Departamento de Ahorro de Energía*), to work under the Secretariat of Public Services and Ecology (*Secretaría de Servicios Públicos y Ecología*). The arrangement was formalized in the 1999-2001 Municipal Development Plan (City of Aguascalientes, 1999).

In 2001, another FIDE National Energy Saving prize was awarded to the municipality for its continued efforts to increase energy efficiency in the street lighting network. Measures implemented by the City included adoption of the ISO 9000 standard by the Public Lighting Directorate, installation of more dimmers and low-loss ballasts, and diagnostics to detect and repair electricity losses (López Rodríguez, 2007). With time, several more energy projects were undertaken, as described in the following section.

Description of the Initiative

In 1999, a newly-elected City Council decided to look into the municipality's energy consumption and explore ways it could become more energy efficient. The Energy Saving Department (*Departamento de Ahorro de Energía*) was created as a special administrative division in 1999, with a mandate to reduce municipal energy consumption and generate savings that could be used to help fund other municipal programs and services. The department answers directly to the Secretariat of Public Services and Ecology (*Secretaría de Servicios Públicos y Ecología*)[3] but is composed of staff "borrowed" from the Ecology Directorate (*Dirección de Ecología*) and the Public Lighting Directorate (*Dirección de Alumbrado*).

The Energy Saving Department has several projects currently in progress: (1) energy efficiency in the public lighting system; (2) renewable energy procurement from small hydro; (3) energy generation from municipal landfills; (4) the PEPS program (Promoting an Energy-Efficient Public Sector); (5) an awareness campaign for all municipal departments and the general public; and (6) municipal building improvements.

ENERGY EFFICIENCY IN THE PUBLIC LIGHTING SYSTEM

As mentioned above, the public street lighting program is comprised of several initiatives. By 2005, the City had installed 396 dimmers (*atenuadores*) on circuits on principal avenues. This technology allows a reduction of energy consumption in street lamps, by dimming the lights after peak hour traffic. More than 2,275 highly efficient lamps (150 watts instead of 250 watts) and 450 low-loss electronic ballasts (devices that provide the right voltage to start and operate lamps) had also been installed (City of Aguascalientes,

[1] FIDE is a national non-profit organization with the purpose of encouraging electric energy saving in industry, commerce, services, agriculture and municipalities.

[2] In Mexico, Municipal governments change every three years, and incumbents are not eligible for re-election. In Aguascalientes, the latest administration change was on January 1, 2008. This time not only the administration changed but the party in power also changed, resulting in an immense turnover in municipal staff. Such turnovers often result in program interruptions, modifications and/or cancellations.

[3] The Secretariat of Public Services and Ecology is composed of five Directorates: Street Cleaning, Parks, Cemeteries, Public Lighting and Ecology.

2006). Other circuits on principal avenues and in public parks were retrofitted with timers, allowing 50% of the lamps on principal avenues to switch off during low traffic periods. In public parks, most lights are programmed to switch off after midnight. Also by 2005, more than 400 light-emitting diode (LED) traffic signals, which are 80 to 90% more efficient than conventional signals, had been installed (City of Aguascalientes, 2006).

ENERGY PROCUREMENT FROM SMALL HYDRO

The small hydro program involves the purchase of electricity from Comexhidro, a private hydro company that has been operating a 14MW dam, located in the nearby state of Michuacán, since 2005. The 2005 contract between Comexhidro and the City of Aguascalientes stipulated that electricity produced by the former would be sold to the latter at a lower price than the national rate (City of Aguascalientes, undated b) .[4] The first contract terminated at the end of 2007. However, the procurement of electricity from Comexhidro continues and negotiations for contract renewal are currently under way. It is expected that a second contract will be signed in 2008 (López Rodríguez, 2007).

ENERGY GENERATION FROM MUNICIPAL LANDFILLS

This project involves burning biogas emitted from two municipal landfills to produce electricity for the local grid. The biogas plant is being built by EcoMethane, a private company, under the Clean Development Mechanism (CDM) of the Kyoto Protocol.[5] This project is important for the City because it not only allows for a reduction in GHG emissions, but also generates new income (through the Kyoto CDM) and produces cheap electricity (City of Aguascalientes, undated a). In 2005, the municipality and EcoMethane signed a contract concerning the construction of the power plant at the City's landfill sites and the use of the biogas to generate electricity. The following year, EcoMethane began construction of the biogas facility, which is expected to start commercial operation by the end of 2008 and to have a lifespan exceeding 20 years. The plant will have an installed capacity of between 2 and 4 MW and the electricity produced will be sold to the municipality at a price below the national average rate (EcoSecurities, undated). By generating revenues for the City through certified emission reductions, the project will be injecting much needed cash into the public treasury, the use of which will be at the discretion of the local authority (EcoSecurities, undated).

PROMOTING AN ENERGY-EFFICIENT PUBLIC SECTOR PROGRAM

PEPS, a program administered by ICLEI,[6] is designed to help local governments achieve direct energy and cost savings, while building a market for energy efficient products and services. The PEPS project in Aguascalientes aims to establish a green purchasing policy for the municipality (including energy efficiency concerns), and to develop a tailored purchasing manual with the involvement of municipal agencies (ICLEI, 2008). ICLEI worked with Aguascalientes' Energy Saving Department to develop the local program and in 2006, secured a small grant from USAID to procure a number of energy-efficient products. As a result, in 2007 the City was able to buy more than 50 utility vehicles with fuel efficiencies greater than 16km/litre and more than 20 light trucks with efficiencies greater than 10 km/litre; more than

[4] It was agreed the rate would be 18% lower than the national rate for low tension circuits and 11% less for medium tension circuits.

[5] The CDM is one of the three flexibility mechanisms of the Kyoto Protocol, designed to lower the overall costs of achieving the Protocol's emission reduction targets. It allows for Annex I Parties (industrial countries) to implement project activities that reduce emissions in non-Annex I Parties (developing countries), in return for certified emission reductions (CERs).

[6] ICLEI was founded in 1990 as the International Council for Local Environmental Initiatives. The council was established when more than 200 local governments from 43 countries convened at the inaugural conference, the World Congress of Local Governments for a Sustainable Future, at the United Nations in New York.

260 computers and 110 printers with the Energy Star label; 420 compact fluorescent lamps, 60 T8 lamps (linear fluorescent lamps with a 1-inch diameter, which are more efficient than conventional T12 lamps with a 1.5-inch diameter); more than 7,500 low-loss ballasts for public interior lighting; and 12 energy-efficient air conditioners (ICLEI, 2008). ICLEI, along with some municipal officials, is still working on the adoption of the official PEPS purchasing policy.

MUNICIPAL EMPLOYEE AWARENESS CAMPAIGN

This campaign, which has been in place since 1999, aims to raise awareness among municipal employees of opportunities for saving energy. It consists of distributing resource material on energy efficiency, such as fact sheets, information on new technology and equipment, and case studies (López Rodríguez, 2007). Most of the information used in the campaign comes from the Electric Power Saving Trust Fund (FIDE) and the National Energy Saving Commission (*Comisión Nacional para el Ahorro de Energía*). The material is distributed to the various departments of the municipal administration. On occasion, demonstrations on new technologies and equipment are organized for municipal officials. The campaign also includes a sticker pilot project; notes reminding employees to switch off lights and computers when not in use have been stuck next to light switches and on computers (López Rodríguez, 2007).

MUNICIPAL BUILDING IMPROVEMENTS

Municipal building improvements start with an energy audit in order to identify where and what kind of interventions should be undertaken. The measures involved are often small and simple yet results can be significant. For example, energy audits revealed that light bulbs were burning 24 hours a day in some security buildings, that some corridors were over-lit, and that in other corridors, all the lights had to be switched on even though only one small section needed lighting. In all three cases, simple actions were undertaken to solve the problem and save energy (López Rodríguez, 2007).

Policy Context

The projects initiated by the Energy Saving Department are included in the provisions of the Municipal Development Plan, which is rewritten with every change in administration. As the municipal administration changed recently, the new Municipal Development Plan for 2008-2010 is currently being developed. Various public consultations recently took place, covering a range of topics including environmental and energy issues. The final plan will set a roadmap that will include all municipal programs and projects for the next three years.

Since 2005, the City of Aguascalientes has been a member of a larger municipal network organized by ICLEI Mexico[7] and the PEPS Program to promote an energy-efficient public sector. ICLEI Mexico has been giving annual national workshops since 2004 that bring together hundreds of public employees from all over the country. In March of 2006, Aguascalientes was host to one of these national capacity-building workshops and was able to serve as a national role model to the other cities represented (ICLEI, 2008).

Through the years, the municipality has established several important partnerships with other governmental and non-governmental entities, such as the Electric Power Saving Trust Fund (FIDE), National Energy Saving Commission (*Comisión Nacional para el Ahorro de Energía*) the Federal Commission of Electricity (*Comisión Federal de Electricidad*), the University of Aguascalientes, and the School of Mechanics and Electrical Engineers (*Colegio de Ingenieros Mecánicos Electricistas de Aguascalientes*). These partnerships have provided expert advice and/or funding through the years. For example, FIDE provided advice and funding for a pilot project on how to reduce the energy used in the

[7] This is the Mexican division of ICLEI Local Governments for Sustainability.

City's traffic lights. Through FIDE's funding, the City was also able to implement a citywide program to encourage residents to replace obsolete refrigerators and incandescent light bulbs with more energy efficient options (López Rodríguez, 2007).

Financial Aspects

As the City has limited financial resources for environmental projects, the initiatives of the Energy Saving Department cannot depend heavily on the City's coffers. In fact, most of the projects have cost the City little money. The partnership with Comexhidro on the hydroelectric project, for example, cost the City a symbolic 100 pesos—otherwise all the funding came from the company (López Rodríguez, 2007). In the case of the biogas project, it is the private company EcoMethane that is financially responsible for the entire project. As for the other projects, they have been organized to minimize the municipal investment required and to rapidly become self-financing. The retrofits in the street lighting network for instance, were done partly with leased equipment in order to avoid the massive initial investment usually needed for this type of project. The leasing fees paid by the City were recovered with the savings garnered through the subsequent use of the installed energy-efficient equipment. Any equipment that needed to be purchased was bought with grants secured through organizations such as ICLEI or USAID. In this way, the City was able to go forward with new projects without having to invest large sums.

As mentioned above, the Energy Saving Department was created as a special administrative department in 1999. The creation of the department produced only one new permanent position. However, the department "borrows" three staff members from the Ecology Directorate (*Dirección de Ecología*) and five from the Public Lighting Directorate (*Dirección de Alumbrado*) to help carry out or administer the carrying out of the various energy projects described in this case study.

Outcomes

No compilation of energy or financial saving has been carried out across all the projects described in this case study. Nonetheless, individual results have been calculated for the majority of the projects. For instance, during the nine years of energy efficiency efforts in the street lighting system, over 55 million kWh has been saved. This represents 16.34% of the City's total consumption over the same period, a saving of approximately 80 million pesos (US$8 million at the time of writing) (López Rodríguez, 2007).

The purchases effected through the PEPS program have achieved energy and cost savings as well. In 2007, purchases amounting to US$1.7 million resulted in annual energy savings of more than 450 MWh and fuel savings of more than 150,000 liters. The reduction in energy use produced financial savings of more than US$165,000 in 2007 (ICLEI, 2008).

As for the hydroelectricity project, the cheaper energy bought from Comexhidro over a two year period (2006-2007) was used to supply 44.6% of the City's total street lighting energy needs, which represents approximately 46.7 million kWh and 5.5 million pesos in savings (US$556,700) (City of Aguascalientes, undated b).

In terms of GHG emission reductions, once again, no detailed results have been compiled across all the projects. We can surmise, however, that these projects have had a positive impact on the environment. The biogas combustion project alone will mitigate 1.6 million t CO_2e over ten years and reduce noxious air pollution that had previously been responsible for considerable nuisance, odours and health risks to the local community (EcoSecurities, undated). As for the PEPS program, in 2007 alone it avoided the emissions of 700 t CO2e (ICLEI, 2008).

From a social point of view, the outcomes are also positive, albeit indirect. By saving money on its energy bill, the City has been able to invest more in other programs, benefiting all of the Aguascalientes' citizens.

Finally, on the political level, the outcomes have been positive as well, allowing Aguascalientes to gain national credibility as a leader in terms of energy efficiency. In 2007, the municipality of Aguascalientes received yet another award,[8] the Energy Saving and Renewable Energy national prize for its public lighting project. This prize was awarded by the National Energy Saving Commission *(Comisión Nacional para el Ahorro de Energía*) and the federal Secretariat of Energy *(Secretaría de Energía*).

Lessons Learned

Two main factors explain the success of this municipal initiative according to municipal officials interviewed. The first is the dedication and perseverance of the staff at the Energy Saving Department, who have ensured the continuity of the program through five changes of government since 1999. Incoming administrations could not ignore the positive results flowing from the various projects, which may explain their willingness to allow projects implemented by prior administrations to continue.

The second success factor has been the good relationships that the Energy Saving Department has maintained with other governmental and non-governmental entities, especially at the national and international levels. National recognition has helped the Energy Saving Department's efforts to gain credibility, not only with incoming local councils (which arrive every three years), but also with the general public. This has led to increased public receptivity and a high level of participation in the different projects. ICLEI has also played an important role, being an external stakeholder that has lobbied the mayor's office for the adoption of a green procurement policy.

As previously mentioned, one of the main challenges Aguascalientes faces is its limited financial resources. However, staff at the Energy Saving Department have been able to address this problem by creating partnerships with private companies, leasing equipment to avoid large initial investments and securing revenue through the Clean Development Mechanism.

Another challenge faced by staff at the Energy Saving Department has been the lack of interest shown by other municipal departments when trying to promote its energy-efficiency projects. In light of consistent positive results, however, the other departments have gradually become more receptive. Nonetheless, the Energy Saving Department has found it to be an uphill battle, as all the arguments in favour of energy saving efforts and investments must be presented anew every three years to incoming administrations.

When asked what could have been done differently in order to increase the success of these energy initiatives, staff at the Energy Saving Department say an official budget sanctioned by City Council would have permitted better planning of the energy projects, and would have allowed projects of a greater scope to be undertaken.

Several of the projects undertaken in the case of Aguascalientes demonstrate how technological and knowledge transfer can play an important role in their success. Energy production from biogas combustion, for instance, was possible only through the participation of EcoMethane, which brought with it international expertise. The partnerships with FIDE and ICLEI have also allowed important knowledge and technological transfers that have contributed to the success of Aguascalientes' energy efficiency initiatives.

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[8] See Municipal context and Background, section p. 2, for description of the other awards.

The projects undertaken in Aguascalientes are adaptable to any municipal setting. Indeed, the case study shows that a municipality can make significant progress on the energy front even in the absence of an integrated plan and in the face of significant financial constraints.

Next Steps

While working towards strengthening the existing energy projects in order to ensure their permanence, the Energy Saving Department is also looking towards developing new renewable energy options. One such project will consist in installing solar water heaters in neighbourhoods with low-income households (López Rodríguez, 2007).

The department intends to continue with its energy efficiency awareness campaign, with an increasing emphasis on encouraging citizens to implement everyday measures to achieve household energy savings.

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WEB RESOURCES

City of Aguascalientes
www.munigas.gob.mx

Comisión Federal de Electricidad
www.cfe.gob.mx/es

Comisión Nacional para el Ahorro de Energía
www.conae.gob.mx/wb/CONAE/CONA_informe_premios_2007

EcoSecurities
www.ecosecurities.com

Fideicomiso para el ahorro de Energía Electrica (FIDE)
www.fide.org.mx

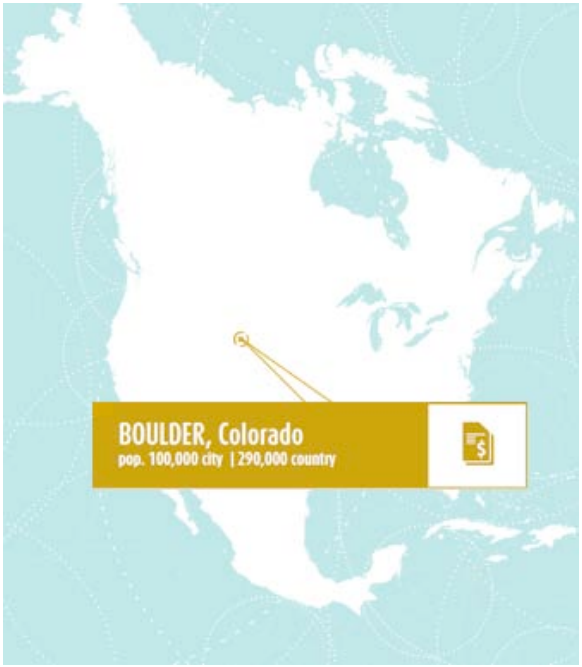
ICLEI Mexico
www.iclei.org/index.php?id=954

INEGI - Instituto Nacional de Estadística, Geografía y Informática
www.inegi.gob.mx/inegi/default.aspx?s=est

Kyoto Protocol Clean Development Mechanism (CDM)
www.cdm.unfccc.int

Climate Action Plan and Carbon Tax, Boulder, Colorado, United States

Summary



In 2006, the City of Boulder launched the Climate Action Plan (CAP) to reduce greenhouse gas emissions in both municipal operations and the wider community. The CAP includes emission reduction strategies for residential, commercial, industrial, institutional, transportation, and solid waste sources. Measures include energy audits for households and businesses, incentives for better building practices, rebates for environmental renovations, and support for renewable energy development. In April 2007, Boulder became the first municipality in the world to launch a dedicated carbon tax (on electricity usage) to fund climate change-related interventions.

The most recent available data (from 2006) reveals a slight increase in emissions after three consecutive years of GHG reductions. However, the City expects energy efficiency actions through the CAP will yield emissions reductions ten-fold greater than those achieved by pre-CAP municipal actions. Electricity consumers are already starting to reap the financial and environmental benefits from energy saving measures. Citizens and businesses are now also able to purchase wind power through a program initiated by Xcel Energy, the private utility company that collects the CAP tax for the City. Customers of this program are excluded from paying the CAP tax.

Boulder's climate plan benefits from an extremely high level of environmental awareness among citizens and extensive technological know-how among local academics, research institutions, and industries with climate change or energy efficiency expertise. An extensive consultation process involving these players has benefited the adoption of climate action policies. The Office of Environmental Affairs (OEA), which is responsible for designing and implementing the CAP, meets regularly with local experts and municipal officials, provides regular updates to Council, and publishes a greenhouse gas inventory annually. Other municipalities may learn from Boulder's experience in working cooperatively with local partners, including the electricity utility and local contractors conducting energy efficiency audits and renovations.

Going forward, Boulder plans to continue its efforts to increase energy efficiency in the residential sector through the distribution of compact fluorescent light bulbs and through home energy audits. Through networking programs and partnerships, the City is also working to increase the private sector's involvement in helping Boulder meet its climate objectives. Transportation emissions are projected to continue growing throughout the program period to 2012; the poorly funded, existing efforts to curb transportation emissions are focused primarily on encouraging the use of biofuels for private vehicles. A more comprehensive plan, with the participation of the state, is required in order to change travel behaviour and implement viable public transportation options for the City and the surrounding region.

Municipal Context and Background

The City of Boulder, Colorado has a population of roughly 100,000 with a metropolitan population of close to 300,000, including 28,000 full-time students at the University of Colorado at Boulder. The local economy is driven by a robust high-tech sector with Sun Microsystems and IBM employing nearly 10,000 people. Boulder is home to several federal laboratories conducting research on climate science and renewable energy technology. Several world-class renewable energy institutes and firms are also located in the Boulder area, contributing to a high level of environmental awareness and an active public interest in alternative energy development.

In May 2002, the City of Boulder passed Resolution 906, also called the Kyoto Resolution, to reduce greenhouse gas emissions by seven percent below 1990 levels by 2012. As a result, the Office of Environmental Affairs (OEA), a section of the City Manager's office, was directed to research and develop an action plan to help the City reach this emission reduction target. This led to the creation of a volunteer task force made up of local energy experts, City officials and concerned citizens, dubbed the Boulder Renewable Energy and Energy Efficiency (BREEE) working group.[9] In 2003, the group submitted a preliminary inventory of greenhouse gas emissions as well as policy recommendations on how to improve energy efficiency, reduce emissions and develop long-range funding strategies. The plan also laid the foundation for future spending and the organizational objectives underpinning the 2006 Climate Action Plan (CAP).

This early action resulted in a one-time municipal allocation of $100,000 in 2004 to fund a comprehensive assessment of GHG emissions that could be easily updated on an annual basis. Econergy, the energy consultant retained for this project, set up a GHG inventory-tracking tool. The budget was also used to support a preliminary assessment of commercial and residential energy efficiency, and a campaign to replace inefficient lighting in homes and businesses.

In order to provide funding for climate protection measures following the 2004 budget, Council voted to increase the local Trash Tax for two years. The short-term nature of the Trash Tax increase, coupled with public opposition to the tax, prompted OEA staff to explore long-term funding options.

In May 2005, a consultant team composed of local academics and technical experts evaluated various long-range funding options and submitted recommendations to the City. After considering several fee and tax-based options, the City decided on a voter-approved carbon tax. Such a tax was believed to give the City the most flexibility in the allocation of program funding for the CAP—i.e., to fund transportation as well as residential energy efficiency measures.

Subsequently, volunteers launched a highly successful marketing campaign to gather support among residents and businesses for the CAP tax. Public support was seen as integral to the success of the tax in the aftermath of strong opposition to the two-year Trash Tax increase in 2005. Clear public support was also important to Xcel Energy, the private utility responsible for collecting the tax through residential, commercial, and industrial electricity bills. The utility agreed to collect tax revenue for the City on the condition that Boulder voters supported the initiative. On November 7, 2006, the Climate Action Plan Tax passed with unanimous support from City Council, the Chamber of Commerce, and 60 percent of voters. Thus, residents and businesses in Boulder became the first in North America to be charged a levy

[9] Since the adoption of CAP, the Climate Action Plan Advisory Group (CAPAG) has replaced BREEE as a formal technical review body. CAPAG meets regularly to discuss the City's progress on attaining CAP objectives. Minutes, contact information, and other relevant materials are listed on a City website, allowing citizens to stay current on the most recent decisions and updates.

on their electricity usage (which is produced almost entirely by fossil fuels with three percent generated from wind) with the explicit purpose of funding climate protection measures.[10]

Description of the Initiative

The Climate Action Plan (CAP) was designed to help the City of Boulder meet its emissions reduction goal of seven percent below 1990 levels (or 19 percent below 2005 levels) by 2012. Environmental Affairs staff have tracked Boulder's GHG emissions using the Econoergy inventory-tracking software since 2004. The system uses electricity and natural gas data from Xcel Energy, along with transportation and solid waste data from City departments to provide Council with regular updates on the effectiveness of emission reduction policy measures. Environmental Affairs releases a full inventory update and assessment annually.

Inventories for 2005 and 2006 show a 4.6 percent increase in emissions for the year the CAP was implemented (16.2% above the 1990 baseline). The City estimates that increased electricity consumption associated with population growth and commercial expansion is largely to blame for this increase.[11] In order to reach the 2012 CAP target, the City will have to reduce annual GHG emissions by 22% of 2006 levels (see Table 1).

Table 1 - 1990 baseline, 2005 and 2006 emissions, and 2012 target

Year	CO_2 emissions (metric tons)	% from baseline
1990	1,580,942 tons	-
2005	1,804,182 tons	+12.4%
2006	1,887,596 tons	+16.2%
2012 (target)	1,481,107 tons	-7%

Source: Office of Environmental Affairs, 5 March 2008

The Office of Environmental Affairs administers Boulder's climate protection measures, which can be grouped into three general aims: (1) to increase energy efficiency in homes and buildings; (2) to facilitate the switch to renewable energy; and (3) to promote the use of alternative vehicle fuels.

ENERGY EFFICIENCY

In terms of energy efficiency, the City provides low-cost energy audits for households and businesses. The Office of Environmental Affairs also helps households and businesses obtain rebates offered by Xcel Energy for energy-efficiency measures and find qualified contractors to conduct renovations.

The City is also working to increase the availability of energy-efficient products and services such as CFL

[10] Only customers of Xcel's Windsource program are exempt from the tax (Boulder, 2007). Xcel Energy is the largest single wind energy provider in the country and Windsource is the largest voluntary renewable energy program in the US, with over 70,000 participants.

[11] Xcel Energy assumes an average growth rate of 1.8% in electricity consumption with increases of up to 7% and decreases of up to 5%. (Office of Environmental Affairs, March 12, 2008)

light bulbs, energy efficient windows, photovoltaic (PV), and solar hot water equipment. To this end, Boulder officials have recruited volunteers to conduct "community sweeps", distributing low-cost energy conservation kits to households including CFL bulbs and tips for how to reduce electricity consumption using low-cost methods. Furthermore, the plan commits the City to facilitating home energy audits through the Residential Energy Audit Program (REAP) and the Multifamily Performance Program.

In order to build local energy efficiency expertise, the City has embarked on a program to develop the federal Energy Star program for Home Performance (HPwES) among local construction contractors. The end goal is to develop a local homebuilding industry capable of conducting full service energy audits and comprehensive retrofits. In 2007, a total of twelve contractors representing eight companies attended the HPwES training session.

Boulder has also launched a program to provide low-cost, professional energy audits and energy conservation information to homeowners through a partnership with the Center for ReSource Conservation (CRC), Boulder County, and Longmont Power and Communications. Finally the plan commits the City to updating energy codes for new construction and retrain builders, contractors, and architects.

RENEWABLE ENERGY

In terms of renewable energy, the City is promoting greater participation of residents and businesses in wind power and other "Green Energy" purchase programs. Xcel Energy, for example, offers its customers the option of purchasing wind energy through its Windsource program. The City encourages membership in this program by waiving the CAP tax on those who sign up. Boulder also offers grants and rebates to homes and businesses adopting solar energy and other renewable energy technologies.

VEHICLE FUELS

The primary focus of the CAP transportation plan is an education and marketing campaign to encourage local fuel suppliers to offer clean-burning biofuels and help consumers make the connection between transportation usage and GHG emissions. Other aspects of the CAP transportation strategy, including support for public transit, have been slow to emerge due to limited funding and staff resources. In 2007 the Office of Environmental Affairs hired a full-time staff person to coordinate transportation measures and work with GO Boulder (the local transit authority) to implement transportation demand management programs.

Policy Context

The City of Boulder benefits from a collaborative institutional relationship with Boulder County, which has also taken measures to reduce GHG emissions. In 2005, Boulder County passed two important sustainability resolutions with implications for renewable energy and energy efficiency in the Boulder County area. The resolutions called for the development of detailed action plans for each member municipality; the analysis of existing practices and new opportunities to reduce emissions; and an assessment of the environmental, operational, community, and budgetary impacts of climate action.

In December 2007, Boulder County launched its Sustainable Energy Plan with the help of staff from the City of Boulder. Joint programs listed in the county's plan incorporate measures already undertaken by the City such as the "ClimateSmart" campaign to help individuals, families, and businesses increase their energy efficiency and reduce their carbon footprint. Boulder County also plans to integrate City programs to assess household and business emissions while providing technical and financial support through existing programs setup by the municipality.

In 2006, Boulder also joined 14 other US cities in the Energy Freedom Challenge (EFC), which is a campaign to encourage cities across the US to obtain their supply of energy from local and renewable wind, solar and bioenergy sources. The objective is to obtain half of the city's energy from these renewable sources. The city that reaches the objective first will be named the "Clean Energy Capital of the US" (City of Boulder, 2007b).

The City of Boulder is also a member of the Chicago Climate Exchange (CCX)—a voluntary cap-and-trade program, which calculates emission reductions credits for firms and organizations (including municipal governments), which may be sold to offset emissions elsewhere. Furthermore, Boulder's climate efforts benefit from participation in the federal Environmental Protection Agency's (EPA) Energy Star rating system, which is the basis of several local initiatives to improve energy efficiency in homes and businesses.

Financial Aspects

The local Trash Tax generated $258,000 annually in 2005 and 2006 to support climate change measures. This temporary tax was replaced by the CAP tax on electricity consumption in 2006, from which the City expects to generate approximately $1 million annually. Revenues started at $860,265 for FY2007 and are expected rise to $1,342,000 by FY2012. The initial tax rate is $0.0022 per kWh for residential customers, $0.0004 per kWh for commercial customers, and $0.0002 per kWh for industrial customers. According to the Climate Action Plan Tax resolution, Council is authorized to raise CAP tax rates, as shown in Table 2.

Procurement expenses as well as operating and administrative costs are covered by revenue from the CAP tax. The allocation of CAP tax revenue to each sector is based on the proportions listed under Percent of Total Public Investment in Table . With 31% of planned emission reductions, the residential sector receives 58% of the CAP tax revenue. Commercial CAP programs receive 39% of CAP tax revenue with 53% of total GHG emissions. The allocation of CAP tax revenue to industrial programs is just 3% despite its contribution of 19 percent of total emissions.

The average household will pay a CAP tax of $16 per year and an average business will pay $46 per month. The average industrial user pays $3,226 per year although this amounts to a relatively low share of the CAP tax. According to the Office of Environmental Affairs, the industrial sector pays a smaller CAP tax rate and receives a smaller share of CAP tax revenue because the City has not yet identified cost-effective means to implement emission reduction strategies for local industry. Table provides a summary of rates and average annual charges for FY2007 and the maximum possible rates.

Table 2 - Share of emissions, projected reductions, total private and total public investment by sector

	Residential	Commercial	Industrial
Percent of Total Emissions (2005)	27	53	19
Percent of Total Reductions	31	41	22
Percent of Total Private Investment	19	76	5
Percent of Total Public Investment	58	39	3

Source: Brouillard and Van Pelt, 2007: 9

Table 3 - Summary of rates and average annual charges (2007)

Sector	2007 rate $/kWh	2007 Avg. Charge (Annual)	Maximum rate $/kWh	Avg. Maximum Charge (Annual)
Residential	0.0022	$16	0.0049	$37
Commercial	0.0004	$46	0.0009	$93
Industrial	0.0002	$3226	0.0003	$6428

Source: City of Boulder - Climate Action Plan Tax: Frequently Asked Questions

In 2007, the City spent $155,000 on public education and marketing campaigns, $164,000 on commercial and industrial programs to reduce emissions, and $258,000 on household energy efficiency programs. Only $5,000 of CAP tax revenue was spent on transportation-related climate action. (City of Boulder, 2008)

Of the $860,265 allocated to CAP in the 2007 budget, $278,211 was spent on salaries, computers, travel, training, and professional memberships. Office of Environmental Affairs staffing has increased in recent years from two full-time employees in 2006 to four full-time staff in 2007 (one working exclusively on residential programs, one on industrial and commercial programs and one on coordinating marketing and communications). In 2007, a fifth employee was hired to work on transportation emission reduction strategies and programs (City of Boulder, 2008).

Outcomes

As the GHG inventory for 2007 is not yet available, we cannot report on global changes to GHG emissions and energy use since CAP was adopted in 2006. However, outcome data is available for most of the projects being carried out under CAP.

ENERGY EFFICIENCY

Over the past three years, the number of building audits has fluctuated with corresponding rates in electricity savings and emission reductions. In 2005, there were 31 building audits with a total of almost 2 million kWh in potential electricity savings. In 2006, the number of audits fell to 15 with 350,000 kWh in savings before climbing back up to 35 audits in 2007 and an estimated 4.3 million kWh in electricity savings. GHG reductions are estimated to have increased with these measures, but not to the extent of electricity savings, which increased 55 percent from 2005 to 2007. 2,575 metric tons of greenhouse gas emissions were averted in 2005 compared with 4,053 tons in 2007, representing a 37 percent increase in reductions (City of Boulder, 2008).

The effectiveness of the campaign to deliver energy-efficiency kits to households was measured with a follow-up survey, which indicated residents were using 3,048 compact fluorescent light bulbs with an

estimated 1,193 tons of emission reductions. Similar results were recorded in 2007 with another community sweep resulting in 939 tons in greenhouse gas emissions mitigated. The Boulder Housing Partners program also distributed compact fluorescent bulbs over the past two years with an expected combined outcome of 1,745 tons in emissions reductions. A program geared towards affordable housing distributed 181 kits in 2007, cutting emissions by 675 tons of CO_2.

Due to the success of the pilot program in 2005, the Residential Energy Audit Program (REAP) was expanded in 2006 to reach 300 homes in the City of Boulder. According to the 2007 Progress Report, 224 audits were performed through REAP. Also in 2007, the City expanded the Multifamily Performance Program launched in 2006. (City of Boulder, 2008).

Results from the Building Performance with Energy Star (BPwES) program were very promising for increasing energy efficiency in commercial buildings through improved lighting and heating systems. Efficiency retrofits implemented through the BPP resulted in 4,053 tons of potential GHG reductions after the City successfully met its target of conducting 35 business audits in 2007 (City of Boulder, 2008).

The City has committed a total of $360,000 to CAP energy efficiency measures including the replacement of old heating, ventilating, and air conditioning (HVAC) units, additional insulation and new efficient windows in municipal buildings. The City is also the number one single participant in Xcel Energy's Windsource program, purchasing 420,000 kWh a year for City-run facilities, resulting in a 624 megaton in reduction in emissions (City of Boulder, 2007b). Over the past two years, the City of Boulder has increased its share of alternative fuel and hybrid vehicles purchases as a proportion of its overall vehicle procurement. In 2006, 51% of vehicle purchases were alternative fuel or hybrids (City of Boulder, 2007b) while that share increased to 78% in 2007 (City of Boulder, 2008). As a result of reducing emissions from municipal buildings and operations by 3.14 percent relative to the baseline, the City has generated 83 carbon financial instruments (CFI's) tradable on the Chicago Carbon Exchange (CCX) representing 8,300 tons of greenhouse gas emissions.

RENEWABLE ENERGY

CAP programs have encouraged electricity consumers to take advantage of existing renewable energy programs offered through Xcel Energy. According to the utility, there were 313 new Windsource subscribers in the City of Boulder as of December 31, 2006 using 1.1 million kWh of wind power leading to 897 tons of greenhouse gas reductions (City of Boulder, 2007b). Boulder now has the highest customer concentration of Windsource customers in the state of Colorado with about 8,000 customers out of 43,000 statewide.

Solar energy was also expanded after Council passed an ordinance to establish a sales tax rebate on photovoltaic (PV) or solar thermal (hot water) systems installed within the city. Of the total tax rebate, 35 percent is returned directly to the customer while the other 65 percent goes to rehabilitate or install renewable energy systems for low- or moderate-income housing and non-profit organizations. By 2007, the fund had accumulated roughly $80,000 with $25,000 available for rebates and $55,000 dedicated to the ClimateSmart Solar Grant fund.

VEHICLE FUELS

According to the City's greenhouse gas inventory, emissions from vehicle fuel usage fell from 27 percent of total emissions to 22 percent from 2005 to 2006. This reduction, however, is misleading because the decline is attributed to a greater reliance upon ethanol and other biofuels, whose upstream emissions are not counted in Boulder's greenhouse gas inventory. According to the City, biofuels will continue to be an important feature in Boulder's Climate Action Plan.

Lessons Learned

The City of Boulder benefits from a strong working relationship with local energy experts, as well as firms, organizations, laboratories, and academic institutes specializing in renewable energy, economics and environmental policy. Many of the innovative components of the CAP were designed, elaborated, publicized and advanced politically by City staff working first with the volunteer Boulder Renewable Energy and Energy Efficiency working group (BREEE). The CAP Advisory Group (CAPAG) has since replaced the BREEE with a municipal mandate to provide technical and professional expertise in helping the City meet or exceed CAP goals.

The first and most substantial accomplishment of this collaborative network was the initial emissions inventory that enabled staff and experts to consider options for reaching feasible emission reduction targets that would later form the basis of the CAP. The initial inventory also strengthened communication and cooperation with other City departments and various private partners including Xcel Energy, which was imperative in aligning existing energy efficiency programs and renewable energy projects as well as advancing the CAP tax.

Despite the successful high-level collaboration on advanced energy policy development, the CAP has suffered from a poor public relations strategy. The result of this oversight was the near rejection of the interim Trash Tax proposal to fund the first steps of CAP. The absence of a detailed communications strategy fueled opposition to the tax, thereby putting the City on the defensive in the local media.

While the City adjusted its public relations strategy with the introduction of the CAP tax, some elements of its public education approach appear to be problematic. In particular, the City must strike the balance between the addressing Council and policy experts with technical information and to reaching out to the public at large with more accessible materials.

For other jurisdictions, barriers to the implementation of a carbon tax similar to Boulder's CAP tax could include the limited availability of local technological expertise and limited public awareness, which might result in an unwillingness to accept taxation of energy consumption. Few cities in North America have such a high level of technological sophistication and environmental awareness as Boulder—favourable conditions that greatly contributed to the development of a highly innovative climate plan and funding strategy.

Other municipalities may learn from Boulder's institutional experience by following its lead in reducing emissions from electricity consumption. One avenue open to many municipalities is the renegotiation of franchise agreements with utility companies to encourage greater energy efficiency and a shift towards renewable energy sources, as Boulder has done with Xcel Energy. Alternatively, municipalities may explore the option of forming their own municipal electricity utility to assume direct responsibility for energy production and distribution. Boulder is considering this option for when its franchise agreement with Xcel Energy expires in 2010.

The Boulder experience demonstrates how small cities may use community spirit and concern for local well being to drive climate initiatives. Small business participation is seen to be an asset, although large players, like IBM, have also taken important steps to embrace the plan by purchasing wind power through the Windsource program.

Next Steps

Given the highly successful programs to increase energy conservation and efficiency for electricity customers, perhaps the most important area for making significant emissions reductions is Boulder's transportation sector. In 2007 a new CAP staff member was hired to manage the CAP transportation strategy in cooperation with GO Boulder and the City's Transportation Division although program funding remains consistent albeit limited at $5,000 annually.

In terms of electricity consumption, the City plans to continue developing a local building contractor industry to conduct professional building audits and renovations. The Office of Environmental Affairs is working with Boulder Green Building Guild and E-Star Colorado to encourage knowledge-sharing networks for residential and commercial building contractors. In February 2008, the City passed a residential ordinance with updated energy efficiency standards.[12] The City also established stricter waste management regulations for new construction and renovations.

Finally Boulder is planning to consolidate its business sector strategies into a single "ClimateSmart at Work" program with an expanded level of service, including onsite training, rebates and bid reviews. The new program will build upon existing programs offered to businesses by Xcel Energy, GO Boulder, the Colorado State Industrial Assessment Center (IAC), and Partners for A Clean Environment (PACE).

Sources

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[12] Provisions for Boulder's "Green Points" residential building ordinance were updated to exceed the 2006 International Energy Conservation Code (IECC) in 2007.

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WEB RESOURCES

Climate Action Plan Tax—Frequently Asked Questions
www.newrules.org/environment/climateboulder.html

Climate Action Plan - Creating a Sustainable Energy Future for Boulder
climatesmartboulder.org/how.html

Be Climate Smart Boulder
www.beclimatesmart.com

Xcel Energy Windsource
www.xcelenergy.com/XLWEB/CDA/0,3080,1-1-2_735_11612-3320-5_538_984-0,00.html

GO Boulder
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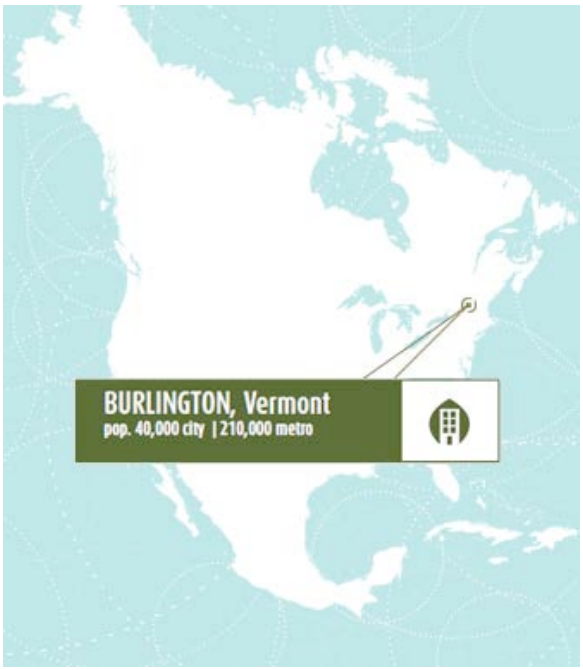
Environment Colorado—FasTracks overview
http://www.environmentcolorado.org/envcogrowth.asp?id2=9396

Climate Action Plan, Burlington, Vermont, United States

Summary



In 2000,Burlington City Council adopted a Climate Action Plan, which included a five-point strategy to address climate change through initiatives both within the municipal corporation and in the community at large. The goal was to implement a 1998 City Council resolution to reduce community GHG emissions to 10% below 1990 levels by 2005.

The plan's five strategies include: (1) energy efficiency measures in municipal buildings and throughout municipal operations; (2) energy efficiency programs for homes and businesses; (3) a public education campaign to raise awareness and encourage public participation; (4) biomass district energy and other clean energy alternatives for electricity generation; and (5) transportation demand management (TDM) programs to work in cooperation with local, state and federal agencies.

Results have been mixed. Although the City failed to meet its 2005 emission reduction targets, energy saving measures undertaken by the municipal electrical utility have been successful. Electricity consumption has been reduced and remains stable at 1989 levels. The Burlington Electric Department has also invested heavily in renewable energy development, which now makes up over two thirds of Burlington's energy mix. Unfortunately, emissions reductions from electricity saving measures and clean energy have been outstripped by increased emissions from the transportation sector, preventing the City from reaching its emissions reduction target.

The involvement of community stakeholders through other municipal programs (such as the Legacy Project, launched in 1999 to engage citizens in developing a long-term plan for the City) has been critical to the success of the Climate Action Plan. Community partners such as the Institute for Sustainable Communities, the University of Vermont, the Fletcher Allen Hospital Complex, and the local Chamber of Commerce have also played supportive roles in advancing emission reduction strategies.

While municipal initiatives have had a significant impact on improving local sustainability, adequate reporting mechanisms and administrative structures have been slow to emerge. As a result, there has been a lack of enforcement and limited accountability for investments related to the Climate Action Plan.

City officials are currently in the process of updating the plan with a new energy consumption and emissions inventory to help establish feasible targets for future reductions. They are also working on improving coordination between municipalities in the Burlington region to better address the problem of emissions from the transportation sector.

Municipal Context and Background

Located on the western shore of Lake Champlain, at the foot of the Green Mountains, Burlington is the largest city in Vermont, with a population of just under 40,000. The metropolitan area, comprised of the Chittenden, Franklin, and Grand Isle counties has a population of 206,007, according to the 2005 US census. Local municipalities are responsible for electricity, water and wastewater services while regional entities are responsible for solid waste and transportation management across the greater Burlington area. The local economy is centered on light industry, services, and retail. There is also considerable employment in several post-secondary educational institutions, including the University of Vermont, Burlington College, Champlain College, and the local Community College of Vermont campus.

Burlington enjoys a strong tradition of community action and public participation in policymaking related to protection of the environment. Over the past two decades, the City of Burlington has worked with local organizations, businesses, and individual citizens to implement projects that have promoted sustainable community development, economic self-sufficiency, social equity, and environmental protection (ICLEI, 2002).

City Council began to address climate change in 1996, when it voted to support a resolution to participate in the "Cities for Climate Protection" campaign organized by the International Council For Local Environmental Initiatives (ICLEI). In 1998, the City adopted a resolution to reduce GHG emissions by 10% below 1990 levels by 2005 and used a portion of two small federal Environmental Protection Agency (EPA) grants to begin investigating emission reduction strategies. This new priority prompted Mayor Peter Clavelle to launch the Burlington Climate Protection Task Force to draft a plan. The task force was composed of employees from the Burlington Electric Department and energy experts from the community.

City Council adopted the resulting five-point Climate Action Plan in May 2000 and directed the Burlington Electric Department to integrate the plan's targets into municipal operations. A public outreach program, called the 10% Challenge, was designed to develop public awareness and encourage residents and businesses to reduce their greenhouse gas emissions. In 2002, the Burlington Climate Protection Task Force was renamed the Alliance for Climate Action (ACA) and assumed responsibility for the 10% Challenge. According to City officials, strong public turnout throughout the Climate Action Plan's consultation process and participation in the 10% Challenge is a testament to the public's interest in curbing emissions.

In 1999, at the same as it was developing the Climate Action Plan, the City initiated the Legacy Project, a public consultation process with the aim of developing a comprehensive action plan to promote economic, environmental and social well-being. The project is managed by the Community Economic Development Office (CEDO), which benefits from the input of leaders from business, low-income, environment, academic, youth and social service groups. Since 2000, the Legacy Project has become an important vehicle for implementing elements of the Climate Action Plan by facilitating energy audits performed by the Burlington Electric Department. Moving forward, CEDO staff were recently delegated the responsibility of updating the Climate Action Plan with new targets and action strategies beginning in 2008.

Description of the Initiative

The rationale behind the Climate Action Plan was to create a comprehensive program to help reduce Burlington's GHG emissions from industrial, commercial, residential and institutional sources, including municipal operations. Burlington's estimated emissions of carbon dioxide from fossil fuel combustion

were 509,000 metric tons in 1990 and 624,000 tons in 1997 (Burlington Electric, 2000). In 2001, an estimated 732,000 tons of CO_2 were emitted from fossil fuel combustion, a 5.9% increase above 1997 levels, and a 34% increase above 1990 levels. (Burlington Electric, 2003). Reaching the goal of reducing GHG emissions by 10% below 1990 levels by 2005 would have required annual emissions reductions of 257,000 tons. However, after assessing emission levels and opportunities for reductions, the Burlington Climate Protection Task Force recommended the City adjust the reduction goal to 156,000 tons per year. (Burlington Electric, 2000).

The plan consists of five strategies to achieve the City's annual emissions reduction target of 156,000 tons. The strategies are detailed under the five headings below. A breakdown of the emissions reductions expected from each strategy is provided in Table 1.

Table 1 - Burlington's Climate Action Plan Strategies

Strategy	Annual CO_2 Reductions Goals
1. Energy efficiency in municipal buildings and operations	6,000 tons (Efficiency: 4,000 tons; Solid Waste: 2,000 tons)
2. Residential and business energy efficiency programs	20,000 tons (Residential 6,000 tons; Commercial & Industrial: 14,000 tons)
3. Public education and outreach	70,000 tons (Transportation: 20,000+ tons; Buildings: 50,000+ tons)
4. Biomass district energy and alternative fuel development	35,000 tons (50,000 tons at full cogeneration build-out)
5. Transportation	25,000 tons (TDM Projects: 9,000-15,000 tons, Policies: 10,000 tons)
TOTAL	156,000 tons

Source: http://www.burlingtonelectric.com/SpecialTopics/climate.htm

ENERGY EFFICIENCY IN MUNICIPAL BUILDINGS AND OPERATIONS

Under the supervision of the Burlington Electric Department and with the help of the Legacy Project, all departments were directed to assess heating, ventilation and air conditioning systems (HVAC), water heating, lighting, appliances and equipment for energy saving opportunities. Departments were also encouraged to investigate the potential for heat recovery and the use of alternative fuels, and to implement either one or both wherever it was found to be cost effective. The Climate Action Plan also called for the creation of a revolving energy fund, dedicated to improving the efficiency of municipal buildings and operations through retrofits and new construction; no such fund has been created to date.

Following the Climate Action Plan's adoption, Burlington immediately updated its energy codes to meet the standards of the 2000 International Energy Conservation Code (IECC 2000).[13] All construction projects and newly procured equipment are now required to comply with the City's IECC 2000 standard (Burlington Electric, 2000a).

The Legacy Project has also facilitated retrofits on buildings in the community, including a program

[13]http://www.iccsafe.org/e/prodshow.html?prodid=3800S00&stateInfo=fiajldbfdhmjbpVa6792133

called 'Solar on Schools' to develop solar energy on schools in the Burlington area. The Burlington Electric Department has also conducted energy efficiency audits and retrofits in municipal buildings, including City Hall, and institutional buildings, such as the Fletcher Allen Hospital Center. After its City-sponsored energy audit, the latter procured energy efficient lighting and fans.

RESIDENTIAL AND BUSINESS ENERGY EFFICIENCY

The second strategy, overseen by the Burlington Electric Department, is to reduce GHG emissions from electricity and fossil fuel usage in homes and businesses by implementing energy-efficiency programs and constructing new, high-performance buildings. Programs focused on capturing energy savings in homes and businesses include: lighting installations; motor efficiency measures; air conditioning upgrades; switching electric hot water and electric space heating systems to the use of other fuels; and improving production process efficiency, ventilation and refrigeration (in the industrial sector). Specific programs include Residential Smartlight, consisting of a leasing mechanism to promote the use of compact fluorescent light (CFL) bulbs ($.20/bulb per month for 60 months); the Commercial Smartlight program, which consists of leasing CFL bulbs at $0.35/lamp per month for 36 months to businesses; and Neighbor$ave, consisting of the installation of energy and water saving devices as well as compact fluorescent light bulbs, using the Smartlight lease mechanism.

PUBLIC EDUCATION AND OUTREACH

The third strategy resulted in a public education campaign called the 10% Challenge, initiated in 2002. The campaign was intended to help citizens and businesses make sustainable consumption decisions with regards to heating, electricity, and transportation while implementing quantifiable actions to reduce emissions. An interactive website, initiated with the 10% Challenge and still in operation, allows citizens and businesses to estimate their GHG emissions and provides information about what people can do to reduce emissions (see www.10percentchallenge.org).

BIOMASS DISTRICT ENERGY AND ALTERNATIVE FUELS

The fourth strategy reflects the Burlington Electric Department's commitment to supporting biomass district energy and other alternative energy sources. One of the initiatives proposed under this strategy was to implement cogeneration at Burlington's wood burning facility, the McNeil Generating Station; the project has not been implemented. Another initiative of this strategy was financial support for the development of other renewable energy projects, including wind power, residential solar-power projects and new practices in landfill methane capture and processing. These renewable energy projects are still under development and do not yet contribute to Burlington's energy supply.[14]

REDUCING EMISSIONS IN THE TRANSPORTATION SECTOR

The fifth strategy was a plan to implement the following climate-friendly transportation policies through the Department of Public Works, in cooperation with the Chittenden County Transportation Authority (CCTA). It includes: (1) developing a more balanced and efficient use of existing transportation facilities; (2) coordinating land use and transportation decisions; (3) enhancing pedestrian, bicycle and public transit opportunities and experiences as alternatives to the single occupant vehicle; (4) sharing transportation resources and facilities between and among land uses; and (5) strengthening connections among various modes of transportation.

The Climate Action Plan benefits from the involvement of several partners within the municipal corporation. The Burlington Electric Department plays the primary role in overseeing the implementation

[14] Note, however, that 67% of Burlington's power is already generated by renewable sources (biomass and hydro) compared with 10% in the rest of New England. (Burlington Electric, 2006a).

of energy efficiency measures and overseeing sustainable building design and construction. The Department of Public Works is tasked with implementing climate-friendly municipal transportation measures and supporting state and regional actions. The Community and Economic Development Office (CEDO) is increasingly responsible for managing the overall direction of the plan through the Legacy Project.

The City has also formed important linkages with partners outside the municipal corporation to implement joint programs, including the Chittenden County Regional Planning Commission, the Chittenden Solid Waste District, and the Chittenden County Transportation Authority. The University of Vermont, the Fletcher Allan Hospital Complex, the Institute for Sustainable Communities, and the local Chamber of Commerce have also played supportive roles by making small grants to the Community and Economic Development Office, which is responsible for administering the Legacy Project.

Policy context

The Climate Action Plan is supported by the 2006 Municipal Development Plan, which commits the City to energy conservation and efficiency measures, investment in renewable energy production, solid waste diversion, and clean building design and construction.

In response to inadequate transit funding and higher fuel prices, the regional planning commission is considering options for a regionally funded transit strategy. Meanwhile, the state of Vermont has revamped its rideshare program and is working to pass tougher vehicle emission standards.

Where energy efficiency measures are concerned, the Burlington Electric Department works in cooperation with a statewide non-profit organization called Efficiency Vermont (EVt) to manage the implementation of measures sponsored by the State of Vermont. Vermont offers rebates tailored for homes and businesses to encourage investment in renewable energy equipment and high-efficiency HVAC equipment and controls (EESI, 2006). The local utility also partners with the Champlain Valley Office of Economic Opportunity (CVOEO) to deliver comprehensive energy services to qualified low-income households.[15]

Financial Aspects

In 1997 and 1998, the City of Burlington received two Environmental Protection Agency (EPA) grants of $35,000 and $28,000 to help local businesses improve energy efficiency. The City decided to use a portion of these grants to begin research on the municipal buildings component of the Climate Action Plan. The City also received a small Environmental Protection Agency grant to launch the Legacy Project. Funding for municipal building construction and energy efficiency renovation projects has been allocated through the City's operating funds and through cost-sharing programs with other institutions.

In addition, voter-approved bonds have been employed by the Burlington Electric Department to cover energy efficiency improvements to utility operations, including minor upgrades to the McNeil Generating Facility. A total of $6 million has been allocated to programs for increasing energy efficiency in homes and businesses since the 2000 plan was adopted. Funding for these programs increased from $318,810 in 1999 to $956,459 in 2006. In 2008, a voter-approved bond worth $11 million will fund a major upgrade to the McNeil Generating Facility to reduce nitrous oxide emissions.

[15] see http://www.cvoeo.org/htm/Weatherization/weatherization_home.html

Since receiving its initial grant in 1998, the Legacy Project has been funded by small grants and donations from local businesses and institutions. Local entities including the United Way, the Fletcher Allan Hospital Complex, the University of Vermont and the local Chamber of Commerce each donate between four and ten thousand dollars annually to the Legacy Project, while the City contributes an additional $30,000 to fund Legacy Project staff and operations. The Burlington Electric Department has made a one-time donation of $2,000 to the Legacy Project for rewriting the Climate Action Plan in 2008. Staffing expenses for the Legacy Project are partly covered by the University of Vermont in the form of research support from students and faculty.

As in the case of the Burlington Electric Department and the Legacy Project, officials from the Solid Waste and Public Works Departments say that emission reduction measures have become part of normal operating procedures and are therefore integrated into routine program funding. Thus, there are no estimates available on the total staff time is allocated to climate change measures by the City of Burlington. Funding for the 10% Challenge has been secured through the Alliance for Climate Action (ACA), which has successfully attracted a number of small grants, amounting to an average total between $20,000 and $30,000 per year.

Outcomes

As mentioned above, an inventory carried out in 2001 showed GHG emissions had by that time increased to 34% above 1990 levels. The City has not produced a GHG inventory report since 2001. Despite the absence of a monitoring mechanism, the Burlington Electric Department has been able to estimate reductions in greenhouse gas emissions associated with energy efficiency programs for homes and businesses during the program period. The available estimates for outcomes from other strategies in the 2000 plan are detailed below.

Several important measures have been taken to reduce GHG emissions from municipal buildings and operations following the implementation of the 2000 International Energy Conservation Code. The City has also undertaken retrofits to maximize energy efficiency among institutional partners in the community including the Fletcher Allan Hospital Center and the University of Vermont. These measures are believed to have had a positive impact on reducing GHG emissions although the City has no record of associated energy savings or GHG reductions. The City is presently in the process of creating a full inventory of initiatives to reduce emissions from municipal buildings retrofits facilitated by City-sponsored energy audits. Further, the Community and Economic Development Office (CEDO) plans to expand the small revolving fund it developed to support efficiency retrofits and the development of renewable energy technology for businesses to support municipal and institutional retrofits, as outlined in the Climate Action Plan.

According to the Burlington Electric Department, energy-efficiency measures aimed to reduce electricity consumption in homes and businesses mitigated 52,500 tons of annual GHG emissions in 2006, exceeding the 20,000-ton target set in 2000 by 62%. On the whole, Burlington was using the same amount of electricity in 2006 as it was in 1990, in spite of a small increase in population. Annual energy savings from business and residential energy efficiency programs that existed prior to the Climate Action Plan jumped from 1,303 MW in 1999 to 3,132 MW in 2000 with the adoption of the plan and have risen steadily to 6,767 MW in 2006. The utility estimates that more efficient lighting yielded 64% of the savings, while another 19% resulted from motor efficiency measures, 4% from air conditioning savings, and 3% from residents and businesses switching from electric water and space heating to other fuels. The

remainder of the savings was yielded by efficiency improvements in industrial processes, ventilation and refrigeration.

The first year of the 10% Challenge campaign saw some initial success with the registration of 200 residential and 50 business participants. Numbers have grown such that there are currently 1,600 residential and 160 business participants involved in the challenge. Self-reported data recorded on the 10% Challenge website indicate a total of 3,526 tons in reduced emissions from more responsible heating and electricity choices among residents and businesses. This is a mere fraction (7%) of the 50,000-ton target for this measure. However, the City suspects that participation is much higher than indicated on the 10% Challenge website; officials believe that many households have undertaken measures without registering them on the website (Burlington Electric, 2003).

As mentioned above, Burlington has failed to move forward with its commitment to developing cogeneration capacity at the McNeil Generating Station, although a project to provide district energy for local greenhouses may get off the ground in the near future. In 2002, the Burlington Electric Department signed a contract to purchase 9 MW of wind power from Little Mount Equinox in Manchester, Vermont. The project is expected to provide 7% of Burlington's future energy needs although no power has yet been distributed. Despite these failures, the Burlington Electric Department estimates that combined energy efficiency efforts save local consumers $7.2 million annually. Furthermore, the City has expanded electricity generation from renewable sources to an impressive 67%.

Although no formal assessment has been conducted, City officials estimate that few gains in the transportation sector have been made, citing obstacles at the regional level. Inadequate funding has inhibited the adoption of transportation demand management projects and the improvement of public transportation infrastructure and services through the Chittenden County Transportation Authority. However, there seems to have been some progress in attracting ridership to public transportation. Data collected from the Campus Area Transportation Management Association (CATMA) and the CCTA indicate an increase in ridership of 37% between 2000 and 2007 while the local population grew by roughly 3.5%.

Despite an incomplete picture of the Climate Action Plan's outcomes in terms of emissions, the available figures suggest that Burlington approached but probably did not meet its target of reducing emissions by 10% based on 1997 levels by 2005. That being said, there was evidence of large emission reductions including significant efficiency gains for homes and businesses.

Lessons Learned

The commitment of local politicians, City officials, representatives of community organizations, local institutions, businesses and citizens to sustainability goals is an essential component of Burlington's emissions reduction strategy. Strong community partnerships and institutional cooperation has enabled local officials and organizations to pool their human resources and coordinate efforts to attract investment to support the implementation of community goals.

Public outreach programs, such as the 10% Challenge, have played an important role in channeling environmental awareness and concern towards action among businesses and residents. The Burlington Electric Department has also played an important role in raising public awareness about climate action through regular communication with citizens via bill messages, newsletters, phone messages, community events and Web-updates.

Burlington's participation in wider networks of knowledge sharing and policy analysis is another

important factor behind the City's success in reducing emissions. For instance Burlington's participation in ICLEI's "Cities for Climate Protection" campaign and "New England Cities" project facilitates information sharing and the development and implementation of new GHG reduction practices and programs.

Other important factors include Burlington's small size and the collaborative spirit that pervades local institutions. However, as an ICLEI report indicated in 2002, there is no structure in place to coordinate community involvement and ensure accountability throughout municipal operations. More progress might have been made if the City had a formal monitoring and reporting mechanism in place to evaluate the effectiveness of various climate protection measures implemented since 2000. The Burlington Electric Department regularly reports on electricity savings, but there is no citywide mechanism for tracking total energy use, GHG emissions and cost savings.

Inadequate inter-municipal coordination in the greater Burlington area has also posed significant barriers to reversing energy inefficient sprawl, expanding public transportation infrastructure and services, and increasing ridership. According to Burlington officials, imbalances in representation at the regional level further prevent the prioritization of Burlington's climate objectives in regional solid waste and transportation planning.[16]

Small cities with a similarly strong commitment to protecting the environment both within the municipal corporation and across community organizations may benefit from emulating Burlington's approach to climate change. The City's ability to control energy production and invest in local energy efficiency programs through the Burlington Electric Department has proven to be invaluable to pursuing the goals of the Climate Action Plan. Burlington's case demonstrates the potential advantages of local, public ownership of energy utilities.

Next Steps

Beginning in 2008, the Legacy Project will be leading the update of the Climate Action Plan with new targets and action strategies. Officials involved in the update anticipate that the monitoring component of the new plan will be strengthened through the use of municipal building monitoring software available from the EPA and emissions calculating software available from ICLEI. The use of these tools is expected to reduce the costs of regular monitoring although their effectiveness in tracking progress will depend on whether they are integrated into a formal reporting structure.

Furthermore, the Community and Economic Development Office (CEDO) plans to expand the small revolving fund it created for efficiency retrofits for local businesses. Through its membership in ICLEI's "Cities from Climate Protection" the City of Burlington plans to benefit from insight from other municipalities on how to implement a revolving energy fund for municipal buildings and those of institutional community partners.

Significant progress is expected in the transportation sector. City officials indicate a willingness to work with other levels of government, including the regional transportation planning authority, to improve public transportation infrastructure and regional funding mechanisms. The City has also expressed a willingness to engage with the State of Vermont to expand climate-friendly transportation programs (such as ridesharing), pass vehicle fuel efficiency legislation, and to obtain increased public transit funding.

[16] According to officials, the City of Burlington contributes two thirds of transit ridership and property tax revenue with only one fifth of the regional council vote.

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Burlington Electric Department
www.burlingtonelectric.com

10% Challenge
www.10percentchallenge.org

Legacy Project
www.cedo.ci.burlington.vt.us/legacy

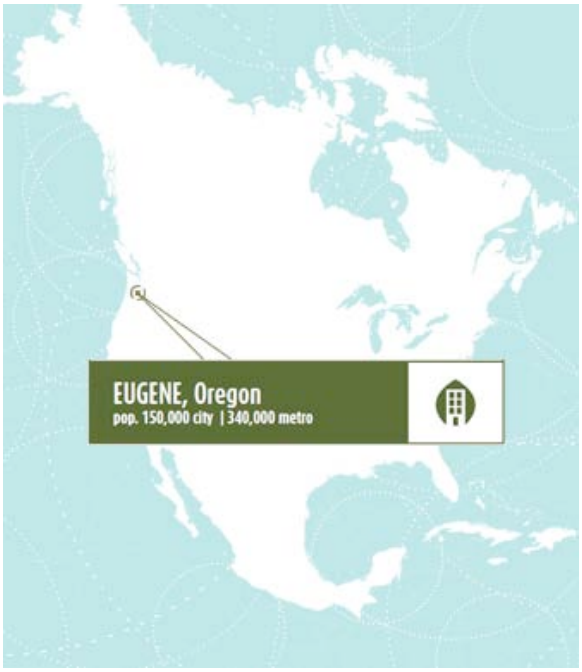
Chittenden County Transportation Authority (CCTA)
www.cctaride.org/

Chittenden Solid Waste District
www.cswd.net

Energy Management Program, Eugene, Oregon, United States

Summary

The City of Eugene, Oregon has been pursuing progressive energy-related initiatives since the mid-1990s. The most significant of these initiatives is the Energy Management Program in City-owned and occupied buildings, launched in 1995. The program started as an internal initiative of the City's Facility Management Division, which became interested in energy efficiency measures as a means to keep operating costs down in the face of rising energy prices. For the first few years, the program had little visibility, remaining largely unknown to the public and to the City's politicians. But in 2000, as sustainability and climate change came to the fore, Eugene's City Council passed a resolution which made the Energy Management Program an official City policy.



The Energy Management Program is built on four basic pillars: (1) implementing energy efficiency measures through the design and construction of new buildings and by retrofitting existing buildings; (2) rigorous building management and maintenance practices, to keep all equipment functioning optimally; (3) the use of energy management tools, to track energy consumption and identify opportunities for improvement; and (4) the education of City employees, to instil energy-conserving workplace practices. The City of Eugene has very strongly relied on the use of energy management tools, using them to identify priorities and to design targeted energy efficiency interventions. By using these tools, the City has avoided commissioning expensive energy efficiency studies with a low potential for savings. To date, the Facility Management Division has used a combination of loans and government incentives to fund energy efficiency measures. Loans are repaid with the savings that these measures generate.

The City of Eugene has carried out over 50 energy efficiency projects since the launch of the Energy Management Program. Energy consumption in City-owned and occupied facilities has decreased by 20%, from an annual average of 108 kBTU (31.7 kWh) per square foot to about 80 kBTU (23.4 kWh) per square foot. The program's success is attributed to rigorous tracking of energy consumption, improvements in building operations and maintenance procedures, and targeted retrofits and equipment upgrades. There has been less success with modifying workplace practices. Managers of the Energy Management Program believe employee behaviour to be one of the greatest barriers to further improving energy efficiency in City facilities.

Municipal Context and Background

Eugene is located in east-central Oregon, roughly 100 km from the Pacific coast, at the confluence of the McKenzie and Willamette Rivers. The City of Eugene is the second most populous municipality in Oregon, having an estimated 153,690 residents. The metropolitan population is the third largest in the

state, at 340,000 residents; the Eugene metropolitan area had long occupied the second place position but was recently overtaken by the Salem, the state capital.

Eugene is the seat of the University of Oregon, a public university attended by over 20,000 students. Along with the City of Eugene and the Sacred Heart Medical Center, the university is one of Eugene's largest employers. Industry is of relatively modest importance to Eugene's economy, with the manufacturing sector employing roughly the same number of people as the education sector (US Department of Labor, 2008). Key industries are wood products manufacturing, recreational vehicle manufacturing, and food processing.

In the early 1990s, the City of Eugene was facing budgetary compression and at the same time rising operating costs, due in part to rising energy prices. On its own initiative, the City of Eugene Facility Management Division began exploring the idea of trimming operating expenses by implementing energy efficiency measures in City-owned facilities. The manager of the Operations and Maintenance section of the Facility Management Division championed the idea of retrofitting City facilities to improve energy efficiency, thereby cutting costs. The Energy Management Program was launched in 1995.

Thus, the Energy Management Program began as an internal initiative of the Facility Management Division; it was not sanctioned by the City Council. In fact, according to facility management staff, the City's politicians were unaware and seemingly uninterested in the program during the first few years of its existence. Only at the end of the 1990s, as sustainability and climate change became hot topics across North America, did Eugene's politicians and public begin to take interest in what the City was doing to cut energy use and emissions. In February of 2000, Eugene's City Council passed Resolution 4681, which defines the basic principles of sustainability and commits the City to upholding them (City of Eugene, 2000). Clause 2.2 of the resolution stipulates that "the City will lead by example" and commits the City to "developing strategies for implementing sustainable practices that address purchasing of products and services, maintenance, facility design, and municipal operations."

The Energy Management Program in City-owned and occupied facilities is not Eugene's only progressive energy-related undertaking. Other notable projects include: the replacement of incandescent red and green traffic lights with LEDs, also initiated in 1995; and the installation of a methane-capture electric generator at the City's wastewater treatment facility in 1984. [17] More recently, the City has begun replacing its fleet of non-police cars with smaller vehicles or with hybrid gas-electric vehicles. As of last year, 25% of the electricity used by major City buildings was being purchased from wind power generators.

Description of the Initiative

Eugene's Energy Management Program is built on four basic pillars: (1) building design and construction; (2) rigorous building operations and maintenance; (3) use of energy management tools; and (4) modification of workplace practices.

The first pillar consists of in implementing cost-effective upgrades to existing buildings and to improve energy efficiency as well as to build new buildings that meet strict energy efficiency standards. Existing buildings with a history of high energy use per unit of area are targeted for major energy efficiency

[17] The wastewater facility serves the entire Eugene-Springfield metropolitan area. Methane-capture generation was installed originally in 1984 and upgraded in 1997. Both in 1984 and 1997, the generators were funded mostly with funding provided through the federal Environmental Protection Agency's Clean Water Program, with only minor contributions from local municipalities including Eugene. The 800 kW generator presently in use provides around 55% of the wastewater facilities electricity. (Source: Robert Sprick, Wastewater Operations Supervisor)

retrofit projects. Energy-efficiency upgrades are also to be introduced whenever building renovations (with a primary purpose other than improving energy efficiency) are undertaken. In terms of cost effectiveness, a key criterion for all energy efficiency-related capital improvements to buildings and all energy efficiency-related design features in new buildings is that they promise to pay for themselves within 10 years.

The second pillar consists of operating and maintaining buildings in a manner that optimizes energy efficiency without compromizing occupant comfort, functionality and ease of maintenance. The foundation of this pillar is (1) the use of a computerized maintenance management system to ensure ongoing preventive maintenance, thereby ensuring the optimal performance of existing equipment and systems; and (2) the use of Direct Digital Control (DDC) to track and optimize the performance of mechanical system, and identify malfunctions quickly. The Facility Management Division is commited to conducting periodic *retro-commissioning*[18] of existing facilities to ensure that all systems, including the DDC control systems, are functioning optimally. Failed equipment is to be replaced with higher-efficiency models whenever possible. Operations and maintenance staff are to be trained on an ongoing basis to further ensure the ongoing optimal performance of all systems and, therefore, optimal energy use.

The third pillar consists of providing accurate and timely information to support effective energy management decision making. A key element of this pillar is utility accounting, or the electronic tracking of electricity and fuel consumption across all City-owned and operated buildings. This information is used to perform energy analyses before and after the implementation of energy efficiency measures. The principal purpose of such analyses is to quickly identify equipment malfunctions or occupant oversights that are wasting energy, and correct them. Additionally, this information is used to quantify energy savings and to identify energy efficiency measures that meet cost-effectiveness criteria.

The fourth pillar consists of adopting energy-efficient practices in the workplace. Key elements include (1) educating employees about the impact of personal behavior on energy efficiency; and (2) improving employees' and the public's understanding of City's Energy Program and of energy-related issues in general.

Officials at the Facility Management Division strongly emphasize the importance of the third pillar: the use of energy management tools. Rigorous tracking of energy consumption in City facilities has consistently helped the Facility Management Division identify energy saving opportunities and to make targetted building retrofits and equipment upgrades while limiting the use of expensive studies.

Within the City of Eugene, there are three key administrative entities responsible for the implementation of the Energy Management Program: (1) the Facility Management Section, which coordinates the program; (2) the Operations and Maintenance Department, a subdivison of Facility Management, which is responsible for the installation and maintenance of energy-efficient equipment; and (3) the Design and Construction Section, a subdivision of Facility Management, which oversees the design and construction of new buildings and major renovations in existing buildings. Outside the municipal corporation, there is one key partner, the Eugene Water and Electric Board (EWEB)—the City's publicly-owned water and electricity utility, which has provided the three aforementionned City departments with ongoing technical assistance.

[18] Retro-commissioning consists of comparing the actual performance of buildings and their systems to their intended (i.e., design-specified) performance.

Policy Context

The Energy Management Program started in 1994 as an internal initiative of the City of Eugene's Facility Management Division; the decision to undertake the program was not motivated by any official City policy or any directive from the City's politicians. Only later, in 2000, did the City Council pass Resolution 4681 (City of Eugene, 2000), which enshrined the pursuit of energy efficiency measures in City-owned facilities as an official policy. In July of 2006, City Council passed Resolution 4884 (City of Eugene, 2006), an amendment to Resolution 4681, which set the *LEED Green Building Rating System for Existing Buildings* (LEED-EB) and *LEED Green Building Rating System for New Construction* (LEED-NC) as the performance benchmarks for existing and newly constructed buildings respectively. The City now officially claims the Energy Management Program as part of its effort to reduce green house gas emissions.

The City of Eugene's energy initiatives are largely independent of the efforts of other, surrounding municipalities. However, the Facility Management Division has received ongoing support from state and federal agencies. Oregon's Department of Energy supports the implementation of energy efficiency and renewable energy measures through a system of low-interest loans and tax incentives. The City of Eugene has made ongoing use of the State's Business Energy Tax Credit Pass-trough program (see State of Oregon, 2007) to fund upgrades to City-owned buildings.

Financial Aspects

The Energy Management Program was initiated with a $2 million loan from the City's Fleet Fund. The loan monies were spent mostly on the design and implementation of energy-efficiency measures. For the management of the design process for energy efficiency measures, the Facility Management Division relied partly on its own Design and Construction Section. The City also relies on *pro bono* technical assistance from the Eugene Water and Electric Board (EWEB).

To repay loans used to fund energy efficiency projects, the Facility Management Division pegged the so-called "facility occupancy charges", which the various City departments pay the Facility Management Division to cover building maintenance and energy costs, at their 1995 levels. In principal, after energy-efficiency measures are implemented, operating costs go down. The difference between the 1995 level and the actual cost of running a department's facilities is used to repay loans. In order to guarantee timely repayment of loans, the Facility Management Division authorizes only energy efficiency measures that are expected to pay for themselves within 10 years of their implementation.

The Facility Management Division created one new position to help administrate the Energy Management Program. The new position is that of Energy Analyst; the person holding this position is responsible for maintaining a database and tracking the implementation of energy efficiency measures, monitoring energy use in City-owned facilities on an ongoing basis, assessing the effectiveness of energy efficiency measures and identifying problems or weaknesses in energy management.

Since all energy efficiency measures pay for themselves over time, the only ongoing costs of running the Energy Management Program consist of the Energy Analyst's salary, the cost of maintaining and upgrading energy-tracking software, and the cost of energy-efficiency certification for Operations and Maintenance staff. The latter is a relatively minor expenditure: currently, it cost $1,200 per person for initial training. The City aims to maintain around 10 certified Operations and Maintenance staff members; training of additional staff is needed only in the event of the departure of one of the already-trained staff members.

Eugene's energy-efficiency efforts have depended on financial support from various sources. A key source of funding and of ongoing technical support has been the Eugene Water and Electric Board (EWEB), a publicly-owned water and electricity utility. EWEB, which is chartered by the City but has its own governing board, has a program of energy conservation rebates to encourage the implementation of energy conservation measures in public and commercial buildings[19]. The City has also benefited from the Oregon Department of Energy Business Energy Tax Credit Pass-through program. The Energy Trust of Oregon, an association of investor-owned energy utilities, has supported natural gas efficiency projects through its Building Efficiency Program. For example, it has provided funding for numerous gas saving features in two new Fire Stations. The City has also benefited from grants from the Bonneville Power Administration (BPA), a branch of the US Department of Energy.

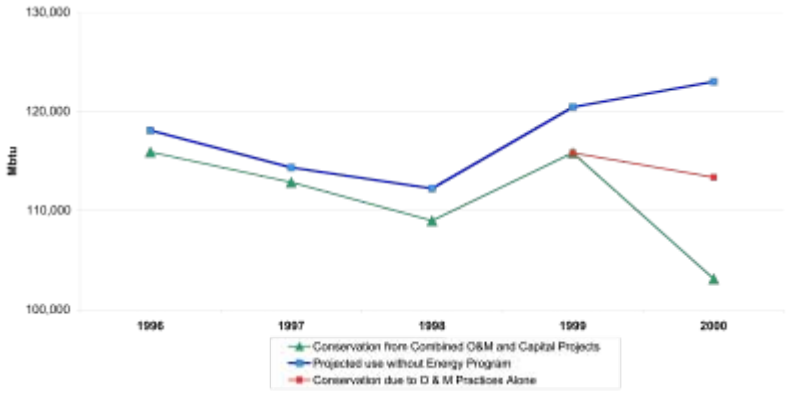
Outcomes

The key accomplishments of the Energy Management Program to date have included the implementation of an energy tracking and management program, energy audits of all major municipal facilities (completed in the mid 1990s), the implementation of numerous energy efficiency capital improvements across the City's building portfolio, and the adoption of several workplace policies intended to reduce energy use. Examples of energy efficiency capital improvements include the installation of energy-efficient lighting retrofits (started in 1995 and ongoing); the installation of occupancy sensors; upgrades to heating, cooling, ventilation and control system retrofits (started in 1998); installation of Energy Star roofing whenever roofs are replaced; and installation of solar water heating at the two community swimming pools and two fire stations beginning in 1999. Examples of energy efficiency workplace policies include a set of lights-out, computers-off-at-night and standard temperature policies; restrictions on the use of space heaters; swap out of incandescent desk lamps (started in 2002); and a ban on Halogen torchiere lamps.

To date, about 50 large and small energy efficiency projects in City-owned and occupied facilities have been carried out. [20] Altogether, the building Energy Management Program has reduced energy consumption per square foot in City facilities by approximately 20% compared to 1995 levels. The greatest reductions occurred between 1996 and 2000 (see Figure 1); in 1996, City buildings consumed an average of 108 kBTU (31.7 kWh) per square foot whereas by 2000 they consumed an average of only 80 kBTU (23.4 kWh) per square foot. The best year to date was 2003, during which consumption dropped just below 75 kBTU (22.0 kWh) per square foot; since then, however, energy use has been creeping upwards, reaching 84 (24.5 kWh) kBTU per square foot in 2006, the most recent year for which data is available. Aside from saving energy costs, the program has also yielded 5-8% operation and maintenance cost savings, thanks to early detection of malfunctions and equipment failures.

[19] EWEB's policy is to promote energy conservation in order to avoid building new power plants.
[20] A complete list of energy efficiency upgrades in buildings owned and occupied by the City of Eugene is available at http://www.eugene-or.gov/portal/server.pt/gateway/PTARGS_0_2_271750_0_0_18/Energy%20Project%20List.pdf

Figure 1—Total Annual Energy Use in City-Owned and Occupied Buildings, 1997-2000



The accomplishments of the Energy Management Program were largely unknown to City politicians and the public until only a few years ago. In fact, according to Facility Management officials, when sustainability and climate change came to the fore, the public and the media began demanding to know what the City was doing about energy consumption and greenhouse gas emissions. There was some fallout as politicians were at a loss to answer, being largely unaware of the internal initiatives of several City departments, such as the Energy Management Program, the LED traffic light retrofit program, and methane capture generation at the wastewater treatment plant. The visibility of these programs has improved considerably and the public has expressed support.

Lessons Learned

Building retrofits and equipment upgrades as well as improvement in maintenance and operations practices have both yielded significant improvement in energy efficiency. However, officials at the Facility Management Division acknowledge that attempts to modify workplace practices and to instil more energy efficient behaviours among employees have thus far been less fruitful. There has been increasing resistance to certain energy efficiency measures, such as directives on thermostat settings and a restriction on the use of space heaters. The gradual upward creep in energy use that has been observed over the last couple of years is ascribed mostly to employee "push back" to energy efficient workplace practices.

Officials at the Facility Management Division attribute the program's overall success to several factors. Most importantly, they claim that rigorous and detailed tracking of information on energy use and building maintenance has allowed for highly targeted retrofits and maintenance interventions on buildings, yielding high payoffs in energy efficiency per dollar invested. Another important factor has been good communication and close collaboration between the Operations and Maintenance and the Design and Construction Sections, attributed to the fact that both are within the Facility Management Division. The feedback loop between the two sections has allowed both to learn from projects and to further optimize energy efficiency interventions on buildings. A third factor has been the training of the City's operations and maintenance tradespeople, allowing them to properly implement and maintain energy saving measures.

Going forward, Facility Management officials believe the greatest challenge to maintaining and improving upon their successes in reducing energy consumption in City buildings is employee behaviour. A sustained employee education campaign will most likely be needed to improve the visibility of the Energy Management Program and to further sensitize employee to energy efficiency issues. Another

ongoing challenge for the program is limited funding, which restricts how fast further energy efficiency measures can be deployed. Better visibility for the program, particularly among the public and City politicians, could stimulate the City's administration to allot more internal funding, but new sources of external funding are also needed.

For the other cities attempting to undertake a similar program, Eugene's Facility Management staff's advice is to follow their basic mantra: to implement basic building management and energy use tracking systems first, to use them to identify opportunities for improvement, and then to proceed with making targeted improvements. They believe that having good building tracking systems allows for easy identification of opportunities for improvement, limiting the need for expensive studies. They also recommend acting inventory-wide rather than building-by-building. This means identifying an energy inefficient feature common to several buildings in the City's inventory and modifying that feature across all of the concerned buildings. This allows for economies of scale and, ultimately, tends to yield greater energy saving per dollar invested.

Many cities could undoubtedly follow Eugene's example. There are two ideas in particular worth retaining: (1) the implementation of rigorous and detailed building information tracking before jumping into expensive retrofits; and (2) repaying the loans for building retrofits and equipment upgrades with the cost savings that these interventions generate. According to an official at Facility Management, Eugene has a representative building portfolio, both in terms of diversity of types of facilities and in terms of age. For this reason, lessons taken from Eugene should be widely applicable.

A potential barrier for replicating certain elements of Eugene's Energy Management Program could be the structure of the administrative bodies that manage municipal facilities. One key success factors of Eugene's program is the close relationship between the Operations and Maintenance and the Design and Construction Sections, both of which are part of the same administrative unit. Other municipalities wishing to replicate Eugene's success may need to take special care to ensure that administrative units with the same functions collaborate as closely as those in Eugene.

Next Steps

The main preoccupation of the Facility Management Division is to bring City-owned buildings up to the LEED-EB standards. It intends to continue its policy of implementing energy-efficiency measures throughout the inventory. This entails assessing the entire building inventory and identifying deficiencies according to the LEED-EB standard, and then systematically acting to eliminate the most common deficiencies across the building inventory.

Another important next step is to perform retro-commissioning on the whole inventory. Retro-commissioning entails assessing how buildings are performing with respect to their own design criteria, verifying whether all systems are performing optimally, and making necessary modifications or repairs.

Other planned steps include:

- a marketing campaign to improve the Energy Management Program's visibility
- an educational campaign for City employees to encourage a more holistic approach to energy efficiency and workplace practices
- projects focusing on the reduction of natural gas consumption
- replacement of convection-based heating systems with direct radiation-based systems

- a solar power pilot project, consisting of installing solar photovoltaic panels on certain City-owned buildings to supplement their electricity supply.

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www.eugene-or.gov

Eugene Water and Electric Board
www.eweb.org

Oregon Department of Energy
www.oregon.gov/energy

Energy Trust of Oregon
www.energytrust.org

Energy Use Partnership - Partnership for a Green City, Louisville, Kentucky, United States

Summary

The Partnership for a Green City—of which the Energy Use Partnership is a component—is the result of the collaboration of three agencies, namely the Louisville-Jefferson County Metro Government, the University of Louisville and the Jefferson County Public Schools District. Although the initiative was launched by Mayor Abramson in 2004, all three partners have since been equally involved. Others partners, not directly involved in the founding of the partnership but called in as experts, include the Kentucky Pollution Prevention Center and the Kentucky Office of Energy Policy.

The Partnership for a Green City, which is entering its fourth year, consists of eight different committees working in tandem on different aspects of environmental sustainability. The Energy Use Partnership, one of the eight committees, aims specifically to reduce energy use within the partnering organizations in order to achieve budget savings; to attract funding for energy efficiency projects and training; and to create a forum to share ideas, experiences and expertise on the development and implementation of energy saving technology. Essentially, the partnership functions as a vehicle for knowledge exchange and project development. Since December 2007, it has been managed and coordinated by a full-time employee.

The Energy Use Partnership received a large grant from the US Department of Energy for an Active Solar Demonstration Project. With the help of the Kentucky Pollution Prevention Center, the Partnership was also able to train university and high school students to perform energy audits. Subsequently, these students conducted eleven energy audits in classrooms and buildings, which in turn allowed each agency to begin implementing low-cost, low-tech energy-saving solutions. Concomitantly, the agencies involved were able to purchase energy data management software with a grant from the federal Environmental Protection Agency (EPA), which will be used to track energy consumption and monitor the success of different energy saving solutions. Finally, the group has worked to expand energy efficiency awareness through the organization of various guest lectures and workshops on different energy-related topics.

The Energy Use Partnership—and the Partnership for a Green City, more generally—is innovative because it is an unprecedented partnership between three major public institutions that have decided to pool their resources and share their expertise and experience. It is also innovative because it did not require any funds at the start; the initiative came about because staff members in each agency agreed to participate and take on the extra work without compensation. Finally, the Energy Use Partnership is innovative because, unlike many ‘upgrade’ programs, it does not aim to showcase expensive green technology; rather, it tries to help each partner find low-cost solutions that they can implement themselves.

The main lessons learned were that public institutions can gain a lot from sharing their knowledge and experience, that political leadership is important for promoting such a partnership, and that a collaborative effort of this kind must be sustained and renewed - hence the need for a full-time employee who can coordinate and motivate the various committees.

Municipal Context and Background

Louisville, the capital of Kentucky, is a medium-sized city that was merged in 2003 with the surrounding county to create the Louisville-Jefferson County Metro Government, thereby propelling the new entity of 700,000 residents to the 16th rank among US municipalities in terms of population. Its location on the Ohio River in the centre of the continental US has made it an important hub for water, land and air shipping. Recently, Louisville has emerged as a major center for the health care and medical sciences industries.

The Partnership for a Green City was founded in 2004, a few months after the municipal merger. The merger was seen by community leaders and politicians as a fresh opportunity to transform Louisville into a green city. This enthusiasm for environmental sustainability came at a time when the municipal administration was trying to reposition Louisville economically. Indeed, this green agenda has been described as a strategy to help revive the City's economy and attract people to live and work in Louisville (Partnership for a Green City, 2004).

The three partners, namely the Louisville-Jefferson County Metro Government, the Jefferson County Public Schools District and the University of Louisville, employ five percent of the metropolitan area workforce, or approximately 26,000 people. Also, the University and the School Board together have approximately 120,000 students, which represents more than 75 percent of the student population of the county. In addition, the three partners own approximately 10 percent of the land in the county and take a significant share of the energy consumed (Partnership for a Green City, 2004). Each of the three partners had been active in the area of environmental sustainability before the Partnership was launched but their actions were undertaken independently and were often ineffective for lack of visibility and expertise.

The Partnership was not launched in response to a particular environmental problem, even though the City's overall environmental performance has not been outstanding in the past, and in many respects is still below that of other US cities. According to an environmental report card compiled by *Louisville Magazine* in 2007, the city was rated poorly for its energy performance because of its continued dependency on electricity from coal-fired power plants and its excessive reliance on the automobile for passenger transportation (Louisville Magazine, 2007).

Mayor Jerry Abramson, President James Ramsey of the University of Louisville and Superintendent Stephen Daeschner of Jefferson County Public Schools co-championed the Partnership for a Green City initiative. Very quickly, other stakeholders decided to support the initiative, while the public and the media both welcomed the creation of the Partnership.

Description of the Initiative

This successful partnership of a local government, university, and public school system focused solely on environmental issues is believed to be the first of its kind in the US. The Partnership Project is based on the premise that better collaboration between important public institutions in Louisville could help address the city's environmental and economic challenges. It was made possible through the coordination of approximately 100 employees from the Louisville Metro Government, the school district and the University of Louisville.

The Partnership Project participants defined a number of objectives pertaining to environmental education, environmental assessment and the creation of green public infrastructures. More specifically, the Partners aimed to collaborate on the provision of services, achieve cost savings, share information on environmental challenges and implement low-cost sustainable solutions to these problems.

To help with the realization of these goals, eight committees were formed, each one working on a different aspect of environmental sustainability: Waste Management, Green Purchasing, the Energy Use Partnership, Environmental Education, Outdoor Classroom, Environmental Health, Interagency Coordinating, and the Principles and Standards Committee. Other organizations, such as the Kentucky Pollution Prevention Center (which is a research center affiliated to the University) and the Kentucky Office of Energy Policy (which is affiliated to the Kentucky state government), were called upon on certain occasions to provide training and or technical support; however, these organizations were not formally included in any one committee.

Until recently, the Partnership for a Green City was coordinated by a Steering Committee made up of one representative from each partner. However, it was the responsibility of each institution to follow-up on the various initiatives launched through the Partnership. At the Metro Government, for instance, the Mayor's Office for Environment Policy was created for the very purpose of monitoring the progress of the institution in terms of sustainability. Since December 2007, a full-time Director has managed the Green City Partnership, whose role is to coordinate the various committees and follow-up on their work. However, each committee maintains the responsibility for managing and implementing its own initiatives. As a consequence of this decentralized structure, the success of committee initiatives depends largely on the degree of involvement of each committee's Chairperson and individual members.

In the case of the Energy Use Partnership, the Chair is also a member of the Steering Committee and has been very dynamic and proactive in his approach. The Energy Use committee is composed of approximately 15 active members. The committee members from within the municipal corporation come from a variety of agencies, including the Facilities Management Department, the Mayor's Office, the Louisville Water Company, the Physical Assets Department, the Financial Department, and the Metro Air Pollution Control District. The Partnership also includes representatives of Jefferson County Public Schools and the University of Louisville. The expectation is that members will bring their expertise and experience to the Partnership meetings, share their knowledge of the subject and help implement the Committee's recommendations in their respective workplaces.

Early in the process, members of the Energy Use Partnership defined seven main objectives:

- develop funding proposals for energy efficiency projects and energy education programs
- perform energy efficiency audits in buildings at all three organizations
- develop low-cost energy efficiency technology that facilities personnel can easily implement
- promote alternative financing mechanisms, such as energy savings performance contracting
- develop energy efficiency awareness training programs for all three partners by 2006
- work with engineering firms to incorporate energy efficiency provisions into new building specifications.
- identify a standardized electronic format for utility data to better track energy use in buildings.

Of these seven objectives, the Energy Use Partnership has made at least some progress on the first five. The committee obtained a grant to implement a solar technology pilot projects in facilities owned and operated by the School Board and the Metro Government. However, these projects have largely focused on incorporating solar technologies in a particular school, which includes heating a swimming pool and conducting a solar photo-voltaic street-lighting project in front of the school. The Kentucky Institute for the Environment and Sustainable Development and the Kentucky Solar Research Center, both of which

are part of the University of Louisville, have provided oversight and professional expertise for this project.

The energy audits conducted in various buildings owned by the School Board, the City and the University are a good example of the initiative in action. These energy audits were carried out by high school and university students, who were trained by professional engineers at the University. The audits were performed in 11 buildings; in each, a number of low-cost energy saving devices, such as energy-efficient light bulbs, light-reflecting shelves and low-energy devices on vending machines, were implemented. The training and technical support for these audits came primarily from the Kentucky Pollution Prevention Centre, which is a research unit of the University of Louisville. Each institution also worked with its respective IT department to ensure that the power management features of the agency's computers were activated with the right settings.

The main low-cost energy saving technology that was developed in the context of the Partnership was for light harvesting. It involves installing light-coloured shelves in the middle of classroom windows to reflect light onto the ceiling of a classroom, which is then reflected back into the room. This has allowed substantial energy savings at the University of Louisville and Jefferson County Public Schools by reducing the number of electric lights that need to be turned on during the day. Different low-tech insulation techniques, designed to be performed by facilities personnel, were also tested and implemented.

In addition, the administration of Jefferson County Public Schools implemented energy performance contracting, which consists in using cost savings from reduced energy consumption to repay the cost of installing energy conservation measures. Finally, although the Partners did not put in place an energy efficiency training program per se, there were several workshops—organized for facilities managers and the personnel of the three institutions—on the theme of energy efficiency and energy saving technology. In addition, facilities managers received training on Green Building standards to help demystify the apparent technical complexity of "green retrofitting".

Not much progress has been made on the last two objectives in the list above as they were not considered immediate priorities. However, the Chairman of the committee seems confident that these objectives will be achieved in the near future.

Policy Context

Each of the three Partners was already active in the area of environmental sustainability— in the words of one official, the major institutions in Louisville were in many respects already "green". However, many of the policies that had been implemented prior to the creation of the Partnership were limited in scope by the simple fact that each partner was acting alone and could not benefit from the expertise—and the resources—available in the other institutions. For example, the School Board's previous energy saving policy was mainly limited to systematically turning off appliances and lights when not needed. The Partnership for a Green City made possible the collaboration between public entities in Louisville, the pooling of their resources and expertise, and the expansion of the scope of existing policies.

The main grant obtained by the Energy Use Partnership came from the US Department of Energy through a program called the Solar America Initiative, which aims to accelerate the development of advanced photovoltaic technologies with the goal of making solar electricity generation cost-competitive with other forms of renewable electricity by 2015.

Several of the committees formed through the Partnership have received funding from the Federal government and other institutions, but the Partnership itself has not been supported or framed by policies or programs of the upper tiers of government.

Financial Aspects

Because the human resources contributed by each partner were already in place and involved in each institution's respective environmental program, the partners did not incur any extra costs in their first three years of collaboration. Developing the initiative was mainly a matter of redirecting existing resources. For instance, by reassigning existing staff members to specific areas of research, the University and the School Board created two joint positions with a mandate to focus on environmental health and education.

In 2007, after its first three years, the Partnership for a Green City hired a full-time Director, with each partner contributing one third of the necessary funds. This is the Partnership's only staff member and represents an expense of approximately $30,000 for each partner.

As mentioned above, the Energy Use Partnership received a $396,000 grant from the US Department of Energy for the solar technology pilot projects. The committee has also received $66,000 in funding for the low-cost energy conservation measures from the Kentucky Division of Energy and $5,000 for energy-tracking software from the US Environmental Protection Agency.

Finally, as mentioned earlier, the training and technical support for the energy audits came primarily from the Kentucky Pollution Prevention Centre, a research unit of the University of Louisville. As for the implementation of energy savings performance contracting and the organization of conferences and training sessions on the theme energy efficiency, they did not require external funding.

Outcomes

This section presents a summary of the outcomes of those aspects of the Partnership for which relevant information was available. Given that the Partnership was until recently managed at the committee level, it is not surprising that there has not yet been a systematic accounting of outcomes across the various committees and projects undertaken. The Partnership for a Green City's annual reports issued in 2005 and 2006 provides few quantitative measures of the Partnership's energy accomplishments. The extent of outcome monitoring done in each member institution varies. The Metro Government does not have precise figures as to how much energy has been saved in its operations.[21] In contrast, Jefferson County Public Schools and the University of Louisville have been able to estimate how much money and energy has been saved—or will be saved—through some of their energy saving projects, as explained below. Given that similar energy saving solutions have been implemented in Metro Government buildings, it is reasonable to assume that energy savings are—or will be—of a similar magnitude.

In terms of developing funding proposals for energy efficiency projects and implementing low-cost energy-efficiency technology, the Energy Use Partnership did quite well. As mentioned earlier, the committee received approximately $467,000 in external grants, $66,000 of which was used for implementing energy saving technology. The University, for example, installed energy misers on vending machines, which resulted in cost savings of approximately $3,000 to $4,000 (University of Louisville, 2006). In addition, the partners received $5,000 from the US EPA for buying energy-tracking software, which should help them monitor progress. However, it is as of yet unclear how these grants will translate into cost savings.

In terms of promoting alternative financing mechanisms, such as energy savings performance contracting, the Energy Use Partnership also did quite well. It is estimated that the School Board saved approximately $90,000 last year through the use of energy improvement contracting. The organization took out a $5.2

[21] The Mayor's Office for Environment Policy, the agency responsible for the follow-up on improvements within the municipal corporation, is still developing appropriate measures.

million loan for energy conservation measures, which it is paying back with the money saved from the resulting reduction in energy expenditures. Since the interest on the loan costs approximately $410,000, and since they have saved more than $500,000 in energy costs, the conservation measures have actually yielded a profit. These conservation measures also had an environmental impact: indeed, according to an official from the Energy Use Partnership, the School Board has recorded electricity savings up to 50% in certain cases, and cut natural gas consumption by 49% in 2006 through better energy management (Mulheirn, 2008).

In terms of developing energy efficiency awareness training programs in all three institutions, the Energy Use Partnership has been less successful. As mentioned above, the Partners held several workshops for facilities managers and personnel and facilities managers received training on Green Building standards. There was, however, no systematic energy efficiency awareness training programs put in place.

However, on the political level, the Partnership has allowed for the formation of a strong coalition in favour of positive environmental change. The value of this coalition was recognized when the Partnership for a Green City won the 2007 National Award for Community Partnerships (Louisville-Jefferson County Metro Government, 2007a). Judging from the coverage in the local media, it appears that the Partnership for a Green City has already had a major impact on the City in terms of raising awareness about environmental issues and pushing a "green agenda". And according to the director of the Partnership for a Green City, this might serve as a basis for further reforms. Indeed, the Metro Government is currently drafting a "green agenda" which aims, among other things, to foster the development and implementation of a Green Building Standard for the construction and operation of all new, renovated and existing buildings and facilities owned by the Metro Government.

Lessons Learned

There are several success factors in the case of the Partnership for a Green City. Most notably, the decentralized committee framework seems to have worked quite well, at least initially, in terms of facilitating the development and implementation of small-scale projects. Moreover, the fact that committee members were professionals who had volunteered to become members and therefore already had an interest in the matters discussed, also helped. This structure allows peer pressure, rather than top-down decision-making, to bring about changes in operating procedures within each partner agency (Louisville-Jefferson County Metro Government, 2007b). This is especially true in the case of the Energy Use Partnership, which was able to obtain external funding, develop projects and implement them all in the first year of its existence.

Another success factor is the political leadership that was behind the initiative. The Partnership was initially proposed by Mayor Abramson, and was—and still is—very much supported by the City Council. It is worth noting that Stephen Daeschner and James Ramsey, respectively Superintendent of the Jefferson County Public Schools District and President of the University of Louisville, have also been very active in setting up and promoting the Partnership. This political will to "work together" has greatly facilitated the sharing of expertise and resources, which many of the interviewed officials agree has been instrumental to the initiative's success.

The initiative's main weakness has been the uneven follow-up across committees on their own recommendations for action. As alluded to earlier, it has been difficult for the Steering Committee, composed of volunteers who already had full-time jobs within the partner agencies, to effectively coordinate the various committees and monitor their progress (Fryrear, 2008; Harris, 2008). To a large extent, a committee's progress has depended heavily on the enthusiasm and commitment of the committee's Chairperson and membership; this has proven to be highly variable across committees. Not surprisingly, certain committees did not get past the 'project development' stage. However, this challenge

has been addressed by the recent hiring of a full-time Director, whose job it will be to follow the activities of each committee more closely.

It is possible that this situation could have been avoided if the Director's position had been created at the launch of the initiative. However, it might have been difficult to convince the partners to contribute to a full-time salary before anything substantial had been accomplished. According to one official, the hiring of the director reflected the growing realization that the partnership could generate substantial savings—both in time and money. One of the interviewed officials argued that if a partnership of this kind is to be replicated, the benefits from collaboration should be measured and publicized within the partner organization as soon as possible. This points to another weakness of the current initiative, i.e., the lack of systematic monitoring of the Partnership's progress.

The Partnership model pioneered by Louisville could be reproduced in any other city in North America. In fact, cities of different sizes and in different regions of the US are already replicating the Louisville model. For example, Lexington, Kentucky; Bowling Green, Ohio; Frankfort, Kentucky; and Richmond, Virginia have all created institutional partnerships to promote energy conservation and efficiency (Louisville-Jefferson County Metro Government, 2007a).

Next Steps

In order to facilitate the management and promotion of the Partnership, each partner plans to contribute additional support to the initiative. The University will make office space available and provide some clerical support, while the School Board will maintain a web site to help coordinate and publicize the Partnership's activities and the Metro Government will create videos and brief spots that can be used for training staff members, in public presentations or for publicizing the initiative (Louisville-Jefferson County Metro Government, 2007b).

The Partnership has undertaken a planning process in 2006 that aims to establish clear objectives for each committee and develop specific measures to monitor the progress of each institution. It is also worth noting that the Metro Government plans to eventually widen the scope of its campaign and involve the community as whole, in which case it could use these same metrics to measure community environmental progress and provide regular updates to the community (Louisville-Jefferson County Metro Government, 2007b).

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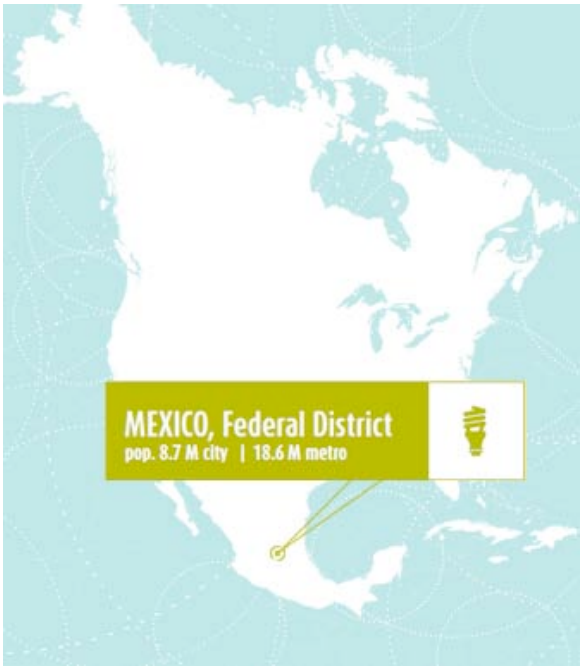
WEB RESOURCES

Partnership for a Green City
www.greencitylouisville.com

Jefferson County Public Schools Center for Environmental Education
www.jefferson.k12.ky.us/Departments/EnvironmentalEd/GreenCity

Climate Action Plan Energy Projects, Mexico City, Federal District, Mexico

Summary



The Environment Secretariat (*Secretaria del Medio Ambiente*) in Mexico City has developed several strategies to help protect the environment. Among them are the Local Strategy for Climate Action (*Estrategía Local de Acción Climática*), adopted in 2006, and the 2008-2012 Climate Action Plan (*Plan de Acción Climática*), to be adopted in the spring of 2008. The first provides general lines and directions in terms of climate action for Mexico City whereas the latter will complement the former by setting tangible goals as well as a timetable for their accomplishment.

Although the Climate Action Plan has yet to be officially adopted, some of the measures included in the plan are already under way. For instance, under the *Norma Solar* (Solar Bill), the installation of solar water heaters in all new commercial and industrial buildings that employ 51 people or more is required. At least 30% of the hot water used in applicable buildings must be heated by solar energy. Another measure to be included in the Climate Action Plan that has already been initiated is the Environmental Administration System and the closely-linked green procurement policy, adopted in May 2007. The objective is to reduce the environmental impacts associated with municipal activities and to encourage environmental awareness among municipal staff. Some pilot projects related to increasing energy efficiency in residential and public lighting are also currently under way. These initiatives will be integrated into the official Climate Action Plan and will be expanded once the plan comes into force.

As these initiatives are relatively recent, outcomes to date remain limited. However, estimates have been made of the potential environmental outcomes of each initiative, in terms of energy saved and greenhouse gas emissions mitigated per year. By 2012, the different initiatives have the potential to reduce greenhouse gas emissions by the following amounts: the *Norma Solar*, 350,000 tons CO_2 per year; the Environmental Administration System, 1,133 tons of CO_2 per year; the energy efficiency initiatives in the residential sector, 850,000 tons of CO_2 per year; and in the public lighting system, 11,000 tons CO_2 per year.

Although the energy efficiency projects in the different lighting sectors are not very innovative, as several Mexican cities already have such projects in place, the green procurement policy and the *Norma Solar* are. In fact, the latter is unique, as no other Latin American city has adopted such a measure to date.

Officials at the Environment Secretariat have identified two major barriers that are impeding the full realization of the energy-related initiatives associated with the Climate Action Plan: (1) the lack of financial resources; and (2) the lack of awareness or knowledge concerning climate change and new energy-related technologies within the municipal corporation and among community stakeholders.

Municipal Context and Background

Mexico City is the capital of Mexico. It is located on a high plateau in the Valley of Mexico, at an altitude of 2,240 meters. It is the country's most important economic, industrial and cultural centre as well as the most populous municipality, having 8.7 million inhabitants according to the 2005 national population count. Mexico City is also known as Mexico DF, or Distrito Federal. Mexico DF is in fact one of 59 municipalities in a large metropolitan area, the *Zona Metropolitana del Valle de México* (Metropolitan Zone of the Valley of Mexico). In 2005, the *Zona Metropolitana* had a population of 18.6 million. From 1980 to 2000, Mexico City's economic base shifted from industrial production to the service sector. Today, the City's main industries are trade, financial services, insurance, telecommunications, information technology, and transportation.

In July 2004, Mexico City was host to an international event organized in partnership with ICLEI (Local Governments for Sustainability), during which cities from around the world presented their initiatives for the reduction of greenhouse gas emissions. Encouraged by the event, Mexico City began developing its own institutional framework related to climate change prevention.

In November 2006, the Climate Action Strategy was published. This document sets the general outline for climate policy in the City. Its eight chapters provide background information on climate change and the Kyoto Protocol, Mexico City's vulnerability to climate change, adaptation measures, mitigation measures, and presents a greenhouse gas inventory[22] for the City and the *Zona Metropolitana* (GDF, 2006a). In the chapters on mitigation measures, the Strategy presents a list of initiatives that were already under way in the City as well as a list of new initiatives to mitigate climate change. Although the Strategy does not set quantitative targets, it did quantify the emission reductions achieved through projects and programs the City already had in place, such as transport programs, a waste separation program, and a reforestation program. Mexico City's administration is the first local government in the country to adopt a policy to combat climate change (GDF, 2006a).

Mexico City is now in the midst of developing a Climate Action Plan, which will complement the 2006 Strategy by laying out a detailed set of measures as well as setting a timetable for their implementation; it is expected that implementation will be completed by 2012. The proposed measures will be divided into six areas of activity: transport, water, waste, education, adaptation, and energy (GDF, 2007d). Finally, the Action Plan will detail the expected cost of implementing each measure and will provide information on potential funding mechanisms, and a provide a roadmap for entering the international carbon market.

In September 2007, all involved stakeholders sat down together to consider the measures to be included in the Action Plan. Presentations from experts and stakeholders were given, workgroups were created, and public consultations were scheduled. Three months later, a second meeting took place; the final document is expected to appear in the spring of 2008. However, the City is not waiting for the Climate Action Plan to be officially enacted to start the work; several programs are already under way.

The office in charge of the Local Strategy for Climate Action, the greenhouse gas inventories and the Climate Action Plan is the Directorate for Climate Change and Clean Development Mechanism Projects (*Dirección de Programa de Cambio Climático y Proyectos MDL*), which works under the General Directorate for Policy Planning and Coordination (*Dirección General de Planeación y Coordinación de Políticas*). The latter is one of the eight general directorates that make up the Environment Secretariat.

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[22] The City has produced greenhouse gas inventories for the years 2000, 2002, and 2004. These inventories identify the sectors with the largest greenhouse gas emissions and provide a basis to evaluate the best mitigation options as well as the efficiency of the measures adopted. Together, the inventories helped Mexico City determine which policies and initiatives would integrate the Climate Action Strategy.

The Directorate for Climate Change and Clean Development Mechanism Projects administers the programs and projects included in the Climate Action Plan.

Description of the Initiative

Officials at the Directorate for Climate Change and Clean Development Mechanism Projects and other experts on climate change consider Mexico City to be very vulnerable to the effects of climate change, given that it has experienced extreme weather events more frequently in recent years. These events have entailed significant changes in temperatures and levels of precipitation and consequences have ranged from droughts to flooding (GDF, 2007b). It is in this context that the Directorate is pushing hard to get a Climate Action Plan under way. Although the plan has not been officially adopted, some of the included measures are already in progress. The measures currently under way include the *Norma Solar* (Solar Bill), the Environmental Administration System, and energy efficiency measures in residential and public lighting.

In April 2006, the City adopted the *Norma Solar* (GDF, 2006 b). This initiative, which will be incorporated in the Climate Action Plan, is the first of its kind to be adopted by a local government in Latin America. The *Norma Solar* requires the installation of solar water heaters in all new commercial and industrial buildings that employ 51 people or more. Some smaller enterprises such as dry cleaners, launderettes, and swimming pools must also comply with the requirements of this new bill. The equipment installed must comply with the technical specifications included in the *Norma Solar*. The regulation stipulates that at least 30% of the hot water used in affected buildings must be heated by solar energy (GDF, 2007b).

Different stakeholders, such as educational institutions, industrial chambers of commerce, and solar equipment manufacturers were brought together in a working group in order to develop the *Norma Solar*. Since its adoption, several training workshops have taken place to explain how the technology works and what the *Norma* requires. These workshops target building owners, planners, and builders—i.e., members of chambers of commerce and commercial associations and of colleges and engineering associations, architects and construction site managers, and officials responsible for issuing construction permits (GDF, 2007b).

Another important initiative that will play a significant role in the Climate Action Plan is the Environmental Administration System.[23] This system, which is essentially an energy auditing and green procurement program, is managed by a committee (created in 2001) that serves as a consultation, planning and support body to the Environment Secretariat. The objective of the Environmental Administration System Committee is to reduce the environmental impacts associated with municipal activities and to encourage environmental awareness among municipal staff (GDF, 2006a). Between July 2001 and August 2006, the committee carried out 25 energy audits and 27 lighting audits, as well as several other diagnostics for water, waste, and office supplies in more than 30 municipal buildings (GDF, 2006a). A series of recommendations was generated as a result of these audits. For energy use and lighting, the recommended actions were divided into two general types: those related to energy conservation, such as switching off computers and lights, and those related to investment in new equipment, such as replacing conventional lights with more efficient ones (GDF, 2006a).

[23] This initiative has been in place since 2001. Therefore, it was not developed for the Climate Action Plan. Nonetheless, the adoption of its associated Green Procurement Policy and the new results flowing from its adoption (higher compliance) will be integrated in the Climate Action Plan.

To implement the committee's recommendations, the City adopted a bill in 2007 laying out a green procurement policy (GDF, 2007a). The new regulations introduced through the bill stipulate that all government agencies must purchase goods with reduced environmental impacts only. The bill's annexes provide a list of specific goods, along with detailed information on their environmental characteristics, that are allowed to be purchased. The list covers items such as paper, pencils, binders and other office supplies as well as models of fluorescent lights and ballasts, taps, showers, toilets etc. For example, T-8 linear fluorescent lamps and energy-efficient ballasts must now be purchased by all agencies in the municipal government; the purchase of less efficient T-12 lamps and ballasts is no longer permitted (GDF, 2007a).

Two pilot projects related to increasing energy efficiency in **residential** and **street lighting** have been under way since 2001.[24] According to City officials, these initiatives will also be officially integrated into the Climate Action Plan and will be expanded once the plan comes into force.

In an effort to increase energy efficiency in the **residential** sector, the Environment Secretariat has produced and distributed a small guide to apartment building managers on environmental best practices. The guide recommends, among other things, the substitution of conventional light bulbs with compact fluorescent ones (GDF, 2006a). The City estimates that in 2001, each household had on average five conventional light bulbs, with only one compact fluorescent bulb in every five households. The City predicts that by 2012, 80% of residential light bulbs will be compact fluorescent (GDF, 2006a).

As for the **street lighting** network, Mexico City has 345,000 street lamps that consume 283,000 MWh annually (GDF, 2006a). The local government has started installing dimmers and doing repairs and preventive maintenance to reduce energy waste. One specific objective is to install 32,000 energy efficient lamps by 2012 (GDF, 2006a). With the coming into force of the Climate Action Plan and the adoption of the recent green procurement regulations, it is expected that improvements to the public lighting network to accelerate in the near future.

Policy Context

The initiatives described above are only some of the measures that will be included in the Energy Chapter of Mexico City's Climate Action Plan, to be enacted by mid-2008. Several other measures to reduce greenhouse gas emissions will be included in the Climate Action Plan alongside the energy efficiency measures. Other areas of intervention will include transportation, communication and education, adaptation to climate change, waste management, and water (GDF, 2007d).

The Climate Action Plan builds on other municipal policies that relate indirectly to energy consumption and greenhouse gas emissions. This includes Mexico City's air quality program called PROAIRE (*PROgrama para mejorar la calidad del AIRE*), the Transport Program (*Programa Integral de Transporte y Vialidad*), the Green Plan (*Plan Verde*) and the Program for Ecological Restoration of Conservation Land (*Conservación y Aprovechamiento Sustentable del Suelo de Conservación*), to name only a few (GDF, 2006a; GDF, 2007b). Thus, the Climate Action Plan and its measures complement many existing policies, but have a greater focus on greenhouse gas reductions.

The Climate Action Plan is also indirectly supported by an international climate protection framework. Mexico City is member of ICLEI-Mexico, the Mexican branch of an international NGO promoting

[24] These pilot projects started in 2001 hence they were already underway before the Strategy or the Plan was published. They were quantified in the Strategy and will be integrated in the Action Plan under which they are expected to expand.

sustainable local governance.[25] ICLEI-Mexico has provided expertise and technical advice, and a network of national and international contacts to the staff at the Environment Secretariat.

Financial Aspects

According to City officials, developing the Local Strategy for Climate Action required a team of ten staff members over approximately two years. As for the Climate Action Plan, eight staff members are currently working on its development. Funding for both initiatives comes from the Environment Secretariat and the World Bank. As mentioned above, the oversight of both initiatives is the responsibility of the Directorate for Climate Change and Clean Development Mechanism Projects, which currently has a staff of eight.

As a major city in a developing country, Mexico City faces severe social and economical challenges that leave its administration with little money for environmental projects. As a result, the Environment Secretariat is constantly looking for external funding in order to implement its programs. The implementation of the projects included in the Climate Action Plan depends crucially on income generated through the Clean Development Mechanism (associated with implementation of the Kyoto Protocol) and various international carbon markets.

International assistance can also take forms other than direct financial aid. Staff at the Directorate for Climate Change and Clean Development Mechanism Projects report that foreign experts are occasionally sent to work with them in a capacity building context. Staff from the Directorate have also on occasion been invited to participate in international workshops.

Outcomes

The *Norma Solar* is a new program and therefore concrete quantifiable results in terms of energy and financial savings are not yet available. However, the Directorate for Climate Change and Clean Development Mechanism Projects has estimated the likely outcomes from the implementation of some measures.

It is estimated that the *Norma Solar* has a reduction potential of 350,000 tons CO_2 per year and that the payback period for the installation of the solar water heaters is only 1.5 years for swimming pools and approximately three years in the case of sanitation uses (i.e., showers, sinks, kitchens) (GDF, 2007b).

The Environmental Administration System should allow a reduction of 584 tons of CO_2 per year by 2012 through energy conservation actions, and 549 tons of CO_2 per year through equipment substitution in lighting and other municipal supplies. It is estimated that another 380 MWh per year will be saved through the implementation of the Environmental Administration System (GDF, 2007 b).

The Directorate for Climate Change and Clean Development Mechanism Projects has calculated that the energy efficiency efforts being undertaken in the residential sector will reduce greenhouse gas emissions by 850,000 tons of CO_2 per year by 2012. The cumulative reductions between 2001 and 2004 were 570,000 tons of CO_2 while between 2005 and 2012, the cumulative reductions are expected to be 4.6 million tons of CO_2. In 2001, the energy saved through the substitution of conventional light bulbs in the

[25] ICLEI was founded in 1990 as the International Council for Local Environmental Initiatives. The council was established when more than 200 local governments from 43 countries convened at an inaugural conference, the World Congress of Local Governments for a Sustainable Future, at the United Nations in New York.

residential sector with more efficient ones reached almost 53,000 MWh. It is predicted that 1.3 million MWh per year will be saved by 2012 (GDF, 2006a).

Finally, the estimated greenhouse gas reductions due to technological changes in the street lighting system was 3,700 tons of CO_2 per year in 2004; in 2012, the reductions should reach 11,000 tons of CO_2 per year. The accumulated reduction of greenhouse gas emissions was 9,300 tons of CO_2 between 2001 and 2004 and it is estimated that between 2005 and 2012, 65,600 tons of CO_2 emissions will be mitigated. In terms of energy, lamp retrofits in the public lighting system will allow over 11,000 MWh per year to be saved (GDF, 2006a).

Lessons Learned

Officials at the Directorate for Climate Change and Clean Development Mechanism Projects have identified two major barriers that are impeding the full implementation of the energy-related initiatives associated with the Climate Action Plan.

The first barrier is limited financial resources. Mexico City faces a number of critical environmental challenges, including the provision of water in sufficient quality and quantity[26] and the adequate disposal of solid waste. The precarious economic situation of a major part of the population also means that the municipal government must dedicate much of its budget to social development programs and to health and housing projects. Other important public sectors, such as urban infrastructure and security, also consume a significant portion of the municipal budget (GDF, 2006a). In such a context, little public money is left for energy conservation projects and climate change mitigation programs. The implementation of some of the programs and projects identified in the Local Strategy for Climate Action has been suspended simply due to the lack of funding (GDF, 2006a). For this reason, officials at the Directorate for Climate Change and Clean Development Mechanism Projects say that efforts to mitigate climate change, including the development of renewable energy and energy efficiency projects, would be impossible without funding obtained through the Clean Development Mechanism.

The second barrier is the lack of awareness or knowledge concerning climate change and new energy-related technologies among community stakeholders. This lack of knowledge hinders the rapid propagation of renewable energy technologies through the wider community according to City officials. For example, when officials at the Directorate for Climate Change and Clean Development Mechanism Projects meet with commercial building owners or construction companies in order to present the *Norma Solar*, they are often shocked by the low level of understanding these community stakeholders show concerning the availability of solar technology and its proven benefits. They must work hard to dispel misconceptions and show that solar technology can pay for itself through energy cost savings in as little as three years.

Even within the government, measures to increase energy efficiency and reduce greenhouse gases are tepidly welcomed by other departments and agencies. Staff at the Directorate for Climate Change and Clean Development Mechanism Projects still have much work to do to increase receptiveness to and participation in these measures. Staff from the Directorate believe that better coordination between different municipal agencies could help overcome resistance to energy efficiency measures.

Another lesson learned is that voluntary measures may have little impact compared to mandatory regulations that apply across the entire municipal government. Such was the case with the Environmental

[26] As much as 29.4% of the *Zona Metropolitana* inhabitants don't have drinking water in their homes (GDF, 2006a).

Administration System. After the many energy, lighting, water, waste and office supply audits were carried out, a set of guidelines to increase efficiency and reduce greenhouse gases was devised. Municipal agencies were expected to apply the guidelines voluntarily. However, the committee responsible quickly realized its recommendations were not being followed. In response, the City adopted its green procurement regulations, which mandated that all municipal departments follow the guidelines set by the Environmental Administration System committee. The result is that compliance is increasing considerably. The case of the *Norma Solar* was similar; it was adopted as a regulation because voluntary compliance was too low.

Another advantage of enacting change through regulations, say some City officials, is that they will tend to persist through the years and survive changes of administration. This particular aspect is especially relevant for the rest of Mexico, where municipal administrations change every three years; in Mexico City, the municipal administrations change every six years.

With the exception of the *Norma Solar*, the initiatives undertaken in Mexico City could be emulated in any North American municipal setting. The main prerequisites appear to be a certain amount of political will and environmental awareness among municipal staff. The *Norma Solar* water heater program, however, may only be worth emulating in municipalities with tropical or sub-tropical climates; the efficiency of solar water heaters may be too low in colder climates to justify mandatory installation. Mexico City's methods for financing its energy efficiency initiatives can only be replicated in other Mexican cities; funding opportunities through the Clean Development Mechanism are reserved for developing countries and thus inaccessible for US and Canadian municipalities.

Next Steps

The energy-related initiatives presented above are only part of the City's program to mitigate climate change. Several other projects have been identified and are in the early stages of development. Among them is a biogas combustion project (for electricity generation) at the Bordo Poniente landfill (GDF, 2007b); an expansion of the Metrobus system;[27] an update of the program to restrict the use of old vehicles, introducing tighter restrictions;[28] and a city-wide awareness program to increase bicycle use (GDF, 2006a). Many of the City's future initiatives are focused on the transportation sector, which is not surprising given that this sector consumes more energy and emits more greenhouse gases than any other sector in the City (CIE-UNAM, 2007).

In June 2007, Mexico City created the Commission for Efficient Energy Use (*Comisión de uso Eficiente de Energía*), a body independent from the Environment Secretariat that reports directly to the Chief Administrative Officer for Mexico City. This body is in charge of promoting the use of renewable energies within the City, conducting research, as well as formulating, coordinating, and evaluating different energy efficiency policies. The commission is designed to provide a longer-term vision and ensure the permanence of energy efficiency projects, despite changes in administration (del Valle Cárdenas, 2008).

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[27] Metrobus is a bus rapid transit system that runs on dedicated lanes and features subway-like stations, with entry through turnstiles and vehicle boarding through elevated platforms. The Metrobus is seen as a cost-effective alternative to expanding the City's underground metro train system.

[28] A program established in 1989 that requires vehicles to stay off the road once a week, depending on their age and emissions profile.

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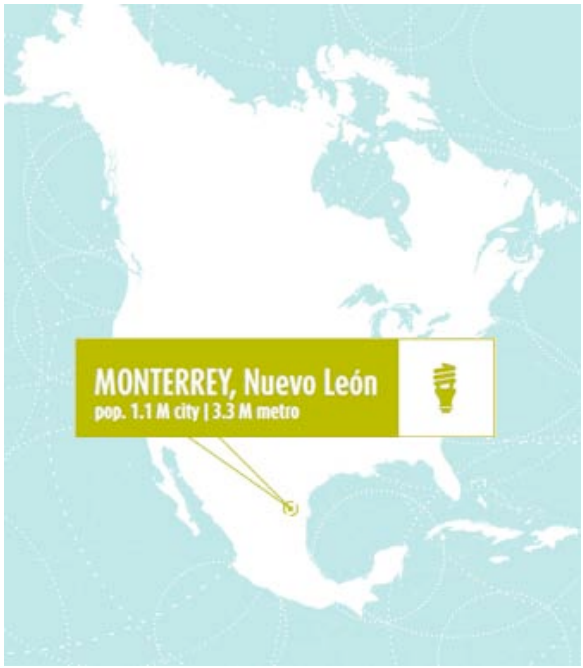
Renewable Energy Procurement, Monterrey, Nuevo León, Mexico

Summary

The City of Monterrey pays among the highest electricity rates in Mexico. This situation has pushed the City to look for alternative and cheaper sources of energy.



In 2003, Bioenergía de Nuevo León, a joint venture between a private energy company and a waste management organization belonging to the Nuevo León state government, started producing electricity through biogas combustion at a local landfill. The City of Monterrey—along with several other municipalities in the Monterrey Metropolitan Area and other governmental entities—signed a renewable five-year contract with the company to purchase electricity from the plant. Hence, since 2003, Monterrey has been using this renewable source of electricity to power its public street lighting network.

The 7 MW generated at the landfill's power plant is sold at a rate 10% cheaper than the electricity available from the Federal Electricity Commission. However, as the energy produced at the landfill is divided among several customers, Monterrey is limited to 700 kW, which corresponds to less than 10% of the energy needed to power its street lighting system. The City therefore is looking to increase its procurement of renewable energy. Bioenergía de Nuevo León is currently enlarging the biogas project in order to generate a further 5 MW by the end of 2008. Monterrey hopes to buy a much larger quantity of renewable energy from the landfill plant once this second phase of the project is operational.

The procurement of cheaper energy has allowed the municipal government to save approximately 50,000 pesos monthly since the beginning of the contract in 2003. These savings are invested in other municipal programs, such as the maintenance of green areas and city streets. This initiative has also produced positive environmental outcomes, including the mitigation of 800,000 t CO_2e since 2003.

An unusual feature of this initiative is the fact that renewable energy is sold in the State of Nuevo Leon at a lower price than the national electricity rate. Consequently, the demand for such energy in the state is much higher than the supply capacity. In this context, the City of Monterrey has had difficulties finding sufficient renewable energy sources to meet its energy needs. The City's Lighting and Energy Saving Department (*Departamento de iluminación y ahorro de energía*) is constantly searching for additional sources of renewable energy, but the few companies operating in the region already have their entire production committed to other users. This has proven to be a major challenge to the City's desire to expand its green energy procurement program.

Municipal Context and Background

Monterrey is the capital city of Mexico's northeastern state, Nuevo León. Also known as the "City of the Mountains", it is a modern industrial and business hub. The municipality lies in the foothills of the Sierra Madre Oriental mountain range, which start abruptly south of the city. The famous *Cerro de la Silla* (Saddle Mountain) dominates the view east of the city and has become a widely used symbol to represent Monterrey.

In 2005, Monterrey had a population of 1,133,800 inhabitants, with an annual growth rate of 0.4%. The City of Monterrey is part of the Monterrey Metropolitan Area (MMA), which had a population of 3,299,302 in 2000. The metropolitan area is composed of the adjacent municipalities of Apocada, Escobedo, García, Guadalupe, Juárez, Salinas Victoria, San Nicolás de los Garza, San Pedro Garza García, Santa Catarina and Santiago. The MMA does not have its own level of government, but some inter-municipal services are administered by the state government. For instance, the agency in charge of the metro system —which serves Monterrey, Guadalupe, San Nicolás de los Garza, and Escobedo—is administered by the State of Nuevo León.

For several years, Monterrey City officials have been actively searching for alternative and cheaper sources of energy. This reflects the fact that Monterrey must pay among the highest electricity rates in the country.[29] In 2003, Bioenergía de Nuevo León started producing electricity from biogas combustion at a nearby sanitary landfill, in the municipality of Salinas Victoria (see map of the Monterrey Metropolitan Area). As the electricity produced is cheaper than that sold by the Federal Electricity Commission, the City quickly concluded that it would be advantageous to replace some of the electricity obtained from the national grid with this local and renewable source. In July 2003, the two parties signed a renewable 5-year contract.

Although there were no public consultations on this decision, the City did inform the population of the renewable energy project upon which it was about to embark through press releases and television and radio adds, according to City officials.

The municipal body responsible for renewable energy procurement is the Lighting and Energy Savings Department that works under the Modernization and Projects Directorate within the Public Services Secretariat.

Description of the Initiative

As mentioned above, the City of Monterrey began buying renewable energy from Bioenergía de Nuevo León in 2003. Bioenergía de Nuevo León is a joint venture between Bioeléctrica de Monterrey and the Integrated System for an Ecological Management and Process of Waste (*Sistema Integral para el Manejo Ecológico y Procesamiento de Desechos* or SIMEPRODE). Bioenergía de Nuevo León is the private consortium in charge of the technical aspects of the project, including the design, construction, operation and maintenance of the biogas plant. SIMEPRODE is a public company of the Nuevo León state government and owner of the landfill site.

[29] The Federal Electricity Commission charges the Municipality of Monterrey approximately 2.3 pesos/kWh for low tension and 1.9 peso/kWh for medium tension (rates as of February 2008). The rates are determined by taking into account the cost of production and distribution as well as the temperature and humidity of the different Mexican regions. Other social-economical factors are also taken into consideration such as regional economic growth and average income of the population.

SIMEPRODE was created in 1987 with the mission of ensuring the safe disposal of municipal solid waste in landfills throughout the state. In 2000, its mission was modified such that it became responsible for the commercialization of solid waste and its sub-products (BENLESA, n.d.). This modification to its mandate allowed the public entity to start exploiting biogas to produce electricity at its Salinas Victoria landfill site, located in the municipality of the same name, some 60 km from the municipality of Monterrey. Household, commercial and industrial waste has been disposed of at the Salinas Victoria landfill since 1990 (Bioenergía de Nuevo León, 2007a). The landfill, which serves a population of 4 million, is expected to close in 2020. The landfill produces 63m^3 per minute of biogas (approximately 50% methane and 50% CO2) (Bioenergía de Nuevo León, 2007a).[30]

Bioenergía de Nuevo León (the joint venture) owns and operates the biogas power plant in Salinas Victoria, called BENLESA. This plant was the first plant in Latin America to generate electricity by burning landfill biogas. It started generating power in September of 2003. The first phase, called Project Monterrey I, has a production capacity of 7MW and has produced 202,500 MWh of electricity to date (BENLESA, n.d.).

The plant is planned to operate for at least the next 25 to 30 years. Its biogas system is composed of a collection system of 248 extraction wells with monitoring valves, covering 44 hectares (ha) of the landfill (total landfill area: 212ha), about 25 km of collecting pipes, three vacuum pumps and filter units and two flare stations for burning excess gas. The actual power plant has seven modular generating units, seven step-up transformers, automated control equipment and switchgear to feed the grid (Bioenergía de Nuevo León, 2007b).

Presently, a second phase of the BENLESA plant is under construction. Project Monterrey II is expected to increase electricity production at the site by expanding operations to cover a larger area of the landfill. This second project will generate an additional 5MW, bringing the power plant to a total capacity of 12MW (BENLESA, n.d.).

Complex national regulations for power generation needed to be taken into account during the project's development. The national Electricity Law does not allow private participation in power generation, but does allow public or private investors to form a Cogeneration Company that provides electric services to its members or partners. While the law does not allow electricity to be "sold", the Co-generation Company framework allows electricity to be supplied by partners in the company to the other partners (World Bank, 2007). This national context explains why the plant was developed as a cogeneration project between several partners. Indeed, the electricity generated at BENLESA is distributed to several municipal and state users that are associates in the project.

The power plant supplies 4.9 MW during the night (between 7:00 PM and 7:00 AM) to the seven associate municipalities within the Monterrey Metropolitan zone for their street lighting (Monterrey, San Pedro Garza García, San Nicolas de los Garza, Escobedo, Santa Catarina, Guadalupe and Apodaca) (World Bank, 2007; BENLESA, undated). This power is divided equally among them, providing them with 700 kW each. The remaining energy produced at night goes to the Federal Electricity Commission (*Comisión Federal de Electricidad*). During the day, the plant powers the state-administered rapid transit system with 5.9 MW (80% of its needs).[31] 1 MW is distributed between the water and sewage state

[30] 63m3/minute of biogas can produce 58 GWh of energy a year and has the capacity of supplying at least 16,000 medium-small houses per year (World Bank, 2007).

[31] The Metrorrey is a modern collective rapid transit transport system of 23 km in total, that counts with two lines, : one above ground consisting of 19 stations across the City of Monterrey and extending east in the Metropolitan Zone and a second underground line downtown counting nine stations with four more currently under construction.

company *Aguas y Drenaje*, the Child and Family Assistance Public Entity (*Sistema para el Desarrollo Integral de la Familia del Estado de Nuevo Leon*) and state government buildings (World Bank, 2007). The remaining energy produced during the day is used for the plant's own operations. Each of the associates has an independent five-year contract with Bioenergía de Nuevo León, which allows them to purchase energy at a rate 10% lower than the national rate for the same service.

Since 2003, the City of Monterrey has purchased 700 kW of renewable energy from Bioenergía de Nuevo Léon, all going towards the street lighting system. According to municipal officials, the City's total energy need for the street lighting system is between 8,000 and 10,000 kW. Therefore, the renewable energy bought from Bioenergía de Nuevo Léon powers less that 9% of the total network.

With the completion of Project Monterrey II, the City hopes to be able to buy up to 5 MW, which is the entire additional capacity expected from Monterrey 2. This would allow the municipality to supply more than 50% of the energy needed for the street lighting system from this renewable source. Accordingly, in November 2007, the City asked for a modification of the purchase contract to incorporate the extra 5 MW (Rodriguez García, 2007).

The transmission and distribution of energy produced at BENLESA is done through the existing national network belonging to the Federal Electricity Commission on a long-term contract basis. Bioenergía de Nuevo León is responsible for installing and maintaining the meters measuring the amount of energy going into the national grid.

Policy Context

Monterrey's renewable energy procurement initiative is supported by the City's 2006-2009 Municipal Development Plan. Two of the six "pillars" put forth in the plan refer to environmental sustainability: Pillar Four promotes an efficient public sector, including energy efficiency, and Pillar Six says that public works will be executed with a long-term vision, taking into account sustainable urban planning and ecological awareness. More specifically, Pillar Four states that City expenditures related to electric energy consumption should be reduced by using local alternative energy sources (City of Monterrey, 2006).

This municipal initiative is also supported by the State of Nuevo León's 2004-2009 Development Plan. Chapter Five of the Plan highlights the creation and development of alternative programs to generate energy through the processing of solid waste for public and social use (Government of Nuevo León, 2004).

Even the National Development Plan 2007-2012 supports the initiative in some ways. Chapter Four, environmental sustainability, mentions the need to reduce the environmental impact of waste and the potential benefits to municipalities of using biogas as an energy source (Government of Mexico, 2007).

Since 1992, the City of Monterrey has worked towards reducing its energy needs by increasing the efficiency of its lighting network. To date, the City's Lighting and Energy Saving Department has installed 800 dimmers, covering 60% of the city's total lighting network. Also municipal policy renders the use of energy efficient ballasts in the entire public lighting network mandatory. Furthermore, the department works towards the recycling and reuse of electrical components and is constantly in the midst of developing new projects to save energy (Gutiérrez Alvarado, 2007).

Financial Aspects

The financial arrangements related to this initiative are quite simple. As the City is only a customer in the whole process, no additional resources are required to administer the initiative. As previously mentioned, all costs related to the production, transmission and distribution of the electricity are taken care of by Bioenergía de Nuevo León. As for any other customer, the City pays a monthly fee to the company for the energy purchased during that month.

The City has seven full-time staff in the Lighting and Energy Saving Department. This team oversees the contract with Bioenergía de Nuevo León, but is also actively working on finding other sources of renewable energy and developing more energy-efficiency projects and programs.

The City neither seeks nor receives extra money from external sources for its renewable energy initiative. However, Bioenergía de Nuevo León has sought external funding. In order to develop phase 1, SIMEPRODE received US$5.1 million from the GEF-World Bank Funds (representing 47% of total investment) while the remainder of the capital needed (US$5.7 million) was provided by the private company Bioeléctrica de Monterrey, for a total capital investment of US$10.8 million (Bioenergía de Nuevo León, 2007b).

The second phase of the project is being financed in part by the World Bank. The company also intends to apply to sell emission reduction credits on the international carbon market.

Outcomes

Methane (CH_4) is a potent GHG which makes up 14% of global GHG emissions, the second largest contributor to GHG emissions after CO2 (77%). Methane emissions from the waste sector comprise 10% of total GHG emissions in Mexico (2002) (SEMARNAT, 2007a). At the same time biogas constitutes a valuable fuel and can therefore be used for energy generation, displacing energy generated with fossil fuels.[32] The first phase of Project Monterrey has mitigated 44,300 t of methane between 2003 and 2007, which is equivalent to 800,000 t CO_2 (BENLESA, undated).[33] Once the second phase of the project is operational, greater CO_2 reductions will be achieved.

At a very local level, the project provides environmental and health benefits to the local population by reducing odour and controlling emissions of volatile organic compounds that are found in biogas (World Bank, 2007).

From a financial point of view, the municipality has been saving approximately 50,000 pesos monthly since the beginning of the project in 2003 (Gutiérrez Alvarado, 2007). According to City officials, the money saved goes towards other municipal programs, such as the maintenance of green areas, city streets and the storm water drainage system, benefiting the entire community.

Although the City's original motivation for participating in Project Monterrey was financial, the environmental benefits of the initiative were soon recognized. Because of its contribution to climate change protection, the initiative has undoubtedly helped green the image of the municipal government, at least in the environmental community.

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[32] In Mexico, 91% of electrical generation is from fossil fuels. Electricity generated from hydroelectricity, wind, geothermal, biomass and nuclear sources account for the remaining 9% (SEMARNAT, 2007a).
[33] This is for the entire project, not only for the portion bought by the City of Monterrey.

Among the wider public, however, the City's renewable energy procurement policy has a relatively low profile, perhaps due to the fact that the amount of renewable energy involved is marginal when compared to the City's total electricity consumption. The initiative may take on more visibility after the second phase of Project Monterrey is operational and the City's quotient of green electricity is boosted to more significant proportions.

Lessons Learned

This case study shows that when renewable energy is available at a reasonable price, municipalities will act quickly to incorporate it into their supply mix. However, it is rare to find situations in which renewable energy is sold at a lower price than the national electricity rate. In northern Mexico, the rates for renewable energy—not only for electricity from biogas combustion, but from wind and hydroelectricity as well—are from 10 to 20% cheaper than the exorbitant national rate. In this regard, Monterrey has an advantage over other North American municipalities, where buying renewable energy usually entails considerable additional costs. In fact, the high price of renewable energy is a key barrier impeding demand in other North American cities.

The unusual financial context in northern Mexico, however, has created a huge demand for renewable energy that far exceeds the supply capacity. The Lighting and Energy Saving team has been actively looking for additional sources of renewable energy. Two wind companies operating in the region were approached, as well as a hydroelectricity company with projects in the south of the country. So far, the search for new sources has been unsuccessful: the companies approached had concluded contracts to sell their electricity long before the construction of their projects had even started.

Even though the best available technology was used for the project, environmental conditions in Mexico produced some technical problems that had not been anticipated. High daytime temperatures forced the operator to add heat removal equipment to the landfill in order to avoid loss of performance. Another unexpected problem was the widespread content of siloxanes (silicate oxides and complex silica compounds), resulting from the disposal of cosmetic and paints. The presence of these compounds contributed to the accumulation of hard deposits in the compressor heads, which required a continuous cleaning process to maintain output pressure and consequently more frequent stoppage of operation. Some problems also occurred with the link to the national grid from the power plant site. The link proved to be unreliable at first and led to several plant stoppages. Upgrading the link generated more costs for the operator (World Bank, 2007).

The transmission and distribution of energy produced at BENLESA is done through the existing national network belonging to the Federal Electricity Commission. Contracts between the commission and Bioenergía de Nuevo León governing the interconnection and wheeling of electricity were signed in order to make this relationship official. Due to the lack of precedents, the negotiation of these contracts took longer than originally foreseen and caused a six months delay in the provision of energy to the municipalities (World Bank, 2007).

Finally, due to the fact that municipal governments change every three years, often entailing a high turn-over of staff, continuous commitment to a given project by municipalities in Mexico is difficult to achieve. This situation also makes it difficult to accumulate institutional knowledge and to learn from past experiences. The Public Private Partnership (PPP) structure in Monterrey, however, has helped address this situation by involving federal, state, and private sector agencies working cooperatively with municipal governments. This three-way partnership has helped assure continuity in technical capacity on this long-term project. This is particularly relevant for the replication of the Monterrey experience in other Mexican municipalities (World Bank, 2007).

Next Steps

As mentioned above, the municipality would like to expand its renewable energy procurement program, but cannot find sources of new supply. Given that the development of new projects generally takes several years, the City will have to content itself with the energy from Bioenergía de Nuevo León for now. The municipality is hoping to obtain an addition 5 MW in supply once the second phase of Project Monterrey is completed. The municipality received a commitment letter from Bioenergía, but the final decision has not yet been taken. If the increased capacity is divided among all municipal associates, as it was the case for the first phase of the project, Monterrey will need to continue its search for more renewable energy sources elsewhere.

When questioned about the feasibility of producing their own renewable energy, with solar modules for example, the staff at the Lighting and Energy Saving Department was not convinced it was a good idea. According to them, solar energy technology is only now being introduced in Mexico and remains to be proven on both technical and financial levels. In the future however, this could be an option that will deserve closer study.

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Corporate Action Plan "For Preserving the Climate," Montréal, Québec, Canada

Summary

In 2005, the City of Montréal began work on the Corporate Action Plan "For Preserving the Climate" (*Plan d'action corporatif "Pour préserver le climat"*) with the aim of reducing the City's corporate greenhouse gas emissions to 20% below 2002 levels by 2012. The City carried out a greenhouse gas inventory to help establish the plan's priorities and, subsequently, to devise a set of specific actions. The plan was adopted by the Executive Committee of the Montreal City Council in 2007.

The plan has several innovative features. For example, it calls for the use of a set of performance indicators that are to be used to hold participating municipal departments (i.e., boroughs and divisions of the central administration) accountable to the City Council. The Plan has also called for the creation of the first municipal energy fund in Quebec, designed to help finance energy efficiency projects within the municipal corporation. Another important initiative is the creation of an internal website that encourages capacity building and information sharing among the different stakeholders.

The City's Infrastructure, Transport and Environment Service (*Service des infrastructures, transport et environnement* or SITE) was responsible for developing the Action Plan. The same administrative body is now overseeing the implementation of the plan and is responsible for managing the Energy Fund and the website. However, the responsibility for implementing the plan's individual actions will be shared by several municipal departments.

As the plan was only recently adopted, there is a dearth of quantitative information on outcomes. The City reports that GHG emissions from corporate operations have diminished over the past year by about 2%. Qualitative outcomes resulting from this initiative are a greener corporate image for the City of Montreal and the creation of successful partnerships between stakeholders involved.

One factor that facilitated the development of the Action Plan was the strong support from City Council. The adoption of the resolution to reduce the City's GHG emissions in November 2005 and the Mayor's speech during the 11th Conference of Parties to the United Nations Framework Convention on Climate Change (COP11) are two events that helped to legitimize and provide a considerable impetus for the whole Action Plan process. The high level of cooperation between SITE and the various participating departments can also be considered as a success factor. Interdepartmental cooperation has helped to overcome one of the Action Plan's greatest challenges—the fragmented and decentralized nature of the municipal administration.

Municipal Context and Background

The City of Montreal is located on an island in the St-Lawrence River, in southwestern Quebec. The City, having a 2006 Census population of 1,620,693, is the largest of 16 municipalities on the Island of Montreal. This is by far the largest municipal population in Quebec and the second largest in Canada, after Toronto. Altogether, the municipalities of the Island of Montreal have 1,854,442 residents, whereas the metropolitan region has 3,635,571 residents.

The City of Montreal municipal corporation is a made up of a central administration and 19 borough administrations. The central administration is responsible for a number of island-wide services—i.e., services for the 19 boroughs of the City of Montreal itself plus the 15 remaining municipalities on the Island of Montreal.[34] Island-wide services include urban development, public safety, public transportation, and the environment. The boroughs, which have their own mayors and councils, are responsible for waste collection, road maintenance, zoning, parks, culture, and other local matters.

During the 2002 Montreal Summit (*Sommet de Montréal*), the City announced its commitment to protecting the environment. Three years later, in April 2005, Montréal adopted its First Strategic Plan for Sustainable Development (*Premier plan stratégique pour le développement durable*). This five-year plan includes 36 concrete actions, of which nine are directly related to improving air quality and reducing greenhouse gas (GHG) emissions (City of Montreal, 2005). Seven months later, in November 2005, as Montreal was about to host the 11th Conference of Parties to the United Nations Framework Convention on Climate Change (COP11), the municipal administration adopted a resolution to reduce its corporate GHG emissions to 20% below 2002 levels by 2012.

At about the same time, the City Council ordered the Infrastructure, Transport and Environment Service (*Service des infrastructures, transport et environnement* or SITE) to begin work on a corporate action plan to reduce GHGs emitted from municipal operations.[35] The first step in the development of the *Plan d'action corporatif "Pour préserver le climat"* (Corporate Action Plan "For Preserving the Climate", referred to here as the Action Plan) was to produce a corporate GHG inventory.[36] Once completed, the inventory was used to determine the Action Plan's priorities and to devise a set of actions to meet the 2012 emissions target.

The inventory—which was published in 2007—shows that in 2002, the Montréal agglomeration emitted 196 kilotons of CO_2; in 2003, 204 kilotons of CO_2; and in 2004, 189 kilotons of CO_2 (City of Montreal, 2007b).[37] Of those emissions, 35.8% came from municipal buildings, 27.5% from the municipal fleet; and 20% from the wastewater treatment plant (see Figure 1).

The main energy source responsible for most of the GHG emissions (41% of the total) was natural gas (see Figure 22). Based on the inventory, it was concluded that the best way to reduce the City's GHG emissions would be to invest in energy efficiency, especially in municipal buildings and vehicles (City of Montreal, 2007c).

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[34] Between January 1st 2002 and January 1st 2006, all the island municipalities and boroughs were merged together to create one single municipality. On January 1st 2006, however, 16 cities were reconstituted and demerged from Montreal.

[35] The corporate Action Plan covers all municipalities and boroughs in the Montreal agglomeration.

[36] The 2002-2004 corporate inventory covered 27 boroughs (including the merged cities at that time), the police and fire departments, the museums complex, the water filtration and wastewater treatment plants, the landfill Complexe Environnemental St-Michel and some other central services.

[37] It is important to note here that these numbers represent only 1.4% of the GHG emissions for the entire Montréal community.

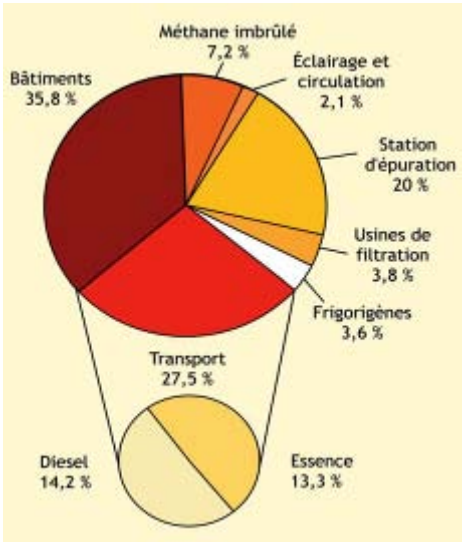

Figure 1 : GHG emissions per activity sector

Source : *Inventaire corporatif des gaz à effet de serre 2002-2004. Agglomération de Montréal*

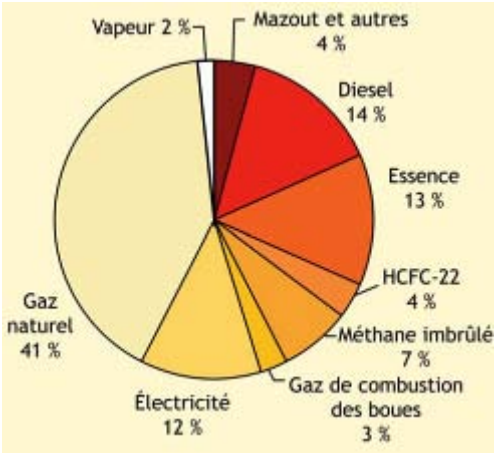

Figure 2 : GHG emissions per energy source

Source : *Inventaire corporatif des gaz à effet de serre 2002-2004. Agglomération de Montréal*

Internal stakeholders, such as the police and fire departments, the wastewater treatment plant, and various agencies and departments, were consulted by SITE officials before they drafted the Action Plan. According to City officials, this obviated any surprises when the plan was published and resulted in a high level of cooperation towards achieving the plan's goals. As the Action Plan is a corporate initiative that affects only the internal operations of the City of Montreal, public awareness of the plan is limited. No public consultations took place in the process of developing the corporate Action Plan. The plan was adopted by the Executive Committee of City Council in 2007.

Description of the Initiative

The Action Plan focuses on the two principal sources of GHG emissions from City operations, namely municipal buildings and vehicles. Among the twelve actions that it proposes, five pertain to municipal buildings and four others pertain to the municipal fleet. The three remaining actions are intended to provide technical and financial tools to the municipal departments involved. The actions were chosen so as to achieve the maximum impact on GHG emissions at the lowest cost.

The 12 actions listed in the Corporate Action Plan (City of Montreal, 2007c) include:

- Creation of an Energy Fund to help finance energy efficiency projects within the municipal corporation. The fund is expected to be operational by mid-2008 and will be used to finance actions 3, 4 and 5 of the Plan.
- Creation of a capacity building/information sharing internal network on energy issues. The network will be operational two or three months after the launch of the Energy Fund.
- Installation of passive solar heating. Solar walls38 and solar water heaters will be installed on two municipal buildings as a pilot project to determine feasibility of future solar projects. This project is to be financed in part by the Federation of Canadian Municipalities.
- Renewable energy project development. Based on the experience gained through Action 3, the Municipal Building Directorate (*Direction des Immeubles*, in charge of managing all municipal buildings) is committed to developing at least one renewable energy project per year for three years.
- Replacement of oil furnaces. A list of all municipal buildings using oil furnaces will be established via the GHG inventory and the feasibility of replacing obsolete furnaces with a cleaner technology will be evaluated with each department.
- Elimination of ozone depleting refrigerants (HCFC22). Ozone depleting refrigerants will be eliminated in all arenas and other municipal buildings by 2010, as required under the Montreal Protocol on Substances that Deplete the Ozone Layer.
- Creation of an energy efficiency plan for the Muséums Nature Montréal[39] by the end of 2008.
- Modification of the natural gas burners at the wastewater treatment plant. Sewage sludge is incinerated at Montreal's only wastewater treatment. The burners in the post-combustion chamber have been modified to reduce fuel consumption. This action was completed in 2007.
- Anti-idling campaign. This campaign applies to all municipal staff that drives a vehicle. This initiative is already in place. By the end of 2006, approximately 3000 municipal employees (mainly blue collar workers) had received training on climate change and how individual actions such as reducing idling can help mitigate climate change.
- Energy efficiency procurement policy for police vehicles. The City will add an energy efficiency criterion to its tenders when purchasing vehicles for the Police Department.
- Use of gasoline blended with 5% ethanol. Municipal services on the Island of Montreal consume 10.5 million liters of gasoline per year. The City will purchase blended fuel as it becomes

[38] A solar wall is a passive solar collector that is installed as a building cladding and that heats the building's ventilation intake air.

[39] Muséums Nature Montréal is a system of four educational facilities including the Biodome, the Botanical Garden, the Insectarium, and the Planetarium.

available, in compliance with the provincial requirement that distributors sell fuel containing at least 5% ethanol by 2012.

- Adoption of a green policy for the municipal fleet. The Municipal Fleet Directorate (*Direction du Matériel Roulant*) will buy energy efficient vehicles, eliminate energy-consuming devices (such as air conditioners) in vehicles, and carry out an awareness program among City employees to reduce energy wasting driving habits.

Montréal is not the first city to adopt an action plan to reduce GHG emissions and increase energy efficiency. However, Montreal's Action Plan has some unique features. First of all, the Action Plan has established three performance indicators to help measure progress. These include: (1) energy efficiency in municipal buildings—the average energy consumption per building type; (2) buildings temperatures—the average temperature in different building types during day and night operations as compared to specific norms to determine whether buildings are being operated in an energy efficient way; and (3) CO_2 emissions per volume of potable water processed by the City's filtration plants. Together, these performance indicators allow the City to track the impact of measures taken and to calculate which actions are most effective in terms of the amount of GHGs avoided or energy saved (City of Montreal, 2007c).

The second innovative aspect of the Action Plan is the creation of the Energy Fund. Montréal is the first city in Québec to put into place such a fund, which will be used to finance the installation of passive solar heating, the development of renewable energy projects and the replacement of oil furnaces. Once the initial investment by the municipal government is made, the Fund will sustain itself through returns on energy efficiency investments and subsidies from external sources (i.e., energy efficiency grants and incentives). On a $10.7 million municipal investment over a six-year period, the Fund is expected to generate $24.4 million in total investment, assuming that 20% of the municipal spending will be matched by external sources and a seven year average repayment period (see Table 1) (City of Montreal, 2007c).

Table 1 : Energy Fund (in millions of dollars)

Year	Investment	Reinvestment	Subsidies	Return on investment	Total Investment
1	3.0	0.0	0.8	0.4	3.8
2	2.7	0.4	0.8	0.9	3.9
3	2.0	0.9	0.7	1.3	3.6
4	1.5	1.3	0.7	1.7	3.5
5	1	1.7	0.7	2.1	3.4
6	0.5	2.1	0.6	2.4	3.2
7	0	2.4	0.6	2.8	3.0
TOTAL $	10.7	8.8	4.9	11.6	24.4

Source: Plan d'Action Corporatif "Pour préserver le climat" 2007.

The third innovative aspect of the Action Plan is the internal Energy website to encourage information sharing among the different participating municipal departments. The City of Montreal has a very decentralized administration, making information sharing quite challenging. The intranet project is intended to help overcome this structural problem, reducing duplication between departments and helping to save staff time. Using the website, officials involved in energy management will be able to share information and experiences with respect to managing energy use and to help identify and locate expertise on specific matters within the administration. Tendering calls on upcoming projects as well as technical

and financial reports on existing energy-related initiatives will also be found on-line (City of Montreal, 2007c).

The responsibility for managing and implementing different aspects of the Action Plan is distributed among a number of stakeholders within the municipal corporation. General oversight and coordination, as well as the intranet portal and administration of the Energy Fund, is the responsibility of SITE. The plan's other actions are to be carried out by the relevant department or service, with SITE acting as a facilitator in most cases. For example, the Municipal Building Directorate is proceeding with the installation of solar walls. In this case, SITE researches the different technology providers, administers the project, and seeks external funding whereas the Municipal Building Directorate oversees the actual installation of the solar walls on the buildings.

Policy Context

Montreal's corporate Action Plan flowed from the more global *First Strategic Plan for Sustainable Development,* which the City adopted in 2005. The Action Plan is therefore considered part of the larger effort by the City of Montreal to achieve more sustainable development.

Montreal is also part of the Partners for Climate Protection program, put forward by the Federation of Canadian Municipalities. This partnership provides funding opportunities for the different actions found in the Action Plan, but, according to City officials, is also useful for benchmarking, networking and as a source of information on municipal initiatives elsewhere in Canada.

Financial Aspects

Approximately 1.5 staff members at SITE worked two years to produce both the GHG inventory and the Action Plan. Now that most of the development work is done, City officials estimate that one-quarter of a staff position is necessary to administer and coordinate the plan, including management of the Energy Fund and the intranet project. Work on updating the GHG inventory will require between one and six months of full-time work, depending on data availability.

To get the Energy Fund going and to achieve the expected total investment results (see Table 1), an estimated municipal investment of $10.7 million over a six-year period is required. This estimate assumes a contribution of $5 million from different federal and provincial programs (such as the ecoENERGY program[40] by Natural Resources Canada) and the energy utilities (such as the Energy Efficiency Fund[41] by Gaz Métro). Combined, these investments should ultimately generate savings of $5 million in energy costs per year. So far, the administration has invested $2 million in the Fund.

As mentioned in the Policy Section, the Federation of Canadian Municipalities, through its Partners for Climate Protection (PCP) program, acts as a financial partner as well: 50% of Action 3 is to be financed by the PCP program, for example (City of Montreal, 2007c).

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[40] The ecoENERGY for Renewable Heat program is a four year investment to : increase the use of renewable thermal energy by industry, commercial businesses and public institutions, boost the amount of renewable thermal energy created for these sectors and contribute to cleaner air.

[41] This fund offers innovative solutions to save on energy consumption while contributing to the reduction of greenhouse gas emissions

Some of the actions put forth in the Plan, such as the adoption of a green policy for the municipal fleet (Action 12) or the use of gasoline blended with 5% ethanol (Action 11), will require no new investments from the Energy Fund as they were already under way before the adoption of the Action Plan, or because their financing is already covered by other programs or departments.

Outcomes

Due to the recent adoption of the Action Plan (in 2007), there are as of yet few quantified outcomes. Nonetheless, the City reports that GHG emissions from corporate operations have diminished over the past year by about 2%. This result is consistent with the City's goal of reducing emissions by 20% over ten years (2002-2012).

No global figures on energy savings, GHG emission reductions, and cost savings already achieved through the application of the plan are available. However, some information is available on individual initiatives. For example, retrofitting the gas burners at the water treatment plant has allowed a reduction of 2000 tons CO_2 per year and cost savings of $150,000 per year. Other actions have only just been initiated but are expected to have positive outcomes over the coming four years. For example, the solar heating projects should allow reductions of 350 tons CO_2 per year, and $0.2 million in savings per year, the creation of an energy efficiency plan for the Muséums Nature Montréal should allow reductions of 2750 tons CO_2 per year and annual saving of $1 million; the anti-idling campaign should allow reductions of 200 tons CO_2 per year and $70,000 in annual savings; the energy efficiency procurement policy for police vehicles should allow reductions of 1200 tons CO_2 per year, and $0.42 million in savings; the use of gasoline blended with 5% ethanol should allow reductions of 1200 tons CO_2 per year; whereas the adoption of a green policy for the municipal fleet should allow a reduction of 3,000 tons CO_2 per year, and $1.05 million in annual savings (City of Montreal, 2007c).

On the political front, the main outcome is a greener corporate image for the City of Montreal. The Action Plan has shown that the City is willing to lead by example. As emissions from the municipal corporation represent only 1.4% of the total emissions from the Island of Montreal, significant reductions will eventually have to come from other sectors—such as in the transport, private, commercial and residential sectors—if significant cuts in GHG emissions are desired on a community-wide scale. It is hoped that leadership from the City will help inspire action elsewhere.

Another positive outcome, according to City officials, is the fostering of productive partnerships during the development of the Action Plan. SITE worked in close collaboration with several municipal agencies during the development of the GHG inventory and the Action Plan; these partnerships continue now that the Action Plan has come into force, as SITE acts as the coordinating body. The success of one such partnership was recognized through the 2007 Energia Prize[42], awarded jointly to SITE and the wastewater treatment plant for the gas burners retrofit project (AQME, 2007).

Although the Action Plan appears to be putting Montreal on the road to energy and cost savings as well as GHG emission reductions, it is important to keep in mind that some progress had already been made prior to the Action Plan. Moreover, some of the plan's actions—such as the use of 5% ethanol blended fuel and the elimination of ozone depleting refrigerants—were actions that the City would have had to take eventually, as both have been mandated by provincial and international law respectively; the fuel distributors have until 2012 to comply with the 5% ethanol blended fuel law and refrigerant users and fabricants have until 2010 to comply with the elimination of ozone depleting substances.

[42] The Energia Prize is an annual award by the Quebec Association for the mastery of energy (AQME for its French acronym) for innovative energy projects in different sectors.

Lessons Learned

One factor that facilitated the development of the Action Plan was the strong support it received from City Council. The adoption of the November 2005 resolution to reduce the City's GHG emissions, and Mayor Gérald Tremblay's speech during COP11 are two events that helped to legitimize and provide impetus for the whole Action Plan process.

A factor that is expected to contribute to the Action Plan's successful implementation is the energy auditing that is now taking place in order to update the GHG inventory. Before the development of the GHG inventory, the energy bills paid for each municipal building by the individual boroughs and administrative divisions were not accounted for centrally. Now, with a centralized energy audit, it is possible to compare energy consumption among different buildings, boroughs, and departments and, consequently, to spot those who are making progress in improving energy efficiency and those who are not. The dissemination of such information, City officials believe, will motivate stragglers to reinforce their energy saving efforts. The various departments' willingness to collaborate with SITE can also be considered as a success factor. If SITE staff had not established good working relationships with other departments during the development of the Action Plan, its current implementation would have been jeopardized. Cooperation with external stakeholders is also imperative; they provide much-needed external funding, essential to the functioning of the Energy Fund.

One of the challenges that had to be addressed in developing the Action Plan, according to one of the interviewed City officials, is the fragmented and decentralized nature of the municipal administration. As previously mentioned, the central administration is responsible for some services on the Island of Montreal as a whole, covering not only the City of Montreal and its 19 boroughs, but also 15 suburban municipalities. The drafters of the Action Plan overcame this challenge by involving the many stakeholders in its development. This collaborative approach allowed the stakeholders to move beyond their silos in the decentralized administrative structure. Nevertheless, it remains to be seen whether the fragmented nature of municipal governance on the Island of Montreal will undermine the realization of some of the Action Plan's objectives.

While the involvement of numerous City departments in its development has overall been a boon for the plan, SITE's decision to consult with each partner individually in preparing the plan slowed the process considerably. One of the interviewed officials suggested that a more efficient way to proceed might have been to group certain stakeholders together for consultation purposes.

This type of initiative—the adoption of a corporate climate action plan—could be transferred to any type of city in North America, as long as the political will and a certain degree of environmental awareness among city officials is present. In Montreal's case, to facilitate the adoption of such a plan, the Action Plan's drafters emphasized the rapid return on investment yielded by new energy projects and the overall financial benefits of carrying out such projects. Officials in other municipalities may find it useful to emulate Montreal's emphasis on the financial benefits when arguing for the adoption of a similar initiative.

Certain specifics of Montreal's Action Plan are not necessarily transferable to all municipalities. For example, the development of an internal website to help coordinate the implementation of the Action Plan is a response to the sheer size and complexity of Montreal's administration. For municipalities with smaller and more centralized administrations, the expense and effort of such a communication tool may not be justified.

Next Steps

The City intends to carry out a corporate GHG inventory every year until 2012 and will use the information gathered to inform decisions concerning the Action Plan after 2012. In the meantime, the City is planning to develop an action plan to reduce GHG emissions from all sources on the Island of Montreal—i.e., not just from the municipal corporation. Several sectors are to be integrated in the future action plan, including the commercial, residential, and industrial sectors. The experience gained from developing and implementing the corporate Action Plan is expected to facilitate the preparation and implementation of the community-wide plan.

An important focus of the community-wide action plan will undoubtedly be on the transportation sector, which is responsible for 49% of all GHG emissions on the Island of Montreal. This aspect of the action plan will be supported by the City's recent adoption of a Transportation Plan, which is based on principles of urban sustainability. The plan focuses on the issue of climate change and emphasizes the need to shift travel demand to alternatives to the automobile, such as public transport, active transportation, carpooling and car sharing.

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Federation of Canadian Municipalities
www.fcm.ca

Energy Conservation in Municipio de Centro, Tabasco, Mexico

Summary

Municipio de Centro is located in the state of Tabasco, in southeast Mexico. In August 2007, the Municipality created the Energy Conservation Commission, which has since then developed programs designed to reduce energy consumption and greenhouse gas emissions within the municipal corporation.

For analytical purposes, Municipio de Centro divides its energy consumption into three main sectors: public lighting, drinking and wastewater conveyance (i.e. for electrical pumps), and the use of electricity to run the municipal buildings. Expenditures in these three sectors account for approximately 30% of all municipal expenditures. In 2007, a newly elected mayor championed an energy program that would save money as well as reduce the Municipality's greenhouse gas emissions.

To date, the Municipality has concentrated on three main energy saving/efficiency projects: 1) making the public lighting system more efficient, 2) increasing the efficiency of the water pumping system, and 3) installing energy efficient transformers.

Through these projects, the Municipality has been able to save considerable amounts of money, allowing the administration to invest in other programs that benefit the general public, such as the construction of new drinking water plants. The environmental outcomes are also quite significant, including energy savings and the mitigation of greenhouse gas emissions, among other benefits. Energy efficiency measures in the public lighting and water pumping systems resulted in a reduction in electricity consumption of 9,542,969 kWh in 2008 alone. This means 12.71% less energy was consumed in 2008 compared to 2007. It also means that 6,641 tCO2e were not emitted into the atmosphere as a direct result of this program. Furthermore, Municipio de Centro is now considered a national leader in energy-efficiency projects.

The program's success is attributed mainly to the political will of the Mayor as well as to the dedication of the members on the Municipal Energy Conservation Commission. This program demonstrates that even in a short period of time (less than three years) it is possible to successfully bring about municipal energy improvements.

Municipal Context and Background

Municipio de Centro is one of the 17 municipal regions that make up the state of Tabasco in southeast Mexico. Its name comes from its geopolitical situation; the region is located at the centre of the state and is home to the State's capital city, Villahermosa.

Municipio de Centro represents 28% of Tabasco's total population, with 558,524 inhabitants in 2005. About 80% of the populatoin of the municipality live in urban areas, mostly in Villahermosa. The municipality covers an area of 1,612 km2, which represents 6.9% of the State's area.

Villahermosa, the fourth biggest city in the southeast, is a business and administrative centre for the Mexican oil industry. It is a modern centre that takes advantage of being located between Mexico City and the largest cities of the southeast region.

In January 2007, a new mayor was elected, Lic. Evaristo Hernández Cruz, who believed it would be possible to save money and reduce the Municipality's greenhouse gas emissions through energy conservation. Shortly after his election he adopted the Municipal Development Plan 2007-2009, which contains a four-page section on the science and impacts of climate change, particularly those impacts already being felt in southern Mexico. This document led to the creation of the Comisión de Ahorro de Energía del Municipio de Centro—AEMC (Municipal Energy Conservation Commission) in August 2007. The objectives of the AEMC are to promote and develop energy saving programs within the municipality, to protect the environment and to reduce municipal expenses related to energy consumption.

The Commission, which is unique within the country, consists of a president (the Mayor), a vice president, a technical secretary, seven counsel members, four permanent external members (which include representatives from the Comisión Nacional para el Uso Eficiente de la Energía—CONUEE (National Commission for the efficient use of energy), Comisión Federal de Electricidad —CFE (Federal Energy Commission), Fideicomiso para el ahorro de Energía Electrica—FIDE (Electric Power Saving Trust Fund), and ICLEI-Mexico) and a coordinator of operations. The coordinator of operations meets on a monthly basis with the head engineer of the water department and the head engineer of the public lighting department. This team of three forms the operational centre of the AEMC. They do a general review and update of the programs and verify the rate of energy consumption. They report to the rest of the AEMC members once every two months.

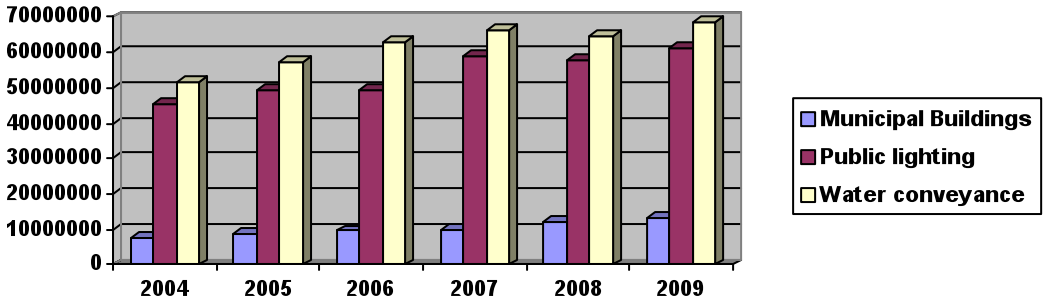
In addition, the AEMC counts on a working group that is composed of representatives from different municipal departments (finance, municipal secretariat, programs, administration, municipal services, water, development, public works, environment, registry, union). The role of this working group is to help implement the initiatives recommended by the commission. To improve their effectiveness as agents of change within their respective departments, members on this working group took part in workshops that brought them up to date with the objectives and activities of the commission.

Description of the Initiative

As a first step, the AEMC undertook an in-depth analysis of the Municipality's energy consumption. For analytical purposes, Municipio de Centro divides its energy consumption into three main categories: public lighting, drinking and wastewater conveyance (i.e., for electrical pumps), and the use of electricity to run municipal buildings. This accounts for a consumption of about 6,682,000 kWh per month, which in turn represents about 30% of all Municipal expenditures.43 The consumption levels in each of these three sectors are shown in Figure 1 for the years 2004 to 2009.

[43] This percentage does not include the cost of manpower, equipment for operating and maintaining the service, reparations, etc.

Figure 1: Municipal energy consumption in Mexican pesos



To date, the municipality has concentrated on three main energy efficiency projects: 1) making the public lighting system more efficient, 2) increasing efficiency in the water pumping system, and 3) installing energy efficient transformers. This section looks into these projects in more detail.

MAKING THE PUBLIC LIGHTING SYSTEM MORE EFFICIENT

The AEMC started by undertaking a census of all street lamps within the municipality. Although the Municipality was being charged for 25,000 lamps by the *Comisión Federal de Energía*—CFE (Federal Energy Commission), the census turned up only 21,135 lamps. This led to a revision of all historical billing agreements with the CFE as well as a revision of the formula that was being used to calculate consumption rates, as this consumption would change drastically with the installation of new, more efficient technologies. The second step the municipality undertook was to contract an external firm, Ergón Plus Ingenieria S.A. de C.V., located in the neighbouring state of Veracruz, to conduct a study on the substitution of sodium vapour lamps (the type of lamps in use) with more energy efficient models. The purpose of the study was to verify if this change in technology would be beneficial. It reviewed the advantages and disadvantages of various technologies and estimated costs. The study recommended going with magnetic induction lights that offer up to 100,000 hours (compared to the 20,000 hours provided by the conventional lamps) of high-quality white light and are therefore practically maintenance-free once installed. As the advantages outweighed the disadvantages, the municipality decided to purchase 10,200 magnetic induction lamps (Ayuntamiento de Centro, 2009a).

In May 2008, Municipal employees started replacing the old lamps, and less than a year later, the process was completed.

INCREASE EFFICIENCY IN THE WATER PUMPING SYSTEM

The AEMC contracted the same company, Ergón Plus Ingenieria S.A. de C.V., to conduct a second study, this time on the state of the public water pumping systems (drinking water and wastewater).44 The study

[44] The study included: revision of tariffs, measurement of leaks in litres/sec, hydraulic charge and power, electrical power (kw), weight of pumped fluid (kg/m3), average time of operation (hrs/day), integrated cost of energy ($/kwh), pump's motor efficiency, monthly energy consumption (kwh/month), monthly invoice ($/month), consumption savings (kwh/month), savings on the demand side (kw), monetary savings ($/month), financial evaluation on type of investment required and time period for return on investment

showed that the pumping equipment needed to be changed; the pumps that were in service were either obsolete or would come to the end of their life expectancy shortly.

When the Municipality ordered the study, it was hoping to get funding from the Fideicomiso para el Ahorro de Energía Eléctrica or FIDE (Electric Power Saving Trust Fund) to finance the replacement of all 43 pumps used in the drinking water pumping system. Unfortunately, FIDE was unable to provide the required financial assistance for this project and therefore the AEMC had to implement the program much more slowly, as Municipal funds permitted.

INSTALLING ENERGY EFFICIENT TRANSFORMERS

This program began with a pilot project, coordinated by ICLEI-Mexico and Pro Cobre45. The pilot project consisted in measuring and comparing energy consumption in both a conventional and an energy efficient transformer. The energy efficient transformers, although a little more expensive, were shown to be superior to the conventional ones in terms of operational efficiency and reliability. With these results, the AEMC sat down with CFE (the Federal Energy Commission) and was able to conclude an agreement that would see the installation of more than 1300 energy efficient transformers. The CFE is in charge of doing the changes. To date, 658 energy efficient transformers have been installed and the remaining half is scheduled to be changed before the end of the summer.

Aside from these three programs, the AEMC also works on environmental education and awareness. For instance, the commission established a list of recommendations intended to increase awareness about energy use amongst municipal public servants. Examples of these recommendations include using natural light when possible, unplugging all electrical appliances after work hours and on weekends, getting purchases of new appliances approved by the energy efficiency coordinator, switching off lights and computers when not in use, painting the exterior of buildings in light colours, implementing a preventive cleaning program of AC systems and lights, etc.

Policy Context

As previously mentioned, the AEMC originated from the Municipal Development Plan 2007-2009; the commission was born shortly after the adoption of the plan in 2007 and got to work immediately. As the AEMC was a new body with little experience or expertise, its coordinator of operations set about to get as much technical support and advice as possible. He and the AEMC vice-president attended several regional, national and international events organised by different stakeholders working on energy issues, such as the 18th and 19th National Congress on Energy Saving and Expo, the international congress to promote an energy efficient public sector, and the regional seminar on energy efficiency for states and municipalities. In total, AEMC staff have attended over 15 such events as a participant and/or speaker since the summer of 2007.

Furthermore, the AEMC solidified its relationship with ICLEI-Mexico by having the Mayor become vice-chair of its Board of Directors. Likewise, ICLEI-Mexico is one of the four permanent external members on the AEMC, together with representatives of FIDE, CFE and CONUEE. These strategic partnerships have helped the AEMC gain the support necessary to develop energy saving programs. The Municipality also became a member of Red Nacional de Comisiones Estatales y Municipales de Energía—RENACE (National Network of State and Municipal Energy Commissions).

[45] The Mexican chapter of the International Copper Association.

These programs to save energy and reduce greenhouse gas emissions have incited the Municipality to participate in the federal government's GHG inventory program, which is coordinated by the Ministry of Environment and Natural Resources (SEMARNAT) and the Commission for the Studies of Sustainable Development in the Private Sector (CESPEDES).

Moreover, the Municipality has signed the ICLEI international Agreement of Mayors and Local Governments for Climate Protection.

Financial Aspects

These initiatives do not cost the Municipality much to run on a daily basis, i.e. the Municipality has not had to hire new employees. The members of the AEMC are municipal employees whose involvement in the AEMC is simply added to their regular activities. In fact, this initiative has freed up some time for the technicians in charge of general maintenance of street lamps and water pumps, as the new technologies introduced by the AEMC require less maintenance than those they replaced. A significant extra cost related to these initiatives however was for the studies mentioned above, which were contracted to an external firm.

The Municipality has had to make some capital investments to implement the program, i.e., to purchase the transformers and new street lamps. The initial pilot project on energy efficient transformers was coordinated and financed by ICLEI-Mexico and Pro-Cobre. ICLEI then provided the Municipality with the necessary technical support to conclude the agreement with CFE, which entailed an investment of 30 million pesos each (CFE and Municipio de Centro) to change the 1300 transformers in the Municipality. As for the public lighting program, it cost the Municipality approximately 5 800 pesos per magnetic induction lamp as well as 1 million pesos to install them. Although these sums are considerable, one must remember that the more efficient equipment provides instant financial savings to the Municipality.

The Municipality has benefited from external funds for its water system program. In 2007-2008, the State of Tabasco suffered severe flooding and FONDEN (Fund for Natural Disasters) provided the State financial support to help recover after the disaster. Municipio de Centro received some of this money, which it used to help finance the program to improve the energy efficiency of the water system.

Outcomes

Although the initiative was only launched in 2007, some tangible results have already been recorded.

MAKING THE PUBLIC LIGHTING SYSTEM MORE EFFICIENT

In 2008, the municipality paid 7.57% less for energy consumption in the public lighting system compared to the previous year. This reduction was achieved despite an increase in electricity rates of 6%. Consumption in this sector was reduced by 4,501,943 kWh, corresponding to a decrease of 14.85% (Ayuntamiento de Centro, 2009a).

The environmental outcomes are also positive; the Municipality avoided emitting 3,133 tCO2e in 2008. Furthermore, less maintenance means fewer technicians on the road, fewer maintenance vehicles, and fewer manufactured parts. From a social point of view, a new, more efficient public lighting system means better street and park illumination and, in turn, improved public safety.

Likewise, as the new technology requires less maintenance, municipal employees have more time to respond to the needs/demands of citizens. These positive outcomes explain the popularity this program has had among citizens, who can literally see the changes and benefit from them immediately.

Despite the positive outcomes, the program did not proceed without obstacles. The AEMC did experience some technical problems near the beginning of the implementation of the program. Municipal employees had difficulty installing the new street lamps at first as they lacked experience with this new technology. As a result, some lamps malfunctioned, such as switching off on their own. However, the technicians received technical support from municipal engineers (who had previously been trained by the manufacturer) and were able to quickly solve the problems.

INCREASE EFFICIENCY IN THE WATER PUMPING SYSTEM

The AEMC originally wanted to change all 43 pumps in use to convey water, as recommended by the study the Municipality commissioned on the state of the public water pumping systems. In order to do this, the Municipality was counting on funds from FIDE. These funds, however, never materialized. Instead, the Municipality received disaster funds from FONDEN, some of which were put towards the water system program and allowed its partial implementation. The revised strategy consisted of rehabilitating 10 pumping stations by installing new pumps, as well as new electrical and electromagnetic systems. By making these changes and working towards reducing peaks in the energy demand curve, the municipality was able to reduce energy used in the pumping stations.

So far, the municipality has managed to decrease its electricity consumption in the water pumping system by 5,041,026 kWh. This represents 11.25% less energy in comparison with the previous year (2007) and translates into savings of US$102,461.

From an environmental point of view, these improvements in the water pumping system have allowed the municipality to avoid emitting 3,508 tCO2e.

The results of the program on energy efficient transformers were not available at the time of printing. To date, it is estimated that the 658 energy efficient transformers that have been replaced have reduced electricity consumption by 8% in comparison with the previous year.

With the money saved through these energy saving programs, the Municipality has committed to building five new drinking water plants in the more rural areas, bringing drinking water to communities that still lack this municipal service.

Finally, one unanticipated result of the program has been the immense interest that other municipalities have shown towards the structure and role of the AEMC. This unique commission has proven itself over the past three years and is now being seen as a model for other municipalities.

Lessons Learned

The personal intervention of the Mayor, and his political will to make these programs work has helped the initiative immensely. The Mayor made sure the Municipality took an active role as a member of ICLEI-Mexico by becoming vice-chair of its Board. As the president of the AEMC, he played an active role in the development of the AEMC and its programs.

The quick success of this initiative shows that a lack of time is not always a barrier. This municipal government was elected in 2007 and was able to create a comprehensive energy saving program that yielded positive results within months.

One aspect of the program that has not worked well is the implementation of the energy saving recommendations in municipal offices and buildings. The reception on the part of the public servants was not very positive and the municipality has still not been able to save much energy on that front. However, members of the AEMC believe it is important to persevere and will continue with its environmental education and awareness activities

One of the major challenges the AEMC is facing is the lack of guaranteed continuity in these programs. A new municipal government will come into power on January 1, 2010.[46] If energy saving and environmental protection are not priorities for the new administration, Municipio de Centro could see all its energy saving efforts abandoned and the AEMC dismantled. One way to approach this problem would be to transform the AEMC into an autonomous public agency that would work independently of the municipal government in power. This would allow continuity and enhance the credibility and weight of the AEMC, both within the Municipality and nationally.

Another challenge facing the commission is the chronic lack of funds to finance the Municipality's energy program. This has impeded the full development of the initiative, as we have seen in the case of the efficient water pumps program; due to the lack of financing, the Municipality could install only 10 new pumps instead of the 43 that were originally planned.

Municipio de Centro's staff have one recommendation to other municipalities that are considering such initiatives—it is important to start the process with an accurate inventory of energy consumption. Such as study provides a baseline with which to measure progress over the long term and may produce immediate results in terms of financial savings. As mentioned above, Municipio de Centro's energy inventory revealed that the Municipality was being charged to power some 3800 street lamps too many.

Next Steps

As the municipal administration changes every three years with no possibility of re-election, it is difficult to have a concrete idea of what to expect with such municipal initiatives on a long-term basis. The employees involved in such initiatives hope their efforts will be long-lasting, but no one can know for sure.

In the three years that have passed, Municipio de Centro has gained experience and acquired national credibility when it comes to energy conservation programs. Aguascalientes (another Municipality covered in this research) and Municipio de Centro are now considered the leading municipalities in Mexico in terms of energy conservation and energy efficiency programs. In July 2009, the AEMC was preparing to host the third meeting on public lighting systems for the south-southeast region of Mexico and 42 municipalities were expected to be present. The AEMC believes that this type of information sharing is very positive and is happy to contribute to the development of similar initiatives elsewhere.

Municipio de Centro was also present at the last ICLEI World Congress that took place in Edmonton, Canada in June of this year. Once again, this was an opportunity to exchange experiences and ideas for more sustainable energy projects at the municipal level.

Finally, the Municipality intends to maintain its participation in the voluntary GHG inventory and hopes to apply for international funds under the Clean Development Mechanism of the Kyoto Protocol.

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[46] In Mexico, Municipal governments change every three years, with no right to re-election. These elections often mean an immense staff turnover, which often results in program interruptions, modifications and/or cancellations.

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PlaNYC Energy Chapter, New York City, New York, United States

Summary

PlaNYC 2030 is Mayor Michael Bloomberg's sustainability plan for New York City (NYC). The plan, which was released to the public on April 22, 2007, is the City's blueprint for sustainable planning and development for the next quarter-century. The plan considers ongoing population growth, aging infrastructure, and increasing environmental risks due to pollution and global warming to be the City's key concerns. The plan seeks not merely to address these concerns, but to bring NYC to the vanguard of the world's large cities in terms of liveability and sustainability. The PlaNYC document (New York City, 2007 a) lays out an extensive set of proposals spread over six chapters, whose topics include (1) Land, (2) Water, (3) Transportation, (4) Energy, (5) Air, and (6) Climate Change. The present case study focuses on the Energy Chapter.

The main concerns of the Energy Chapter are rising demand for energy, a constrained electricity market, and environmental risks related to energy consumption. The chapter proposes 14 initiatives to address these concerns. The plan strongly emphasizes the reduction of energy consumption in residential, commercial, and institutional buildings. Relevant initiatives include: aggressive reduction of energy consumption in City-owned buildings (leading by example); the upgrading of building codes to require energy efficiency measures; and the introduction of smart metering and real-time pricing to help mitigate peak demand. A number of initiatives focus on power generation and distribution infrastructure, including: the re-powering of existing fossil-fuel power plants to make them cleaner and cheaper to operate; the modernization of the electricity grid to improve reliability; and the expansion of renewable electricity generation capacity. Other important proposals include the creation of a NYC Energy Planning Board with a mandate to coordinate the activities of all players in the energy sector and to devise energy policies reflective of NYC's interests; and the creation of a NYC Energy Efficiency Authority that will devise and administer energy efficiency grant and incentive programs that are tailored to NYC's extremely diverse building stock.

PlaNYC is less than a year old and has therefore had little time to produce many concrete outcomes. To date, key accomplishments include the Mayor's signing of an executive order requiring City-owned buildings to reduce their energy consumption by 30% in the next 10 years and committing the planned $80 million annually for this purpose; the first of a series of expected updates to the building code and the introduction of fee rebates for green design; a deal with ten local universities to reduce their energy consumption by 30% in ten years; the launch of a multimedia campaign promoting various 'green' initiatives, include energy conservation; the completion of a siting study for a new conventional power plant; and the announcement of an RFP for 2 MW of solar power (expected March 2008). However, the City has not yet succeeded in setting up the two supervisory bodies proposed in the Energy Chapter—i.e.,

the Energy Planning Board and the Energy Efficiency Authority. The coordination that these two bodies are intended to provide would facilitate the implementation of the other initiatives in the Energy Chapter.

Municipal Context and Background

NYC is the most populous municipality in the US, having an estimated 8,214,426 residents in 2006 (US Census Bureau, 2006 a). It forms the core of the New York City-Northern New Jersey-Long Island metropolitan statistical area (MSA), the largest in the US with a population of 18,818,536 (US Census Bureau, 2006 b). The city's population is projected to increase by nearly half a million over each of the next two decades, reaching approximately 8.7 million in 2020 and 9.1 million by 2030 (NYC Department of City Planning, 2006).

Along with London and Tokyo, NYC is considered to be one of the three "command centres" of the global economy. The NYC metropolitan area has the largest regional economy in the US; internationally, it is second only to Tokyo. The lion's share of the gross metropolitan product is generated by NYC itself. Key sectors of the economy include finance, insurance, real estate, advertising, publishing, broadcasting, film production, and tourism; manufacturing, while in decline, also remains an important sector.

According to Mayor Michael Bloomberg, the City's key concerns are ongoing population growth, aging infrastructure, and increasing environmental risks due to pollution and global warming. Immediate action must be taken, claims the Mayor, to prevent these three concerns from becoming threats to the City's liveability and vitality. PlaNYC 2030 is a 25-year plan, championed by the Mayor himself that purports to address the three aforementioned key concerns and seeks to bring NYC to the vanguard of sustainability.

In the summer of 2006, at the Mayor's behest, a new branch was created within the Mayor's Office of Operations, called the Office of Long-Term Planning and Sustainability (OLTPS), with a mandate to devise a new, long-term sustainability plan for the City. Between September and November 2006, the OLTPS, with the help of numerous consultants and expert advisors, began drafting the new plan. In December 2006, Mayor Bloomberg announced the OLTPS's ten sustainability goals upon which the sustainability plan, dubbed PlaNYC 2030, would be based.

The preparation of the final PlaNYC document involved an extensive, four-month long public consultation process. The Mayor's staff presented the ten-point vision for New York's future to community leaders, public organizations and advocacy goups, and to the City's residents at large, seeking feedback and ideas for the implementation of the vision. Throughout the consultation process, the Mayor's staff met with over 100 advocacy groups and organized a total of 11 town hall and neighburhood leader meetings. The Mayor's Office also received over 3,000 e-mails with comments and suggestions regarding the ten objectives (City of New York, undated). The PlaNYC document was released to the public on April 22, 2007—Earth Day.

The final document expands the OLTPS's ten initial sustainability goals into an extensive set of proposals, laid out in six chapters: (1) Land, (2) Water, (3) Transportation, (4) Energy, (5) Air, and (6) Climate Change. The fourth chapter, hereon referred to as the Energy Chapter, is the focus of the remainder of this case study.

PlaNYC was well received by City Council. It is more difficult to gauge the public's reaction. To date, among over 100 initiatives proposed in PlaNYC, one initiative attracted virtually all public attention and has become the subject of much controversy: Initiative 10 in the Transportation Chapter, which proposes to introduce congestion pricing. Much of the remainder of the document, including the entire Energy Chapter, has received scant media coverage and seems to have attracted little attention from the public.

Officials at NYCEDC, who co-authored the Energy Chapter, say that the public feedback they have received has overall been positive.

Description of the Initiative

The Energy Chapter addresses three interrelated concerns: (1) rising demand for energy; (2) constrained electricity market[47]; and (3) environmental risks related to energy consumption. These concerns are addressed through a set of fourteen initiatives, organized according to four basic themes.

THEME 1—IMPROVING ENERGY PLANNING

Initiative 1: Establish a New York City Energy Planning Board in order to work with the State and utilities to centralize planning for the City's supply and demand initiatives.

THEME 2—REDUCING NYC'S ENERGY CONSUMPTION

Initiative 2: Reduce the municipal government's energy consumption by committing 10% of the City's annual energy bill to fund energy-saving investments in City operations.

Initiative 3: Strengthen energy codes in NYC by updating energy and building codes to support our energy efficiency strategies and other environmental goals.

Initiative 4: Create an energy efficiency authority for NYC, which will be responsible for reaching the City's demand reduction targets.

Initiative 5: Prioritize five key areas for targeted incentives; use a series of mandates, challenges, and incentives to reduce demand among the city's largest energy consumers, including (1) government and institutional buildings; (2) commercial and industrial buildings; (3) residential buildings; (4) new construction; and (5) appliances and electronics.

Initiative 6: Expand Peak Load Management by (1) increasing participation in Peak Load Management Programs through smart meters and (2) by supporting the expansion of real-time pricing (RTP) across the city.

Initiative 7: Launch an energy awareness and training campaign; increase the impact of energy efficiency efforts through a coordinated energy education, awareness, and training campaign.

THEME 3—EXPANDING THE CITY'S CLEAN POWER SUPPLY

Initiative 8: Create 2,000 to 3,000 MW of supply capacity by repowering old plants, constructing new ones, and building dedicated transmission lines.

Initiative 9: Expand Clean Distributed Generation (Clean DG) by at least 800 MW from the current total of 180 MW by (1) promoting opportunities to develop district energy at appropriate sites in NYC; and (2) supporting critical expansions to the city's natural gas infrastructure.

Initiative 10: Expand the City's gas infrastructure by supporting the construction of new pipelines and LNG terminals that will increase the supply of natural gas.[48]

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[47] The market offers little scope for expansion of generating capacity and improving distribution infrastructure.

Initiative 11: Foster the market for renewable energy.

THEME 4—MODERNIZING ELECTRICITY DELIVERY INFRASTRUCTURE

Initiative 12: Accelerate reliability improvements to the City's grid by (1) installing advanced meters that will help the utility identify where problems are occurring and which users are affected; (2) intensifying efforts to replace components of the grid known to be failure-prone and improving the oversight of contractors who carry out such work; (3) implementing the recommendations made in a City report on the power failures in Long Island City in Queens that occurred in the summer of 2006.

Initiative 13: Facilitate grid repairs through improved coordination and joint bidding.[49]

Initiative 14: Support Con Edison's efforts to modernize the grid.

Some portions of the NYC's electricity grid were designed and built in the 1920s, and certain original components are still in use. Con Edison has undertaken a research and development project, called the *3G System of the Future*, which seeks to combine electricity distribution with modern electronics and IT to yield or more efficient and reliable distribution grid. Con Edison requires significant investment to continue developing the 3G System; through Initiative 14, the City pledges to financially support this project.

There are two agencies that have jointly authored and will oversee the implementation of the Energy Chapter: Office of Long-Term Planning and Sustainability (OLTPS) and the NYC Economic Development Corporation (NYCEDC). The OLTPS is a new division within the Mayor's Office of Operations, created for the purpose of overseeing the implementation of PlaNYC. It has staff dedicated to each of PlaNYC's chapters, including the Energy Chapter. The NYCEDC is a non-profit organization sponsored by the City (and overseen by the Deputy Mayor) with a broad mandate to stimulate economic development in NYC. It has a division responsible for the development of the energy and telecommunications sectors in NYC. As the City does not have its own department responsible for energy, the Mayor's Office brought NYCEDC on board to help write and to oversee the implementation of the Energy Chapter. There is no formal division of responsibilities between the OLTPS and NYCEDC.

Within the City of New York, other departments with a significant role include the Department of Citywide Administrative Services (DCAS) and the Department of Buildings (DOB). DCAS administers all City-owned properties. Through its Office of Energy Conservation, DCAS is expected to implement the City's ambitious plan to reduce energy consumption in its own operations by 30% over the next decade. The DOB enforces the building code and regulates the construction industry. It is responsible for enforcing all the new energy efficiency measures that have been and will continue to be introduced into the City's building code.

Outside the NYC government, the key partners involved in the implementation of the Energy Chapter are the state government and the New York State Public Service Commission, the regulator of the state's electric, gas, steam, telecommunications, and water utilities. The OLTPS and NYCEDC are working with the government and the Public Service Commission to put in place administrative mechanisms that will

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[48] The four gas pipelines that currently supply the City have insufficient capacity to meet peak demand. Thus far, this limitation has been overcome by keeping reserves of natural gas. The City is vulnerable whenever there is a disruption in supply or a prolonged period of cold weather.

[49] Joint bidding means assigning all work related to a street opening, meaning roadwork and work on all affected underground utilities, to a single contractor. All work related to a street opening is then carried out simultaneously, ultimately saving both time and money.

facilitate the implementation of various Energy Chapter initiatives. Other important partners include Con Edison and, to a lesser extent, National Grid (formerly known as KeySpan), the utilities that run NYC's electrical distribution infrastructure. Con Edison especially is expected to play a key role in upgrading distribution infrastructure and in introducing smart metering.

Policy Context

The City did not intervene directly in matters related to energy planning, beyond approving sites for new electrical infrastructure, until 2003 (City of New York, 2007 a). That year, the City undertook its first major effort to devise a comprehensive energy policy by setting up the New York City Energy Policy Task Force. In 2004, the Task Force submitted a report (City of New York, 2004) to Mayor Bloomberg with a set of energy policy recommendations. The report is considered a precursor to the PlaNYC Energy Chapter. The Task Force, which included representatives from the City, NYCEDC, the energy utilities, and several other stakeholders, helped to forge a partnership that would later help formulate the goals and initiatives of the Energy Chapter. In essence, the Energy Chapter extends the Task Force's recommendations, fleshing them out into concrete goals and initiatives.

At the metropolitan level, there appears to be little coordination of energy-related efforts among the many cities in the New York Metropolitan Area. The PlaNYC Energy Chapter embodies this apparent lack of coordination: it contains no reference to any of the municipalities surrounding NYC. This is surprising given not only the strong economic interdependence of NYC with surrounding municipalities but also since these municipalities have a stake in the same sources of electricity and natural gas that supply NYC.

At the state level, the initiatives in the PlaNYC Energy Chapter are supported by a set of new energy policies, announced in April 2007. There are four key policies: (1) to reduce energy consumption by 15% by 2015 through new state-wide energy efficiency programs for industry and government, dubbed the "15 by 15 policy"; (2) to set more rigorous energy use standards for appliances and to update building codes with stricter energy efficiency requirements; (3) to invest $295 million in renewable energy projects; and (4) to create new power plant siting legislation that will expedite the approval of new wind power projects, re-powering projects that reduce emissions in existing fossil fuel plants, and other power plant projects with very low levels of carbon dioxide emissions (New York State, 2007 a).

Aside from the Governor's new energy proposals, the state has long pursued energy efficiency initiatives through the New York State Energy Research and Development Authority (NYSERDA). The agency offers a whole gamut of incentives and grants for energy efficiency upgrades for a multiplicity of building types sand is very active in NYC, supporting numerous energy retrofit projects in large commercial and institutional buildings but also sponsoring community-based energy efficiency programs, such as *Energy $mart*.

Financial Aspects

The Office of Long-Term Planning and Sustainability (OLTPS) is a new administrative body, set up in the summer of 2006 as a subdivision of the Mayor's Office of Operations, with a mandate to develop PlaNYC and to oversee its implementation. Originally, the OLTPS was staffed by nine people; it has since grown to 17 staff members. According to an official at OLTPS, two staff members have been primarily occupied with matters related to the Energy Chapter, with frequent support from other staff members. The OLTPS's key partner for the Energy Chapter is the NYCEDC Energy and Telecommunications Division. There are two staff members who dedicate most of their time to administering PlaNYC-related energy initiatives with the ongoing support of seven or eight other staff

members. No new staff was hired as a direct result of NYCEDC's participation in the development and implementation PlaNYC.

The Energy Chapter calls for the creation of a NYC Energy Planning Board and a NYC Energy Efficiency Authority, both of which are expected to require some new administrative capacity. The exact structure of either body remains unknown; the City is still in the process of negotiating the creation of both bodies with the New York State Public Service Commission. For the Energy Planning Board, it is expected that members will include staff from the City, including representatives from the NYCEDC and OLTPS plus other City departments; from the State; and from Con Edison and National Grid, the two local energy distribution utilities. For the Energy Efficiency Authority, staff from the City, from the New York State Energy Research and Development Authority (NYSERDA), and from Con Edison and National Grid would probably be involved. In both cases, it is unclear how many people will make up each body's board and what kind of administrative support each body will require.

In financial terms, the City expects that PlaNYC initiatives will be funded partly from its own coffers and partly through a variety of state and federal grants. For its part, the City has earmarked $1.6 billion in its ten-year capital plan for PlaNYC capital expenses. In the Mayor's Executive Budget for the 2008 fiscal year (FY08) (City of New York, 2007 c), total PlaNYC expenses are set to $199 million, of which $83 million is being dedicated to energy initiatives. While the City's total PlaNYC expenses are expected to grow over the next three fiscal years ($341 million for FY09, $377 million for FY10, and $404 million for FY11), Energy Chapter-related expenses are expected to gradually drop ($77 million for FY09, $70 million for FY10, and $62 million for FY11) because energy efficiency measures are expected to begin yielding savings.

NYSERDA presently administers the Systems Benefit Charge (SBC), a surcharge paid by electricity consumers state-wide. Annual revenues from the surcharge, which are used to fund energy efficiency programs, are currently around $175 million; ratepayers in NYC provide about 50% of the revenues, according to an official at NYCEDC. The OLPTS and NYCEDC are working to ensure that a fair share of SBC revenues is allocated to energy programs in NYC.

Outcomes

Given that PlaNYC was launched less than a year before this report was written, and given the plan's distant 2030 horizon, it has yet to produce many of the expected outcomes. Nonetheless, the City has been moving fairly aggressively on implementing the initiatives of PlaNYC. It has established a set of intermediate implementation targets, which must be met by December 2009. In the first PlaNYC Six-Month Status Report (City of New York, 2007 b), Initiatives 1 through 9, 12, and 14 of the Energy Chapter are reported as launched; Initiatives 11 and 13 are reported as partly launched; and Initiative 10 is reported as not yet launched. In general, the most progress has been made in areas that are largely under the City's jurisdiction.

Key accomplishments to date include the following:

- On October 2, 2007, Mayor Bloomberg signed Executive Order 109, requiring the City to reduce greenhouse gas emissions from its own operations by 30% by 2017, setting aside an annual budget of approximately $80 million for energy efficiency projects, and establishing a steering committee to oversee the implementation of these projects (Initiative 2).
- On July 3, 2007, Mayor Bloomberg signed the first update to the City's building code since 1967. The new building code requires compliance with the New York State Energy Code, white roofs,

and water-conserving plumbing. The code is combined with a set of fee rebates for green design (Initiative 3).

- Ten local universities have signed an agreement with the City to reduce their emissions by 30% by 2017 (Initiative 5).
- On June 25th 2007, the City launched GreeNYC, a multimedia campaign for PlaNYC. Specific outcomes include the forging of partnerships with non-profit groups, corporations, and marketing professionals to that are to develop energy efficiency and green house gas reduction campaigns targeted to specific segments of the population (Initiative 7).
- In July 2007, an initial feasibility study for a district power generator in Hudson Yards was submitted. The study, commissioned by Con Edison at the City's request, found that a "district energy facility" on the Hudson Yards site would be technically feasible and economically viable (Initiative 9).
- The City is about to announce an RFP for 2 MW of solar power (expected March 2008) (Initiative 11).

In areas beyond the City's jurisdiction, there have been fewer accomplishments. The City has proposed an omnibus bill to the State Legislature that would enable it to carry out several of the proposals found in PlaNYC. From the Energy Chapter, these include the creation of the NYC Energy Planning Board (Initiative 1), the NYC Energy Efficiency Authority (Initiative 4), and authorization to implement a property tax abatement for solar power (Initiative 11). The bill has stalled in the Legislature, primarily due to opposition to legislation that would enable congestion pricing, an initiative proposed in the PlaNYC Transportation Chapter.

The stalling of legislation enabling the creation of the NYC Energy Planning Board is a significant but not insurmountable setback. Officials from the NYCEDC and the OLPTS have indicated that they would try to find an alternate means of achieving the same end. The NYCEDC and OLTPS are currently involved in proceedings at the New York State Public Service Commission; through these proceedings, they hope to set up a body with powers similar to those of the envisioned NYC Energy Planning Board.

Lessons Learned

There are important barriers and challenges that will have to be faced in the ongoing implementation of the Energy Chapter. According to officials at NYCEDC, the biggest challenge will be to implement energy efficiency measures in residential buildings. The huge diversity and complexity of residential ownership and tenant structures in NYC makes this an intrinsically difficult undertaking.

Another important challenge is the equitable distribution of the costs and benefits entailed by the initiatives proposed in the Energy Chapter. In a statement on PlaNYC, the Pratt Center for Community Development (2007) suggests that the plan fails to consider the impacts of energy infrastructure on individual communities within the City, taking a citywide perspective instead. It is argued that certain communities, particularly some of the lowest-income communities are near the City's power plants and also happen to be subjected to the most unreliable parts of the distribution grid. When siting new power plants and re-powering existing power plants and rebuilding the City's electricity distribution infrastructure, the Pratt Center for Community Development urges the City to consider the impacts of such interventions on NYC's most disadvantaged populations.

Environmental groups such as the Sierra Club have also scrutinized the Energy Chapter. The Sierra Club generally praises the Energy Chapter but expresses certain concerns. Notably, it criticizes the plan for not sufficiently emphasizing the reduction of dependence on fossil fuels in light of increasing fuel price

volatility. Indeed, the plan calls for expanding natural gas infrastructure (Initiative 10) rather than weaning the City off natural gas. Another principal criticism is that the plan does too little to encourage increased distributed and renewable electricity generation, resigning the City to building new fossil fuel-fired plants. The Club suggests that the City should pursue the installation of net metering, which would allow small electricity generators to feed into the grid and sell part of the electricity they generate.[50] This would in turn encourage the deployment of distributed generators (Initiative 9) and renewable electricity generating capacity (Initiative 11). Yet another significant criticism is that all of PlaNYC, including the Energy Chapter, lacks a clear implementation timetable, beyond setting some broad goals to be achieved by 2009.[51]

The City's thus far unsuccessful effort to obtain legislative approval for the creation of the NYC Energy Planning Board and the NYC Energy Efficiency Authority has yielded an important lesson. Rather than wait indefinitely for the legislation to pass, the OLTPS and NYCEDC have been pursuing the creation of two similar bodies by regulatory means, through two proceedings at the New York Public Service Commission. Officials from both agencies have expressed that this approach is proving to be very effective; they are confident that they will attain their original goals sooner this way. The apparent lesson is that, in terms of setting up new administrative mechanisms in the energy sector, the regulatory approach is more effective and should therefore be prioritized over the legislative approach.

There are innovative ideas in the Energy Chapter could inspire municipal energy policies in other cities. Despite structural and regulatory differences in the energy sector across the continent, many municipalities may find themselves in a position similar to NYC's: jurisdiction over their energy sector split among several agencies and a lack of inter-agency coordination. Moreover, as in NYC's case, state- or province-wide agencies may tend to be unresponsive to the specific needs of particular cities—especially larger, older cities with highly diversified building stocks and ownership structures. One key idea in PlaNYC, from which other municipalities could take inspiration, is that of devising a comprehensive, long-term energy plan, such as the Energy Chapter, and creating a municipal body, such as the proposed NYC Energy Planning Board, to oversee its implementation.

While the idea of a long-term municipal energy plan and a supervisory body is transferable to other municipalities, many of the specifics of PlaNYC are probably not. In particular, the Energy Chapter devotes considerable attention to the reduction of energy use in buildings. About 80% of New York's green house gas emissions are attributed to energy used in commercial, institutional, and residential buildings (City of New York, 2007 a), an unusually high share. Consequently, compared to other cities, NYC has more scope for reducing energy consumption in buildings and less scope for reducing industrial and transportation-related energy consumption. Other cities, in which a greater share of energy consumption is attributed to industry and transportation, may wish to focus more on initiatives to reduce energy consumption in these sectors and less in buildings.

Next Steps

The most critical next step in the implementation of the Energy Chapter is setting up the two supervisory bodies proposed in the Energy Chapter. As mentioned in the Outcomes section above, the City failed to get legislative approval for the creation of the NYC Energy Planning Board (Initiative 1) and the NYC Energy Efficiency Authority (Initiative 4), as proposed in the Energy Chapter. Creation of the former is

[50] According to an official at NYCEDC, the City is supporting net-metering legislation that is currently being pursued at the State Legislature.

[51] Mayor Bloomberg's administration ends at the end of 2009. An official NYCEDC has suggested that a timetable beyond 2009 would be liable to be changed by the next administration.

particularly urgent, as it is needed to see through several other initiatives proposed in the chapter. The NYCEDC and the OLTPS have decided that, rather than seeking legislative approval anew, they will push the New York State Public Service Commission, the State's utilities regulator, to set up bodies with similar powers. Officials at the NYCEDC and the OLTPS acknowledge that the structures and the mandates of the two bodies will be different than those envisioned in the Energy Chapter; as negotiations with the Public Service Commission are ongoing and the outcomes are difficult to predict.

Other upcoming steps include:

- devising a plan for energy efficiency upgrades to City-owned properties, as the $80 million annual budget called for by Energy Chapter (Initiative 2) is in place
- seeing through the deployment of advanced electricity meters to pave the way for real-time pricing and Peak Load Management (Initiative 6)
- announcing RFPs for new conventional power plants (Initiative 8)—an RFP for a 500 MW power plant is expected to be announced in 2008
- creating and approving a citywide street management plan which will, among other things, enable joint-bidding (Initiative 13)

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WEB RESOURCES

PlaNYC 2030 Website
www.nyc.gov/2030

Government of New York City
www.nyc.gov

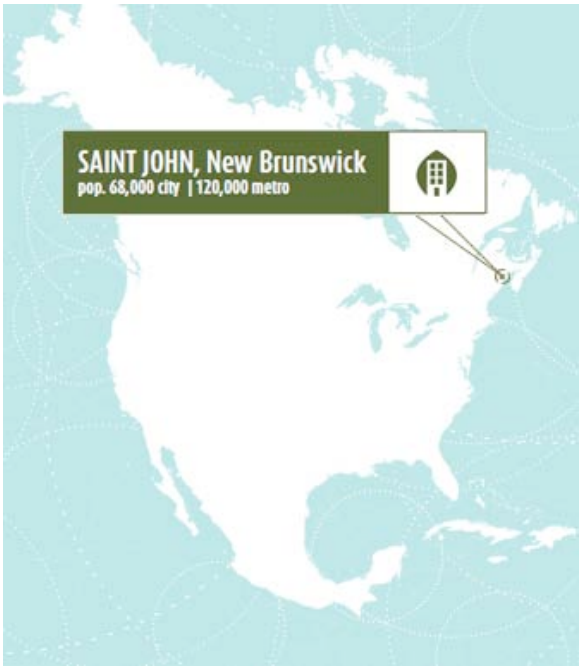
Office of the Mayor of New York City
www.nyc.gov/mayor

New York City Economic Development Corporation
www.nycedc.com

New York State Public Service Commission
www.dps.state.ny.us

Municipal Energy Efficiency Program, Saint John, New Brunswick, Canada

Summary



The City of Saint John initiated the Municipal Energy Efficiency Program (MEEP) in 1997 to reduce energy consumption from municipal buildings and operations to 20-25% below 1997 levels by 2011. The program committed the City to tracking energy consumption and replacing equipment and appliances with more efficient options. In 1998, the program was expanded to include energy savings from water and sewage facilities. In 2001, agencies affiliated with the municipality, such as the Canada Games Aquatic Centre and the Trade and Convention Centre, were added to the program. In 2005, the City committed to a 6% reduction in energy consumption throughout the community by 2011.

The key objectives of the 1997 MEEP were to reduce energy costs; reduce air pollution and greenhouse gas (GHG) emissions tied to energy consumption; and to assist other New Brunswick municipalities undertaking similar energy management programs. These objectives have remained consistent throughout the development and evolution of the program. The same objectives have been extended to the water and wastewater facilities and to other City-affiliated agencies.

Since 1998, the City has increased the effectiveness of the program by adopting an innovative software tool called the Energy Management Control System (EMCS). This system allows the City to test new efficiency measures and monitor changes in consumption patterns as a results of energy efficiency interventions, including the installation of new equipment and building renovations. In 2005, a Web-based version of the EMCS was designed and implemented.

The outcomes of the MEEP have been significant, having yielded annual savings of $1.24 million and 10,000 MWh of electricity in 2006 (the last year for which data was available). City staff estimate that annual savings currently stand at $1.4 million and forecast that they will increase to $2 million by 2011. Cumulative energy cost savings since the program took effect stand at approximately $5.1 million. The City also estimates an annual reduction of 5,792 metric tons of CO_2 emissions from reduced electricity and fossil fuel consumption.

The City is on track to reaching its goal of reducing energy usage to 20-25% below 1997 levels by 2011. It is currently reporting a 15% reduction in emissions below 1997 levels. Going forward, Saint John is exploring new ways to build upon the success of the MEEP through several new endeavors, such as the creation of a district heating/cooling system near the Saint John Harbour and enacting new building codes consistent with LEED standards. The City also intends to coordinate efforts to increase demand-side management (DSM) and develop renewable energy sources with the local energy utilities, which may lead to further reductions in energy consumption and greenhouse gas emissions.

Municipal Context and Background

Saint John is New Brunswick's largest city, with 68,043 inhabitants in the city proper and 122,389 in the metropolitan area. The city is located at the mouth of the Saint John River, on the North shore of the Bay of Fundy. Saint John's economy is heavily dependent on large shipping and industrial facilities, including the Port of Saint John, the Canaport liquefied natural gas (LNG) seaport, the Irving Oil refinery, and the Point Lepreau Nuclear Generating Station. The local electricity utility, Saint John Energy, distributes energy produced by NB Power from conventional energy sources, including coal, oil, diesel, nuclear, and hydroelectric power.

A variety of concerns compelled the City to adopt an energy efficiency program, including: (1) higher energy costs, (2) a shrinking tax base due to declining population, and (3) concern about health problems related to air quality. The last factor was a particularly strong concern for the Environment Committee, which is responsible for planning and executing Saint John's climate strategy. Health officials have blamed poor air quality for Saint John's relatively high rate of asthma and other respiratory problems.

The commitment to reducing Saint John's energy consumption was introduced as a Council motion in 1996, directing the City's Environment Committee to create the Municipal Energy Efficiency Program (MEEP) in 1997. Despite clear environmental and health benefits, the City's Environment Committee found that its most powerful argument when presenting the case for the MEEP before Council was the potential for savings in operating and maintenance costs. There has been no public consultation process associated with the development of the MEEP, although the City plans to consult citizens through the development of MEEP-related community-wide programs to reduce GHG emissions (discussed below in the Policy Context section).

Description of Initiative

The primary objective of MEEP is to reduce energy consumption in municipal buildings and operations to 20-25% below 1997 levels by 2011. The program commits to reducing energy costs; reducing air pollution and greenhouse gas (GHG) emissions related to energy consumption; and assisting other New Brunswick municipalities in undertaking similar energy management initiatives. Since 1997, the program has evolved to include municipal water and wastewater treatment facilities and facilities run by other agencies affiliated with the City. Nevertheless, the core objectives have remained the same.

To begin implementing the plan, the City received funding from the provincial government in 1996 to hire an Energy Manager. The Energy Manager, hired the following year, works within the Department of Facility Management and has a mandate to analyze energy consumption throughout the municipal government and affiliated agencies, to establish benchmarks for energy reductions, and to outline strategies for meeting these benchmarks.

Activities related to the MEEP have focused on three principal axes of intervention: (1) improving energy efficiency; (2) promoting renewable energy generating capacity; and (3) reducing transportation-related emissions.

ENERGY EFFICIENCY

Starting in 1997, the Office of the Energy Manager has been overseeing programs intended to increase energy efficiency throughout municipal buildings and operations. MEEP initiatives have included the evaluation of all City building envelopes for possible efficiency upgrades. These have led to renovations that have included the installation of insulation with vapour barrier, weather stripping, and high efficiency windows and doors. Most of the City's buildings have also been retrofitted with high efficiency lighting

(through the replacement of both ballasts and lamps), heat recovery systems, and natural gas boilers in place of less efficient and dirtier oil boilers. Saint John has conducted more than 65 energy retrofit projects in municipal facilities, including offices, garages, fire stations, and community centres, as well as in facilities belonging to affiliated agencies, such as the Trade and Convention Centre and the Canada Games Aquatic Centre.

To facilitate the implementation of the MEEP, the Department of Facility Management installed an Energy Management Control System (EMCS) at four arenas in 1998. This system allows all types of energy usage in the buildings to be remotely monitored and controlled. By 2005, EMCS was installed in all City facilities. There are presently 26 buildings online with EMCS, allowing the City to monitor energy consumption and the impacts of newly installed energy saving equipment and new workplace practices on energy use across all municipal departments and facilities.

Although the Office of the Energy Manager administers EMCS, the system allows managers in other departments to monitor energy performance, including HVAC, lighting, and overall energy consumption. Since 2005, the system has been linked to the City's internal computer network (LAN) and can be easily accessed by City staff from any workstation. EMCS enables departments to maximize energy efficiency while maintaining comfortable workplace conditions. The system is also capable of tracking and calculating the economic benefits derived from energy efficiency measures, helping managers assess the cost effectiveness of these measures and informing decisions related to energy efficiency (City of Saint John, 2006).

In 2005, Saint John committed to a 6% reduction (based on 2005 levels) in energy consumption in the wider community by 2011. To date, no initiatives specifically addressing this objective have been undertaken.

RENEWABLE ENERGY

The City has recently embarked upon the Geo-Exchange project, which consist of using water from the Bay of Fundy to provide district heating/cooling to buildings in the City's core, including buildings run by City-affiliated agencies such as the Trade and Convention Centre. Private buildings are also expected to benefit from the initiative. Once implemented, the City expects to reduce energy consumption related to heating and cooling by 5 MW annually. Phase 1 of the planning phase was completed in May 2007 and the City is currently seeking funding to implement Phase 2, which entails the creation of a conceptual design to help calculate the costs and benefits the system.

TRANSPORTATION

Although the 1997 MEEP commits the City to reducing energy consumption in its fleet, little has been done to date. Fleet Services has shifted its procurement policy to purchasing smaller-sized vehicles, although the move was not driven by the MEEP per se, according to Fleet Management. In addition, the City embarked on a campaign to upgrade 1,300 traffic lights across the City with LEDs in 2006. The expansion of park-and-ride facilities and ridesharing programs through Vision 2015 (the City's current sustainable development plan) will be consistent with the MEEP's 6% community energy consumption reduction target.

Several departments have been instrumental in helping the Department of Facility Management to get MEEP off the ground. These include City Boards and Commissions, Leisure Services, Municipal Operations, and the Fire Department. Together these four departments are responsible for 35% of the energy savings achieved to date. The Energy Manager cooperates with department managers to establish energy efficiency requirements for equipment, provide employee training, raise awareness about the program, identify financing needs, and monitor building energy usage.

In order to promote greater awareness and coordinated action within the municipal corporation, the City implemented an Energy Awareness Program for staff in 2001. Although the program has languished over the past several years, the City plans to pick it up again in 2008. City staff have also been encouraged to enroll in energy management and energy awareness courses.

The City collaborates with industrial partners including Saint John Energy, Enbridge Gas and NB Power as well as suppliers of energy equipment and commodities such as Irving Oil Ltd. to help implement energy efficiency measures.

Policy Context

The City has consistently enacted policies that reconfirm its commitment to MEEP. In 2001, the City enacted the Energy Management Policy, which explicitly commits to implementing measures to help reach MEEP's objectives, to be overseen by the Environment Committee. These include climate-friendly transportation initiatives such as ridesharing programs and the construction of park-and-ride facilities.

In 2005, support for MEEP was reiterated in the City' Operational Review, also overseen by the Environment Committee. The committee's commitment to MEEP is reflected by a number of its undertakings, including: new municipal corporation-wide procurement practices; life-cycle analyses; the construction of LEED-rated buildings; and the identification and initiation of renewable energy development through Vision 2015, the City's long-term sustainable development plan. Moreover, the Environment Committee has pledged to integrate MEEP targets into this development program.

The City's efforts to increase energy efficiency are supported by partnerships with the Federation of Canadian Municipalities (FCM) and the Province of New Brunswick through its Efficiency New Brunswick program; both FCM and the province have provided grants to fund initiatives related to the MEEP. The City is also a member of Partners for Climate Protection (PCP)[52] and is therefore required to create an inventory of greenhouse gas emissions throughout the community, develop an action plan to reduce emissions and monitor progress and report results. The reduction of energy consumption is expected to play a key role in Saint John fulfilling its climate change commitments. Saint John is still developing its PCP action plan, the completion of which is part of the Environment Committee's mandate for 2008.

Financial Aspects

Between 1996 and 2007, total spending on the MEEP reached $2.5 million. This includes building retrofits, the creation of the EMCS, the Geo-Exchange distribution loop and administrative costs. According to City staff, roughly $200,000 is allocated annually for energy management projects from the City's capital projects budget. Administrative costs, comprised of one full-time salary plus other expenses, total around $70,000 annually and are covered through the City's operating budget.

The New Brunswick Government has provided considerable funding for MEEP initiatives. The City received $25,000 in 1997, $25,000 in 1998, and $15,000 in 1999 for MEEP initiatives from the province. More recently, the City received a $90,000 grant from the New Brunswick Environmental Trust Fund to finance Phase 1 of the Saint John Inner Harbour Geo-Exchange distribution loop.

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[52] Partners for Climate Protection (PCP) is a network of 155 Canadian municipal governments committed to reducing GHG emissions and acting on climate change. PCP is the Canadian component of ICLEI's Cities for Climate Protection (CCP) network that comprises more then 800 communities worldwide.

Since the MEEP's beginning, Enbridge Gas, the private gas utility serving the Saint-John area, has provided a total of $90,000 in grant funding for the purchase of high efficiency HVAC units that have been installed in municipal facilities. Enbridge has also provided technical information and financial support in helping to make the switch from oil and coal to natural gas for space heating and hot water in municipal buildings. The Federation of Canadian Municipalities (FCM) has allocated funding to MEEP in the form of two Green Municipal Fund[53] grants, including: (1) $31,000 in 2002 for the City Hall energy audit, and (2) $50,000 in 2003 for a study of potential energy savings in the City's water and wastewater treatment facilities.

Outcomes

Overall, the City reports an estimated 15% reduction in energy consumption and says it is on track to meeting its MEEP objective of energy consumption 20-25% below 1997 levels by 2011. The Office of the Energy Manager estimates that based on an analysis of energy consumption (including natural gas, oil and electricity), 5,792 tons of CO_2 emissions are being avoided annually thanks to MEEP initiatives. There have been no estimates of GHG emissions from the community as a whole, although the City indicates that a community-wide GHG inventory is a priority for future action.

In terms of energy efficiency, the City of Saint John has recorded a significant decrease in energy costs since the MEEP was established in 1996. Total savings since the program went into effect in 1997 are estimated to be around $5.1 million. By 1998, the implementation of digital control systems and the comprehensive energy audit of the City's water and wastewater facilities resulted in over $88,000 in annual savings, up from $30,000 in 1996. In 2006, the most recent year for which data is available, the City achieved annual energy cost savings of around $1.2 million. City officials predict Saint John is on track to achieving $2 million in annual energy cost savings by 2011.

Certain major retrofit projects in municipal buildings and in buildings belonging to City-affiliated agencies have yielded significant savings. In particular in 2003, energy efficiency improvements to the Saint John Transit Building (the headquarters of the City's public transportation authority) resulted in $50,000 in annual savings over the previous year. In 2006, the Lord Beaverbrook Rink and the Canada Games Aquatic Centre underwent major renovations, which included improvement to the heating and lighting systems, yielding annual savings of $50,000 and $100,000 respectively—savings equivalent to about 80% of maintenance costs for these two buildings, according to City staff. A retrofit of the Downtown Saint John Market Square is expected to save $170,000 annually following an energy audit forecasting a possible 17% reduction in electricity consumption (Saint John, 2006).

Since 2006, 45 water and wastewater treatment plants have undergone comprehensive energy audits resulting in a plan to reduce their energy consumption by 25%. In addition, a number of arenas have been retrofitted with more efficient cooling systems, which led to a reduction in City water usage from 3.3 million to 0.62 million gallons annually in the case of the Lord Beaverbrook Rink (Saint John, 2006). As less water is used in the new cooling systems, less energy is consumed at the water treatment facility.

In terms of developing renewable energy, in May 2007, the City completed Phase 1 of the Geo-Exchange feasibility study detailing technical options for a system that would use water from the Bay of Fundy to provide district heating/cooling to buildings in the City's core. The City is presently moving forward with Phase 2 of the project, which consist of developing a conceptual design for the system that will include a

[53] Green Municipal Funds (GMF) through the Federation of Canadian Municipalities (FCM) provide loans and grants to help municipalities build environmentally friendly infrastructure.

cost benefit analysis to determine the full feasibility of the project. Beyond the Geo-Exchange, Saint John Energy—the local electricity distribution utility—has initiated several pilot studies for the development of renewable energy sources (including wind and biomass), although none have resulted in the creation of alternative fuel sources for the utility's 35,000 customers.

In terms of transportation, there has been no follow up to the 1997 commitment to create a Municipal Energy Efficiency Program Report for Fleet Services as outlined in the MEEP. However, Fleet Services has introduced several programs to reduce energy use for the municipal fleet through an anti-idling campaign and the procurement of two hybrid vehicles. In 2006, the City embarked on a campaign to replace 1,300 traffic lights across the City with LED lighting, resulting in an energy savings of 575,000 kWh and $41,000 operating cost savings annually. (Saint John, 2006)

Lessons Learned

The MEEP has produced a number of positive outcomes for the City, including significant energy savings, cost savings and reductions in greenhouse gas emissions from municipal buildings and operations. According to City documents, success factors behind the program include the early establishment of a reasonable timetable to achieve energy savings, the establishment of an Energy Manager position to oversee the program, and a comprehensive monitoring system to help ensure full compliance throughout municipal departments and agencies.

The development of the EMCS in subsequent years further enabled the Energy Manager to promote the MEEP as a way for department heads to reduce operational costs and compare energy performance among different departments. While there are no built-in incentives or rewards for energy efficiency, the City is working on a building labelling system in cooperation with the provincial and federal government.

Despite the commitment to reduce energy consumption by 6% below 2005 levels throughout the wider community, no measures have yet been taken to develop community energy efficiency programs. In order to increase energy efficiency throughout Saint John, City staff members feel greater political will is required to encourage demand-side management (DSM) programs and renewable energy production in cooperation with local utility companies.

Apart from completing Phase 1 of the Geo-Exchange district heating/cooling system, the City has been slow to advance renewable energy development in Saint John. Saint John Energy has investigated wind and biomass energy potential in the area but developers will not invest in either of these resources at current electricity rates. The electricity utility is not willing to increase its rates to help finance renewable energy. The City, for its part, has not investigated alternative financing schemes to help foster a switch to clean energy.

City staff point to the slow emergence of a public outreach and communication strategy as a major obstacle to expanding the MEEP. Despite having been created in 1997, there still is no webpage dedicated to the program. The absence of a website and public relations strategy dedicated to the program further prevents the participation of local energy experts in the development of the MEEP. A leading environmental NGO conducting research in energy efficiency in New Brunswick was consulted as part of this case study but was unable to offer insight about the program as staff members were not aware of Saint John's MEEP.

According to City documents, the MEEP was intended to be amenable to replication in other cities as an integrated package of tools for planning, auditing, implementation, and monitoring. While there are some gaps in the delivery on MEEP objectives, other municipalities may benefit from Saint John's experience

in developing the highly effective Energy Management Control System (EMCS). City staff claim that several New Brunswick municipalities have benefited from working with the City of Saint John to adopt similar energy management systems although no information on this was available at the time of writing.

Other municipalities in New Brunswick and throughout North America with a similar dependency upon fossil fuel-generated electricity may find the MEEP a useful model for making energy efficiency improvements to municipal operations. Cities with indoor ice rinks may find the Saint John case particularly useful in reducing energy costs for this type of facility. A key barrier to undertaking a similar program elsewhere may be reluctance on the part of the municipality to create a specific position for coordinating energy efficiency measures.

Next Steps

Going forward, the City of Saint John intends to continue pursuing MEEP objectives through the same three key axes of intervention. In terms of energy efficiency, the City intends to build a new Police Headquarters and Saint John Transit building with LEED gold and silver ratings respectively, along with a new "green garage", a carbon-neutral parking facility. The City also intends to launch a website highlighting municipal climate programs as part of its Vision 2015 sustainability plan overseen by the Environment Committee. Furthermore, the City plans to establish an Energy Management Committee overseen by the Energy Manager to monitor progress and provide recommendations to staff and Council on planning new strategies to meet MEEP objectives. In terms of renewable energy, the City wishes to implement 30 MW of wind power generations in cooperation with NB Power and Saint John Energy, as well as solar heating for various municipal and commission buildings. It also aims to complete Phase 2 of the Saint John Inner Harbour GEO-Exchange distribution loop, which will form the basis of an extensive heating and cooling system for the City's uptown core. Finally, in terms of transportation, the main strategy for improving energy efficiency and reducing emissions is to be the construction of park-and-ride facilities. It is hoped that this will encourage greater use of public transit and a reduction in automobile use.

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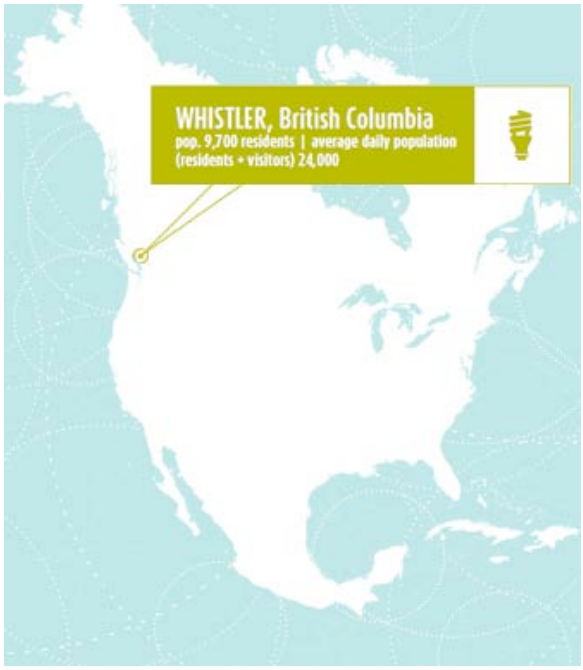
Integrated Energy, Air Quality and Greenhouse Gas Management Plan, Resort Municipality of Whistler, British Columbia, Canada

Summary



The Resort Municipality of Whistler's municipal council adopted an Integrated Energy, Air Quality and Greenhouse Gas Management Plan in 2004. This document was the first municipal strategy in Canada to integrate energy, greenhouse gasses (GHGs), and air quality into a single management plan. The Integrated Energy Plan (IEP) includes an inventory of energy use and emissions of GHGs and other air contaminants for the year 2000; a 20-year projection of Whistler's energy use and emissions under "business as usual" conditions and with the adoption of new measures to reduce energy use and emissions; and a quantitative analysis of the costs and benefits of adopting the new measures. The proposed measures include: (1) replace propane with natural gas in relevant neighborhoods; (2) implement the Expanded Whistler Comprehensive Transportation Strategy; (3) solid waste management to reduce methane emissions from Whistler's landfill; (4) improve municipal fleet efficiency; (5) public education to promote energy efficiency and renewable energy sources within households, businesses and schools; (6) increase small-scale local renewable energy initiatives; and (7) improve energy efficiency in buildings. These measures are to be implemented by various municipal services as well as private partners including the Terasen gas company and the Whistler-Blackcomb ski resort. The timeline for implementation is from 2004 to 2010.

The IEP was launched after an extensive public consultation process in 1999 that led the Resort Municipality of Whistler to focus on sustainability initiatives across its municipal planning activities. Stakeholders understood that allowing the area's natural resources to degrade would undermine the tourism-based economy in the long term. One of the major strengths of the IEP is that it is consistent with the community's emphasis on sustainability and that much of the implementation continues to be community-driven. The IEP is the guiding document for municipal decision makers and for the so-called Whistler2020 taskforces. Whistler2020 is an evolving community sustainability strategy and community consultation process that incorporates local stakeholders such as businesses, NGOs, and citizens.

Although the IEP has been a useful guide for decision-makers and Whistler2020 taskforces, the timeline, monitoring and reporting sections of the plan have weaknesses. Actual outcomes are currently two to three years behind schedule. The IEP projected a 10% decrease in community-wide GHG emissions between the years 2000-2006, when in reality GHG emissions rose by 11% over that time period. The per-capita GHG emissions and energy consumption have also continued to increase within the community since the plan was adopted.

Municipal Context and Background

The Resort Municipality of Whistler (RMOW) is located in the province of British Columbia, 120 kms north of Vancouver. As a resort community, Whistler's economy is centered on tourism: 30% of jobs are in the accommodation and food industry sectors; 10% are in entertainment and recreation; another 9% of jobs are in retail; and 9% are in construction (BC Stats 2008). In 2000, the average[54] residential population was 9,700, and the average daily population including visitors was 24,400 people. During that year, Whistler received 2.07 million visitors (RMOW, 2004). Whistler will serve as the site of the 2010 Winter Olympics Alpine events.

In 1997, council began an extensive process of public consultation—including workshops, surveys, and interviews with community partners—in order to define paths for future development. This resulted in a 1999 vision document entitled: *Whistler 2002: Charting a Course for the Future*. The priorities highlighted in the document included: (1) moving towards environmental sustainability, (2) enhancing the Whistler Experience, and (3) achieving financial sustainability (FCM, 2002). Stakeholders understood that the "Whistler Experience" relied on clean air, water, and snow, and that allowing these resources to degrade would undermine the sustainability of the tourism-based economy in the long run (Hallisey, 2008). The sustainability vision and public consultation process have since been reframed as Whistler2020 (Barnett, 2008).In response to the Whistler 2002 visioning process, RMOW created Whistler's Environmental Strategy, which was adopted by council in 1999. The strategy called for a community energy plan, as well as an air quality management plan. Originally, three separate documents were prepared for energy, air quality, and GHG emissions (RMOW, 2002; Barnett, 2008). Realizing that these issues were inextricably linked, the General Manager of Environmental Services oversaw the incorporation of the three priorities into a single plan—the Integrated Energy Plan (IEP). Integrating the three priorities allowed for co-management opportunities and a streamlined implementation plan (RMOW, 2004).

The plan received strong support and was widely accepted by municipal and community stakeholders. At the time of its adoption, Whistler's IEP was championed by Mayor Hugh O'Reilley. The plan continues to receive strong support from the current Mayor, Ken Melamed, as well as the City Manager and several business leaders in the community (Barnett, 2008).

Description of the Initiative

The Resort Municipality of Whistler's Integrated Energy Plan is the first in Canada to integrate energy, air quality, and GHG emissions into a single management plan. The integrative approach allows the municipality to manage and regulate these intricately linked priorities simultaneously, and avoid duplicating initiatives.

The plan includes an inventory of energy consumption and emissions for the year 2000 in six sectors—residential buildings, passenger vehicle transportation, commercial & institutional, industrial, solid waste, and municipal operations—along with forecasts of energy use and emissions to the year 2020, following a business-as-usual model and with the implementation of recommended measures. The results of the inventory and forecasting are summarized in Table 1. The plan also includes a detailed implementation plan for the recommended measures.

[54] The population fluctuates due to presence of seasonal workers.

Table 1 - RMOW Energy consumption, GHG emissions and Air Contaminants in 2000 and 2020

	2000 Baseline		2020 BAU projection				2020 Recommended Scenario			
	Community	per capita	Community		per capita		Community		per capita	
			Quantity	% increase	Quantity	% increase	Quantity	% increase	Quantity	% increase
Population	24400		34600	29%			34600	29%		
Energy Consumed (MWh)	809722	33.0	1028347	27%	30.00	10%	789479	-2.5%	22.82	-31%
GHG emissions (Tonnes CO2e)	128930	5.00	185659	44%	5.37	7%	117326	-9%	3.39	-32%
Air Contaminants (Tonnes)	2717	0.11	10055	370%	0.29	261%	2457	-10%	0.07	-36%

(Source: RMOW, 2004)

In 2000, the community as a whole consumed almost 810,000 MWh of energy (33 MWh per person) and released 129,000 tonnes of CO_2 equivalent (tonnes CO2e) into the atmosphere (5 tonnes CO_2e per person). The commercial and institutional sectors were the largest energy consumers, while the transportation sector is responsible for the majority of GHG and air contaminant emissions.

According to the business as usual scenario, energy consumption would be expected to increase 26% between 2000 and 2020, while GHG emissions would be expected to rise 42% over the same time period, due mostly to increased traffic and congestion. This scenario allows for a modest decrease in per capita energy consumption, due to improved efficiency consistent with past trends.

The plan projects that, with implementation of the seven recommended measures outlined below, the community would reduce energy consumption by a cumulative 2.8 million MWh by the year 2020, as compared to the business as usual model. GHG emissions would be reduced by 809,000 tons over the same period. The plan projects that the community as a whole would save $100 million on energy costs (a saving of 20% with respect to the business as usual scenario) between 2000 and 2020 (RMOW, 2004).

The seven measures that are recommended by the Integrated Energy Plan and that are being implemented by various municipal services and private sector partners include

1. Convert the existing propane grid to a natural gas system. Terasen, a private gas company has agreed to convert the existing propane grid to a natural gas system (natural gas produces 15% fewer GHG emissions than propane).

2. Expand and improve the efficiency of the Whistler Comprehensive Transportation Strategy, which aims to decrease peak congestion in RMOW by 11%. Improved efficiency is to be attained through more aggressive transportation management activities. The Strategy is based on a package of recommendations put forth by Whistler's Transportation Advisory Group and includes: transportation demand management, improvements to the Whistler and Valley Express public transit system, development of the transportation networks for cyclists and pedestrians, improvements to the road system and management of parking supply. This measure also includes improvements to municipal land-use plans and policies to increase infill development, augment the density of affordable housing in proximity to employment centers, reduce vehicle parking requirements, and locate tourist accommodation in proximity to transit. With the implementation of this strategy, the total vehicle kms traveled in Whistler are expected to increase 1.5% by 2020,

compared to 3% in the Business as Usual model, leading to an overall reduction of 560,000 tonnes of $C0_2e$

3. Divert 70% of solid wastes from landfill by the year 2020 through recycling and composting programs. Emissions from Whistler's landfill represent 8-10% of Whistler's GHG emissions, the largest source of GHGs over which the municipality has direct control (Battiston 2008; Hallisey, 2008). This measure is projected to avoid generating 72,000 tonnes of CO_2e between 2000-2020. This initiative is managed through a partnership between the municipality and the Squamish-Lillooet Regional District.

4. Improve the energy efficiency of the municipal fleet by 30% by the year 2020 by switching to more efficient vehicles during the normal replacement cycle.

5. Support public education and outreach through the "Whistler. It's our Nature" sustainability initiative, which engages households, businesses and school in energy conservation through promotional activities, speakers, multi-media presentations and the distribution of "toolkits" This initiative is projected to lead to a 2% decrease in energy consumption over 20 years, and will incur no new costs.

6. Switch from large hydroelectric to small-scale local renewable energy, with the objective of obtaining 20% of energy consumed within RMOW from low-impact renewable sources by the year 2020.

7. Improve energy efficiency for new and existing residential and commercial buildings in the community by 25%.

Policy Context

The Integrated Energy Plan is being used as a framing document for Whistler2020, an in-depth community consultation process that brings together stakeholders from the municipality, business community and public in 16 sustainability task forces (Hallisey, 2008). Each task force meets annually and recommends actions for the municipality and partner organizations, many of which have been implemented (Battiston, 2008). Examples of energy task force recommendations include: creating and establishing a minimum LEED rating for commercial and industrial buildings (initiated in 2005; in progress) and creating a district energy system for the Athlete's village (accepted 2007; construction underway) (Whistler2020, undated).

The IEP also supports the implementation of several other RMOW policies including: (1) components of the Whistler Environmental Strategy (land-use planning, transportation demand management, green building design); (2) the Whistler Comprehensive Transportation Strategy; and (3) municipal house-in-order initiatives (energy audits, fleet efficiency, etc) (RMOW, 2004).

Several of the measures outlined in the IEP are supported by provincial and federal policies. For example, BC Hydro offers incentives for the implementation of local energy sources and the municipality has received subsidies from the Federation of Canadian Municipalities' Green Municipalities Fund for energy-efficient buildings (Hallisey, 2008).

In 1997, RMOW joined the Federation of Canadian Municipalities' Partners for Climate Protection, committing to a 6% reduction in greenhouse gasses below 1990 levels across the community, and a 20% reduction in GHG emissions from municipal operations. Through implementing the IEP, RMOW became

the first Canadian municipality to achieve all five milestones in the climate protection process (RMOW, 2007 b).[55]

Financial Aspects

The Integrated Energy Plan document was prepared by the Sheltair Group, a private consultant, at a cost of approximately $75,000. RMOW has not attributed a budget, nor hired personnel specifically for implementation of the IEP. Several of the measures support the implementation of pre-existing initiatives, such as Whistler's Comprehensive Transportation Strategy and the "Whistler: It's Our Nature" public education campaign, with already-attributed budgets.

According to the IEP document, the Public Works department holds the responsibility for providing ongoing management, monitoring and data collection, as well as tracking outcomes and coordinating public awareness activities (RMOW, 2004). In practice, however, monitoring and reporting lagged until the municipality created a full-time position, the Manager of Sustainability Initiatives, who dedicates 40-50% of his time completing the annual energy use and emissions inventories. RMOW employs twelve people in the Environmental Services department, which uses the IEP as a guiding document. However, there is no staff dedicated full-time to working specifically on the implementation of the IEP. Four RMOW staff members dedicate at least a portion of their time to the Whistler2020 task forces, which cover a broad range of sustainability initiatives, including energy, transportation, and solid waste management (Hallisey, 2008).

The costs for implementing the various measures, covered by the municipality and various private partners, are summarized in the outcomes section. Several initiatives are eligible for government subsidies. For example, the new LEED Gold compliant library building received a grant from the Federation of Canadian Municipalities' Green Municipalities Fund, as well as BC Hydro's Small Commercial High Performance Building Program (RMOW, 2007 c). BC Hydro has provided incentives for the development of small-scale renewable energy through a province-wide standing offer to purchase locally generated power (BC Hydro, 2007). BC Hydro also offers subsidies for energy conservation.

Outcomes

In 2006, the Resort Municipality of Whistler conducted a quantitative assessment of GHG emissions in order to meet milestone five of the Partners for Climate Change agreement, i.e., monitoring progress and reporting results. The report found that community-wide per capita energy use increased by 3% between 2000 and 2006. The total GHG emissions reached 157,087 tonnes $C0_2e$ in 2006, an 11% increase over the 2000 baseline.[56] The bulk of the increase was seen in the passenger vehicle transportation sector. (RMOW, 2004; RMOW, 2007).

In contrast, the IEP forecast that implementation of the seven measures should have led to a reduction of 10% in GHG emissions between 2000-2006 (RMOW, 2004, figure 17). Thus, actual outcomes are currently two to three years behind the IEP schedule, due mostly to continued growth in the community

[55] The 5 milestones are: (1) Creating a greenhouse gas emissions inventory and forecast; (2) Setting an emissions reduction target; (3) Developing a local action plan (4) Implementing the local action plan or a set of activities; (5) Monitoring progress and reporting results.

[56] For the purposes of the 2006 GHG monitoring report, the 2000 baseline was re-calculated to include emissions from bottled propane, which had not been inventoried in the original IEP report. The 2000 baseline value for community-wide GHG emissions was re-evaluated to be 140,897 tCO2e. (Ted Battiston, 2008)

and unanticipated delays in making the switch from propane to natural gas. According to RMOW's Manager of Sustainability Initiatives, the 2007 GHG inventory, currently under analysis, is expected to show a decrease in GHGs as compared to 2006, due to the completion of a project to sequester landfill emissions.

The details on the community's progress with the seven IEP measures are as follows (based on RMOW, 2007 unless otherwise indicated):

- Switch from propane to natural gas: Terasen is currently replacing the propane grid with natural gas at a cost of approximately $25 million (Hallisey, 2008). Completion of the project is projected for Fall 2008 The community can expect to see a 15% decrease in GHG emissions, representing 6,400 tonnes $C0_2e$, and reduced expenditures on energy, once the natural gas system is in place.
- Implement Whistler's Comprehensive Transportation Strategy: The municipal council has adopted a neighbourhood infill policy, purchased hybrid busses, and endorsed the cycling plan. Transportation planning also led the 2010 Olympic Athlete's village to be built 7 kms closer to the town center than originally proposed. According to an official in RMOW's environmental projects division, the municipality is currently considering putting limits on free parking in Whistler. Despite these measures, the amount of traffic within the community has continued to increase and GHG emissions from this sector went up by 20%.
- Divert solid wastes: The percentage of recycled wastes increased from 24% in 2000 to 38% in 2006, resulting in a decrease of 14,400 cubic tons of landfill waste in the year 2006. Although the total amount of waste put in landfill decreased from 18,433 tonnes in 2000 to 14,404 tonnes in 2006, GHG emissions from the landfill depend on the cumulative amount of waste in place (Battiston, 2008). Overall the community's GHG emissions from solid waste increased by 32%. The emissions associated with solid waste are expected to decrease in 2008 due to the purchase of composting infrastructure and the implementation of a project to capture methane gas from the now-defunct Whistler landfill.
- Improve municipal fleet efficiency: The municipal fleet now includes two smart cars (lightweight, fuel-efficient automobiles, two hybrids, and one fully electric vehicle. All municipal diesel vehicles are powered with biodiesel fuels. The switch to hybrid vehicles is estimated to have a six to eight year payback period. Despite commitments to improve fleet efficiency, the total fuel consumed by municipal vehicles has increased 25.2%. The overall increase is due to the addition of seven new vehicles to the fleet, including three large units (wheeled excavator, a Sewer Flush/Vactor truck and a Cat motor-grader). Fuel consumption also increases in heavy snow years, such as 2006 (Battiston, 2008).
- Support public education and outreach: This is being carried out through the Whister2020 initiative, a planning process that involves over 160 volunteer participants each year. Outreach has been in the form of a Web site (4,000 visits monthly), an anti-idling campaign, a column in the local newspaper and workshops with community groups. It is estimated that public education will bring about a 2% decrease in energy consumption by the year 2020.
- Adopt small-scale local renewable energy. As of 2006, none of the energy consumed in RMOW was generated within the community. However, Whistler-Blackcomb ski resort is currently investing in a run-of-the-river micro-hydro project on Fitzsimmons' creek, which could produce as much energy as the ski resort consumes. A study of wind-turbine potential on the south side of Whistler Mountain had negative results and a new site for wind power is being sought. In total, Whistler-Blackcomb has invested about $500,000 on the hydro and wind studies, as well as nearly $1 million on energy conservation initiatives. Whistler-Blackcomb has had an energy

management system in place since 1992 (DeJong, 2008). A waste-heat district energy system is under construction for the 2010 Athlete's Village (RMOW, 2007)

- Improve energy efficiency for buildings: There was a decrease in the GHG emissions produced by residential buildings (-7%), and by the commercial and institutional sectors (-3%). The green building portfolio is being handled by RMOW's housing planner (no new staff person was hired) and the municipality is working with a non-profit partner, CityGreen, based in Victoria. The municipality has developed a Green Checklist for the building community, which has been used in several re-zoning negotiations (Battiston, 2008). Furthermore, the municipality is committed to LEED standards for the new library and fire hall buildings, as well as for the 2010 Athletes' Village, Legacy Neighbourhood and other Olympic venues. According to an official in RMOW's sustainability initiatives department, the decision to construct a waste-heat district energy system in the Athletes Village was a direct outcome of the IEP.

In summary, four recommended measures are currently in the process of implementation, including the switch from propane to natural gas, the development of local renewable energy, and the capture of GHGs from the landfill and public education, but have not yet come to fruition. Concrete steps have been made towards improving energy efficiency in new buildings, including the 2010 Olympic Athlete's village, as well as in municipal land-use planning. Traffic congestion continues to increase in Whistler and passenger vehicle transportation remains the most important and fastest growing source of GHG emissions in the community. The municipal fleet has also seen an increase in emissions despite the policy to purchase more efficient vehicles, due to an increase in the overall number of vehicles.

According to several RMOW officials, the use of the IEP as a "guiding principals" document by Whistler2020 task forces and local decision makers has had some positive impacts on energy use. For example, RMOW's Environmental Services department used the policy to gain Council's approval for an initiative to sequester methane gas from the landfill despite the fact that Whistler's landfill is below the size required by Provincial legislation for gas collection. This is the largest sources of GHGs in the community over which the municipality has direct control. This initiative cost approximately $200,000 (Hallisey, 2008). The municipality is currently evaluating the feasibility of using captured landfill methane to provide electricity for the nearby wastewater treatment plant (RMOW, 2007).

Lessons Learned

Despite the fact that implementation of the IEP is currently behind schedule, this relatively recent plan has already seen many important successes. The Environmental Services Manager who championed the IEP believes that its strength is that its development was community-driven and that the recommended measures are consistent with the community's focus on sustainability. The IEP benefited from strong community leadership on the part of the mayor, city planner and business leaders. Another RMOW official involved in sustainability planning said that the involvement of both BC Hydro and Terasen Gas was also critical to the implementation of the plan. Furthermore, the reliance on community consultation and partnerships for the implementation of the plan (through the Whistler2020 process) provides an adaptive management framework, where priorities are re-defined on an annual basis.

The fact that Whistler's economy depends upon environmental tourism clearly contributed to garnering support for the IEP from a broad range of stakeholders as well as commitments from private partners. Whistler's IEP is framed within broader sustainability initiatives such as Whistler2020 and the Natural Step Framework, which helps anchor the proposed actions in a clear and coherent set of principals that the community has rallied around (WLAP, 2004).

A study by the British Columbia Ministry of Water, Land and Air Protection found that integrating energy, GHG emissions and air quality allows for better prioritization of resources and avoids duplication of efforts (WLAP, 2004). Adopting an integrated management approach in RMOW was simplified by the fact that nearly all emissions are fuel based and occur in the commercial, residential and transportation sectors. This greatly simplifies the inventory process, as GHGs and other air contaminants can be estimated using standard conversion factors alone. Communities with significant agricultural and industrial emissions would be faced with a far more complex task in terms of inventory and co-management options (WLAP, 2004). Despite the simplified inventory process in RMOW, the Manager of Sustainability Incentives responsible for the inventory said that calculating emissions from private vehicle transportation remains imprecise as the inventory is based on traffic studies.

According to an official in RMOW's Environmental Services department, one of the greatest weaknesses in terms of meeting IEP objectives is that the municipality did not stick to the committed timeline for implementation, monitoring and reporting outlined in the document (section 7.4-6). Furthermore, progress remains dependant upon the availability of staff and financial resources. Another source of uncertainty is the fact that some measures—such as the switch from a propane grid to natural gas, which is being carried out by Terasen Gas company—are beyond the municipality's direct control.

In summary, RMOW's integrated approach to energy, GHG and air contaminant management is well suited to a community where nearly all GHGs and air contaminants are fuel-based (the exception being GHGs generated by landfill waste, which is under direct municipal control.) Furthermore, the link between economic and environmental sustainability in Whistler's tourism-based economy, which is widely acknowledged by the municipality, businesses and the public, led a wide range of stakeholders to support the IEP. These particular conditions may limit the widespread transferability of this framework to other municipalities. However, Whistler's case also highlights the more universal benefits of relying on extensive community consultation, incorporating key business and political leaders, and working with public and private partners (such as the gas and electricity companies) in developing and implementing an energy and emissions policy.

Next Steps

As mentioned in the Outcomes section, several of the IEP measures are expected to be implemented in the near future. These include the switch from propane to natural gas, projected for fall 2008, the sequestering of methane emissions from Whistler's landfill, which began in 2007, and small-scale local renewable energy sources—currently under development by private partners (RMOW, 2007).

A major unresolved challenge for Whistler is the energy and emissions derived from transportation to and from the resort community, which are not addressed by the IEP. Currently, the greenhouse gasses derived from inter-community transportation (including flights) are estimated to be 11 times greater than the total GHG emissions from within the community. Following a recommendation by the Whistler2020 energy taskforce, RMOW and Tourism Whistler are currently working towards integrating whole-trip GHG calculators and offset purchasing tools within major travel booking systems. The municipality has also begun purchasing carbon offsets to compensate for the GHG impacts associated with staff airplane travel (RMOW, 2007).

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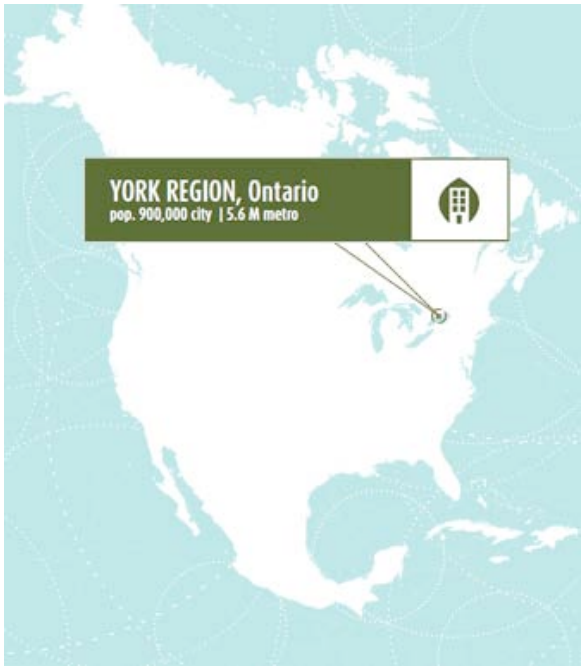
Energy Management Program, York Region, Canada

Summary



The Regional Municipality of York, north of the City of Toronto, launched its Energy Management Program in 2003. The program started as an internal initiative of the Region's Property Services division, championed by the division's director. A new subdivision within Property Services, called Corporate Energy Services, was created to oversee the program. Initially, the program's main goal was to reduce energy expenses through energy-efficiency measures and through energy procurement strategies. In light of the Region's new sustainability strategy, the goals of the Energy Management Program now also include improving the Region's sustainability profile.

The program, which targets energy use in the municipal corporation's facilities, has five key axes of intervention: (1) energy data management; (2) energy supply management; (3) energy demand management; (4) sustainable buildings program; and (5) organizational integration. The first axis, energy data management, is the foundation on which the rest of the program was built. The Region, with the assistance of a software developer, established its own energy consumption monitoring and tracking system, dubbed the Energy and Environmental Management System (EEMS). The second axis, energy supply management, consists of optimizing electricity and natural gas procurement methods to cut costs. The third axis, energy demand management, consists of performing Building Energy Feasibility Studies to identify energy saving opportunities in existing buildings. Another aspect of the same axis is to develop peak demand management strategies. The fourth axis, the sustainable buildings policy, requires that all new Regional facilities with a floor area over 500 m^2 meet or surpass the Canada Green Building Council's LEED Silver standard. The fifth and final axis, organizational integration, consists in developing a comprehensive Strategic Energy Plan (SEP) that will encompass the activities of all Regional departments, setting short-, medium- and long-term energy management objectives.

Since the launch of the Energy Management Program in 2003, the main achievements include the development of the Region's proprietary EEMS; the completion of three major Building Energy Feasibility Studies and the resulting implementation of a series of energy-efficiency upgrades to the Region's large Administrative Building; and the construction of the Region's first LEED-certified facility. The EEMS has proven very effective and is currently being licensed to other municipalities. The Building Energy Feasibility Studies and subsequent upgrades to the Region's Administrative Building have resulted in a 14% overall reduction in electricity use and a 41% reduction in natural gas consumption. For fiscal year 2006, this translated into cost savings of $186,288. The Region's first LEED-certified facility is a joint fire and emergency medical services station. The station is a "greened up" replica of an existing station; it consumes 35% less energy annually and produces 58.6 tonnes less of carbon dioxide emissions than the original version. The station was awarded a LEED Gold rating and recieved the 2007 Canadian Project Excellence Award in the Vision category from the Canada Green

Building Council. Going forward, Corporate Energy Services expects to complete its Strategic Energy Plan, continue energy efficiency retrofits, and build more LEED-certified facilities.

Municipal Context and Background

The Regional Municipality of York,[57] or York Region, is in south-central Ontario, immediately north of the City of Toronto. It encompasses an area of 1,762 km^2 and regroups nine local municipalities, including Aurora, East Gwillimbury, Georgina, King Township, Markham, Newmarket, Richmond Hill, Vaughan, and Whitchurch-Stouffville. The region had a population of 892,712 in 2006 and is projected to reach 1.5 million by 2031.

The region has a very diverse economy. A number of high-tech firms are headquartered and have manufacturing facilities in the southern part of the region, near the border with Toronto. Richmond Hill, in the south-centre of the region, is among the wealthiest jurisdictions in Canada, with an average family income over $100,000. Further north, agriculture remains an important sector of the economy, but is in decline as new developments continually consume farmland.

In 2001, the Region's Chief Administrative Officer (CAO) created the Property Services division, a new administrative unit responsible for managing all of the Region's properties. The director of the new unit understood the importance of monitoring and tracking utility consumption. He championed the idea of establishing an energy management section within Property Services. The new energy section, called Corporate Energy Services, was given a broad mandate to set up a utility consumption monitoring and tracking system and to undertake projects to reduce the Region's energy costs. The Energy Management Program was launched in 2003.

Senior administrators and the Regional Council welcomed the launch of the Energy Management Program. The program has since received ongoing Council support. Overall, the program has had little visibility outside the Regional administration, remaining largely unknown to the general public.[58] There has not been any kind of public consultation nor any public awareness or marketing campaign associated with the program. Nevertheless, the Region's Corporate Communications section has provided regular updates on the program's progress to the media.

Description of the Initiative

In its present incarnation, the main concerns of York Region's Energy Management Program are improving the Region's sustainability profile and cutting the Regional government's operating costs. These are addressed through five key axes of intervention: (1) energy data management; (2) energy supply management; (3) energy demand management; (4) sustainable buildings policy; and (5) organizational integration.

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[57] In Canada, a regional municipality is an upper-tier municipal government, on par with a county government. Regional municipalities are generally set up in highly populated areas to provide oversight for services shared by several local municipalities, such as police and other emergency services, public transit, waste management, and water.

[58] The program has however been showcased to various organizations, including the Internation Facility Management Association (IFMA), the Ontario Regional Facility Managers Association (ORFMA), and the Canadian Green Building Council, as well as at the 2006 Energy Matters Conference.

ENERGY DATA MANAGEMENT

The York Region has developed its own energy data management system, called the *Energy and Environmental Management System* (EEMS). At the core of the EEMS is software that helps track the energy and environmental performance of a number of Regional operations, including: municipal buildings, street and traffic lights, water and wastewater facilities, power generation facilities, and the vehicle fleet. In collaboration with PowerStream and Hydro One, two private electricity distribution companies, Corporate Energy Services staff have set the system up to electronically collect monthly utility bill data.[59] The EEMS allows the Region to compare the performance parameters of its facilities and allows it to target specific buildings for retrofits.

SUPPLY MANAGEMENT

The Region has been engaging in strategic procurements of natural gas and electricity, primarily as a means of cutting costs. For gas, the Region has been participating in a bulk natural gas purchasing program administered by the Association of Municipalities of Ontario. For electricity, the Region is in the process of implementing a new procurement strategy that will use a combination of Regulated Price Plans, the Spot Market, and Fixed Price Contracts. The three-phased implementation plan involves gradually shifting municipal facilities that are currently on either Regulated Price Plans or Fixed Price Contracts to the Spot Market, a move that is expected to save money but will not lead to energy savings *per se*.

The Region will begin purchasing EcoLogo-certified green power for two facilities in 2008. A media campaign, to increase public awareness and benefits of green power, is planned for the upcoming launch.

DEMAND MANAGEMENT

The Region is currently in the process of performing feasibility studies on certain Region-owned assets that will eventually lead to the implementation of energy saving and cost-cutting measures. Presently, the Region is performing Building Energy Feasibility Studies on 13 buildings (representing a floor area of over 446,000 square feet). The goal of the studies is to identify and quantify the energy and cost-saving potential of capital improvements, such as 'green building' retrofits, and of operations and maintenance improvements to energy-consuming systems, particularly lighting and HVAC systems. The Region is also currently assessing the feasibility of several energy-efficiency upgrades to water and wastewater treatment facilities, which have the potential to yield cost savings in the 14-19% range. Furthermore, the Region's housing provider, Housing York Incorporated[60] is performing energy audits at its housing facilities and implementing energy saving retrofits.

The Region has also undertaken two Demand Response initiatives to help attenuate concerns about the reliability of its distribution grid during peak load periods. The first initiative consisted of a Demand Response program designed to cut energy consumption in the Region's Administration Building by at least 50 kW for a six-hour duration within 2 hrs of receiving a directive to do so. The second Demand Response initiative consisted of upgrading an existing electric generator to provide supplemental power to the sewage pumping station. The generator is to be used in periods of peak demand to supply the pumping station with electricity, thereby lowering demand on the local grid by 1.5 MW.

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[59] York Region has licensed its EEMS system to a few municipalities in Southern Ontario, including the Region of Waterloo, Halton Region, the Town of Oakville, and, within York Region itself, the Town of Markham and Richmond Hill; others have expressed interest.

[60] Housing York Incorporated (HYI) is the York Region's housing arm. HYI builds, owns, and manages public housing facilities. HYI offers (subsidized) social housing and (unsubsidized) market-rate low-cost housing.

SUSTAINABLE BUILDINGS

As of April 2006, the Region requires that all its new facilities with a floor area greater than 500 m^2 meet a minimum standard of LEED Silver. The Region is also committed to retrofitting existing Regional facilities to improve their energy efficiency, although no explicit standard has been set. A number of retrofits have been completed at the Region's headquarters and projects in other buildings are presently underway.

ORGANIZATIONAL INTEGRATION

The Region is committed to developing a Strategic Energy Plan (SEP) that will encompass the activities of all Regional departments, setting short-, medium- and long-term energy management objectives. The Region's goal is to move from "energy management to the preferred state of energy sustainability" (RMY, 2007 a, p. 9).

The Energy Management Program is overseen by Corporate Energy Services, a section of the Region's Property Services division. Key partners within the municipal corporation include the other sections of the Property Service Division, notably Capital Projects, which is responsible for the construction of new buildings and major renovations of existing buildings, and Facilities Management, which is responsible for equipment upgrades and maintenance. Housing York Incorporated, the Region's housing arm, is also a key partner in implementing energy efficiency measures in public housing projects.

Beyond the municipal corporation, two key partners are the local electricity distribution companies (LDCs), namely PowerStream and HydroOne, as well as the smaller Newmarket Hydro. The two LDCs have played a crucial role in developing the EEMS, enabling it to automatically collect electricity meter readings and billing information. The other municipalities that have licensed EEMS are also important partners; continuous feedback from these municipalities has helped Corporate Energy Services improve the system.

Policy Context

At the municipal level, the York Region Sustainability Strategy (RMY, 2007 b) calls for continuing "to increase the energy efficiency and sustainability of York Region buildings through retrofits, procurement and conservation measures" (p. 11) under the theme of Corporate Culture of Sustainability; continuing to "construct energy efficient affordable housing projects" (p. 15) under the theme of *Healthy Communities*; and to "investigate and adopt principles for sustainable green communities in order to create more liveable, energy efficient communities with smaller ecological footprints" (p. 18) under the theme of *Sustainable Natural Environment*. York Region's recently updated Official Plan (RMY, 2007 c) also makes reference to energy conservation and green energy, albeit more obliquely. It refers to energy conservation in the context of improving air quality through reduced dependence on motorized transportation (p. 20) and creating environmentally-friendly affordable housing (p. 42).

Each of the lower-tier municipalities within York Region are responsible for their own energy management efforts. Nevertheless, there are examples of colaboration between the Region and lower-tier municipalities. In colaboration with the City of Vaughan, the Region has recently built an LEED Gold-certified fire and emergenecy services station. Also, the Region organized a workshop called Green Building: Policy to Practice, which was attended by representatives of the lower tier-municipalities, the York Region District School Board, and representatives from all department of the Region's municipal corporation. Moreover, the Region is collaborating on energy management with the City of Toronto and the other surrounding upper-tier municipalities.

At the provincial level, Ontario's Energy Conservation Responsibility Act (Bill 21) of 2006 (LAO, 2006) supports the Energy Management Program. Bill 21 paves the way for the provincial government to compel municipalities to engage in conservation planning and to adopt conservation measures in their internal operations.[61] Under this law, like every other municipal corporation in Ontario, the Region is required to periodically prepare and publish energy conservation plans. These must include (1) summary of annual energy usage; (2) itemized description of significant energy consuming technologies and operations; (3) a description of current and proposed activities and measures to conserve energy; (4) a summary of progress and achievements in energy consumption and other reductions since the previous plan (RMY, 2007 a).

Financial Aspects

The main expenses incurred by the Energy Management Program were those related to the development of the EEMS and those related to the Building Energy Feasibility Studies and resulting energy efficiency upgrades to the Region's administrative building. The Region spent approximately $82,500 on the development of the EEMS. Specifications for the new system were developed in-house, but development of the software was outsourced to the Mission Systems Development Corporation. The Region pays Mission Systems an additional $5,000 to $6,000 a year for support costs for the software (RMY, 2004). Part of the cost is recovered through the licensing fees collected from other municipalities to which Corporate Energy Services has licensed EEMS[62]. As for retrofits to the administrative building, the price tag has been around $1.6 million to date. Funding has come from the Region's general fund and from a variety of external funding sources.

As of late 2007, Corporate Energy Services has obtained a total of $470,925 from various energy efficiency grants. Grants for energy conservation studies and for the design and construction of retrofits have been obtained from three different organizations, including (1) Natural Resources Canada ($155,000); (2) the Federation of Canadian Municipalities Green Fund ($276,700); and (3) Enbridge Gas Distribution ($41,225). In addition, Corporate Energy Services recieved wage subsidies totalling $12,000 to date from the Environmental Careers Organization. The Region has also secured $403,000 in capital funding from PowerStream's Conservation and Demand Management Program that will fully cover the costs of an upgrade to an emergency generator at the Aurora Sewage Pumping Station; the generator will help with peak demand management.

The principal ongoing expenses of running the Energy Management Program are for staff. Corporate Energy Services has five permanent staff members including: (1) a Program Manager, who oversees all aspects of the Energy Management Program; (2) a Housing Sustainable Building Engineer, who oversees energy management projects in Region-owned housing; (3) a Sustainable Building Engineer, who oversees energy management projects in properties other than housing; (4) an EEMS Coordinator, who oversees all systems related to tracking energy use data; (5) an Energy Analyst, who monitors energy use in the Region's water and wastewater facilities.

[61] The bill "paves the way" in the sense that there is as of yet no legal remedy for non-compliance. It is expected that the government will soon designate an enforcement authority that is able to undertake legal remedy against municipalities that do not comply (Efficiency Engineering Inc., 2007).
[62] In FY 2006, Corporate Energy Services collected $20,000 in licensing fees from other municipalities.

Outcomes

Beyond the successful development of the EEMS, the most significant accomplishment of the Energy Management Program is the series of energy-efficiency retrofits performed on the Region's administration centre. Interventions have included: (1) replacement of magnetic fluorescent lighting ballasts with electronic ballasts; (2) installation of daylighting control in private offices; (3) installation of occupancy sensors for controlling lights in private offices, meeting rooms and washrooms; (4) installation of automatic sensor-operated faucets; (5) installation of variable-speed drives and return air ducting on air handlers; (7) installation of variable-speed drives on heating and cooling pumps; (8) replacement of heating boilers; and (9) installation of booster heat pumps for police call centre. They have resulted in a 14% (1 million KWh per year) overall reduction in electricity use and a 41% (211,098 m^3 per year) reduction in natural gas consumption.

Since the Region mandated that all new buildings over 500 m^2 meet the LEED Silver standard, one new facility has been built. The facility in question is a joint fire/EMS station, built in collaboration with the City of Vaughan. The new station, number 79, is a "greened up" replica of an existing station, number 78 (Enermodal Engineering, 2007). Compared to its Station 78, the new station consumes 35% less energy and reduces carbon dioxide emissions by 58.6 tonnes annually. It also cuts potable water use by 55% and apparently offers a more comfortable indoor environment. The project exceeded the LEED Silver requirements; the Canada Green Building Council awarded it a rating of LEED Gold. The project also recieved a 2007 Canadian Project Excellence Award in the Vision category.

In financial terms, the outcome of the Energy Management Program is annual utility bill savings estimated at $401,688 for the fiscal year 2006[63]. The retrofits performed on the Region's administration centre alone are believed to have saved $186,288. Energy retrofits at the Region's Blue Willow housing project saved $35,400, while retrofits at Region's Bales Drive Transportation and Works Operation Centre saved $25,000. Entering the Association of Ontario Municipalities' group procurement program saved another $135,000; unlike the aforementioned savings, these did not result from improving energy efficiency.

According to an official at Corporate Energy Services, the program has achieved all of its expected outcomes to date.

Lessons Learned

According to an official at Corporate Energy Services, virtually all of the initiatives undertaken under the Energy Management Program to date have worked well. There have been a few unforeseen delays in the implementation of energy-efficiency retrofits. Prior to installing energy-saving retrofits, Corporate Energy Services performed Building Energy Feasibility Studies that identified opportunities for energy-efficiency upgrades and proposed an implementation schedule. On several occasions, further energy-saving opportunities were identified during the detailed design phase. This prolonged the detailed design phase and resulted in a longer project schedule than initially anticipated.

The program's success to date is attributed to a number of factors. These include the strong support of senior management and a supportive Regional Council. The program also owes much to solid financial support both from the Region itself and from external funding sources.

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[63] 2007 results were not yet available at the time of writing.

The greatest challenge that the program has faced, and continues to face, is the limited availability of local expertise and resources in energy management and green building design. In particular, the Region has found it difficult to find design consultants and contractors familiar with integrated design processes and with proven project experience to carry out green design and various energy efficiency projects. The current manager of Corporate Energy Services says that, while this type of proven expertise remains hard to find, it is quickly becoming more available on the market in the Greater Toronto Area. He believes that universities and trade schools have an important role to play in creating and further developing expertise in this field. The onus is on them to train more people and to further develop expertise through research.

According to the manager of Corporate Energy Services, the only thing he would have done differently in retrospect would have been to develop a comprehensive, strategic energy plan earlier on in the program. Not having established strategic medium- and long-term goals has meant that the program has proceeded on a piecemeal basis. Corporate Energy Services is now developing a strategic energy plan to address overall energy management objectives and to identify the resources needed to achieve them.

The manager's main advice for other cities wishing to undertake an energy management program is to implement an energy monitoring and tracking system, like York's EEMS. Having such a system helps to identify poor performers in the municipality's existing building portfolio and to prioritize energy efficiency and cost saving interventions. He also recommends adopting a widely-accepted minimum standard for new buildings, such as LEED.

Ideas such as implementing an energy monitoring and tracking system to identify opportunities for energy efficiency improvements or setting an accepted minimum standard for new facilities are ideas that many municipalities across North America could try. One constraint, however, might be the lack of the necessary financial and administrative capacity; smaller municipalities might not be able to attract the specialized staff needed to oversee the various components of an ambitious energy management program.

Next Steps

The most important current project related to the Energy Management Program is the development of a Strategic Energy Plan (SEP) by Corporate Energy Services. The SEP will set short-, medium- and long-term objectives for the Energy Management Program. The main objective of the SEP is to move the Region from "energy management to the preferred state of energy sustainability". The SEP will encompass all of the Region's departments, setting timelines for further energy efficiency projects. It will also set targets and a timeline for increasing the Region's supply of renewable energy.

In the near- and medium-term, the Region will be implementing another series of energy efficiency upgrades to its admistrative building as well as in other facilities. The Region also expects to complete a number of new, LEED-certified facilities in the coming years. In collaboration with Corporate Energy Services, Housing York Incorporated (HYI) is currently in the process of building the Region's first LEED-certified multi-unit residential facility. The new facility, called Tom Taylor Place, is expected to consume 58% less energy and produce 147 tonnes less of carbon dioxide annually than a comparable existing facility. After Tom Taylor Place, the next LEED-certified project will be the first of three proposed Community Environmental Centres (CECs). These are to be small, community-level waste management facilities where residents can drop off a variety of resuable and recyclable materials as well as organic yard waste. Another project on the drawing board is a LEED-certified pumping station, to be the first sustainable water and wastewater facility in the Region. Corporate Energy Services is particularly interested in energy efficiency at water and wastewater treatment facilities because they currently consume nearly two-thirds of the energy purchased by the Region.

The Region is also envisaging the installation of a wind turbine at the Sutton Water Pollution Control Centre (WPCC) in the Town of Georgina. Currently, a feasibility study is under way; a meteorological tower has been installed at the WPCC to measure the capacity of the wind resource at the site.

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