



Energy Management Plan

Executive Summary



City of Cedar Rapids, IA

Duns # 06520514

Energy Efficiency and Conservation Block Grant Program - Award No. DE-SC0002598

Prepared By:





“Cedar Rapids is a vibrant urban hometown - a beacon for people and businesses invested in building a greater community for the next generation.”

City Council Strategic Priority Initiative #6 – Develop a Comprehensive Energy Management Plan

Windows of Opportunity

The catastrophic flooding event of June 2008 provided the City of Cedar Rapids with a unique and unprecedented opportunity to build a better, more sustainable community. The City is using the rebuilding effort and investment of over \$100 million in recovery funding to explore possibilities for energy efficiency and sustainability to create a better future for the City and its residents.

A complimentary opportunity arose in 2009, with the Energy Efficiency and Conservation Block Grant (EECBG) Program, funded as part of the American Recovery and Reinvestment Act (ARRA).



Windows of Opportunity

The EECBG program awards funding for local governments, states, and Tribes to reduce energy use and fossil fuel consumption through investments in energy efficiency. Cedar Rapids was awarded \$1.3 million under the EECBG program, of which the City allocated \$150,599 to develop a comprehensive Energy Management Plan (EMP).

The Energy Management Plan provides a lasting framework for improving energy efficiency within Municipal operations as well as in the larger community, and enhances sustainability during the flood recovery efforts and beyond. The potential benefits of the EMP are great: strategies identified to reduce municipal facility energy use could save the City an estimated \$2.5 million per year in energy costs. Establishing programs to support energy efficiency, clean energy use, and energy education will provide additional, less tangible benefits to the City as well. Strategies contained in the EMP will reduce harmful emissions, improve the comfort and health of building occupants, spur growth in local “green collar” jobs (e.g. energy systems installers), and entice people and businesses that are thinking about the impact of actions taken today on future generations. In short, the EMP recognizes that energy efficiency and conservation are part of economic and environmental prosperity strategies, in line with those outlined in the Iowa State 2010 Energy Independence Plan.¹

The primary focus of the EMP is to improve energy efficiency in Municipal Operations. The city wants to “walk the walk” and focus investments on sources of energy demand directly under city control. However, the EMP also addresses citywide energy use because the City believes that the benefits of energy efficiency and conservation will positively impact residents and businesses located in our community. The elements of the plan related to citywide energy use address facility and vehicle energy use within City limits.

¹ <http://www.energy.iowa.gov/OEI/docs/2010WebEnergyIndependencePlan.pdf>

The EMP was developed as a series of Technical Memoranda that are summarized in this document. More details on each element of the plan can be found within the memoranda, listed below and available upon request from City of Cedar Rapids Water Pollution Control Facilities at 319-286-5286, ext 4600.

Tech Memo Title	Objective
TM 6.4 - Current Municipal Energy Use	Provide overview of baseline energy use in Municipal operations. The objective was to provide a baseline against which decision makers could set goals and measure progress.
TM 6.5 - Current Citywide Energy Use	Provide overview of baseline energy use citywide, based on utility and census data from within City limits. The objective was to provide a baseline against which decision makers could set goals and measure progress.
TM 6.6 – Goals	Identify clearly defined energy management goals that will provide City decision makers and the community with a clear direction for their energy management efforts, and will provide intermediate milestones against which progress may be evaluated.
TM 6.7 - Current State of Energy Efficiency Measures	Develop a general characterization of the current state of energy efficiency, and the extent to which previous projects or programs have impacted local buildings and facilities.
TM 6.8 - Policies and Strategies for Achieving Goals	Develop and evaluate a prioritized list of potential implementation strategies to achieve City goals in terms of cost and benefits, as well as additional considerations including staffing requirements, consultant support, and lessons learned in other Cities.
TM 6.9 - Methodology for Monitoring Progress	Develop a means of evaluating progress toward the long-term program goals that will lead to a successful energy program.

Energy Management Team

CORE TEAM

Steve Hershner/Utilities –Leader
Tariq Baloch/Water
Leslie Hart/Traffic Engineering
Roy Hesemann/Utilities
Nancy Geiger/Library
Sandy Pumphrey/Public Works
Brent Schlotfeldt/Building Needs
Roger Hageman/Fleet Services

UTILITY MEMBERS

Tom Barker/MidAmerican Energy
Mary Meisterling/Alliant Energy
Doug Litwiller/Alliant Energy

REMAINING TEAM MEMBERS

Pat Ball/Utilities
Greg Eyerly/Flood Recovery
Dean Archer/Facilities
Jerry Potter/Police
Mark English/Fire
Dennis Hogan/Fleet
Steve Krug/Parks
Vern Zakostelecky/Comm. Dev.
Drew Westberg/City Manager
John Riggs/Public Works
Lyn Wedemeier/Code Enforcement
Megan Murphy/Utilities

Energy Management Team

The EMP was developed by an Energy Management Team (EMT) comprised of representatives from most city departments, as well as representatives from the local energy utilities: Alliant Energy and MidAmerican Energy. The EMT met regularly over the course of the program and was responsible for a wide variety of tasks including:

- Defining EECBG funded projects,
- Informing the development of baseline energy use profiles,
- Developing draft and final energy management policies
- Soliciting community and other stakeholder input
- Shepherding the EMP through to completion.

In the future, members of the EMT will be responsible for implementing strategies contained within the plan and continuing to serve as liaisons to other city staff, City Council, and residents.

Stakeholder Involvement

The development of the EMP included substantial stakeholder involvement in order to create a locally appropriate and feasible plan.

The stakeholder participation process included:

1. Creating and meeting regularly with a cross departmental mix of municipal employees and representatives of the electric and gas utilities to guide the process of establishing policy, goals, and strategies
2. Targeting a broad cross section of the community to invite and encourage them to provide input to findings, potential policies and strategies, and the resulting plan via a series of Community Open Houses
3. Delivering intermittent presentations to City Council to solicit their input to and endorse the process, policies, and plan



Community Open House

The result of the Stakeholder involvement process is an EMP that has been informed, reviewed, and endorsed by City Council, city managers, city staff, local utilities, and members of the community.

Baseline Energy Use

Measurement of existing energy use is a critical part of energy management. Identifying opportunities for energy efficiency is nearly impossible without the ability to understand where and how energy is used. Also, a baseline energy use profile provides a basis for goal setting and a

yardstick against which the success of strategies and policies adopted by the City can be measured.

Fiscal year 2008 (FY08), normally defined as July 1, 2007 to June 30, 2008 (but prorated to 12 months based on actual usage through May, 2008), was selected as the baseline year as it was the most recent, complete year of operations prior to flood damage. This period during FY08 represents a snapshot of what city energy use looked like under normal conditions.

Municipal Energy Baseline

In FY08, the City of Cedar Rapids used approximately 685 billion BTUs of energy in municipal operations at a cost of \$9.63 million. This included electricity (58%), natural gas (26%), and vehicle fuel (16%) as illustrated in Figure 1.

The greenhouse gas impact of energy use in FY08 was estimated to be approximately 113,000 metric tons of carbon dioxide (MTCO₂). This is approximately the same amount of emissions produced by 19,600 typical passenger vehicles or by consuming 238,000 barrels of oil.²

FY08 Municipal Energy Use

Total = 685 Billion BTUs

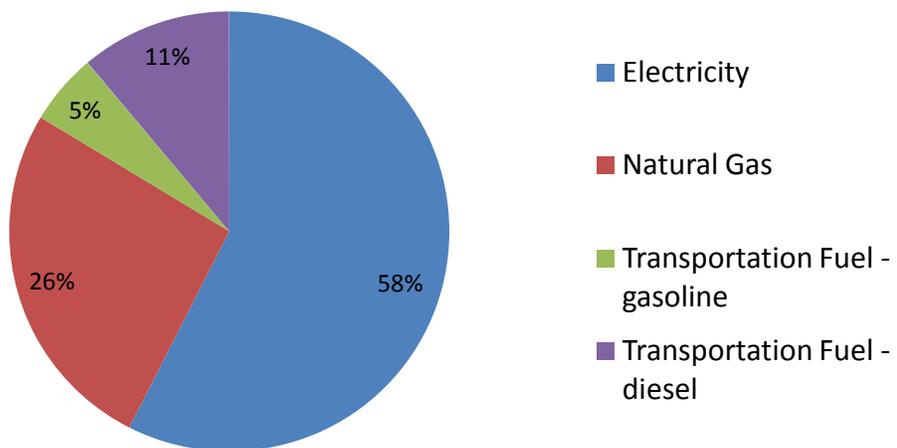


Figure 1 – Total Municipal Energy Use in FY08

Energy use was concentrated in relatively few facilities. The top 20 largest facilities consume 95% of total municipal facility energy use (electricity and natural gas, on a BTU basis) and represent 94% of the total annual facility energy budget. Experience has shown that it is generally most cost-effective to focus limited engineering resources on audits of the largest energy-using facilities, at least initially, to identify potential energy efficiency improvements. These facilities are

² U.S. EPA, 2010. Greenhouse gas equivalencies calculator. <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

listed in Table 1. Highlighted facilities were damaged in the flood; future energy use at these facilities may be drastically different as a result.

Table 1 – 20 Largest Municipal Energy Users in FY08

Facility	Address	FY08 Facility Energy Use (MMBTU)	FY08 Energy Cost (\$)
Water Pollution Control Plant	7525 Bertram Rd Se	274,530	\$3,175,292
CR Water Works	Ellis/Seminole/Shaver	91,880	\$1,186,870
Cedar Rapids Street Lights	n/a	48,198	\$1,556,194
Cedar Rapids Ice Arena	1100 Rockford Rd SW	35,005	\$332,733
Eastern Iowa Airport	3425 Wright Bros Blvd SW/ 2121 Arthur Collins Pkwy	28,011	\$277,682
Public Works Building	1201 6th St SW	22,840	\$112,975
Police Department Bldg	505 1st St SW	13,399	\$127,515
US Cellular Center	370 1st Ave NE	5,665	\$184,225
Cedar Rapids Traffic Signals	n/a	4,131	\$134,516
City Hall	51 1st Ave SW Bridge	3,044	\$68,987
Cherry Hill Pool	341 STONEY-POINT RD NW	2,995	\$31,205
CR Five Season Parkade	400 1st Ave NE	2,898	\$45,209
Noelridge Pool	1248 42ND ST NE	2,263	\$24,665
Ambroz Recreation Bldg	2000 MOUNT-VERNON RD SE	1,923	\$2,528
Greenhouse	4900 COUNCIL ST NE	1,820	\$2,190
Bever Water Booster Station	2355 Linden Dr SE	1,754	\$37,291
Central Fire Station	222 3RD ST NW	1,587	\$5,800
Morgan Creek Lift Station	Ellis Rd. NW	1,464	\$38,702
Bender Pool	940 14th Ave SE	1,345	\$24,127
Site I Landfill	2250 A ST SW	854	\$1,148
TOTAL TOP 20		545,868	\$7,370,166
All Municipal Facilities		573,020	\$7,836,662
Share of Top 20		95.3%	94.0%

Note: The average cost per MMBTU is variable because of the variable costs of electricity across account types and time of use, and because of the difference in cost between natural gas and electricity. Costs and MMBTU are both important from an energy management perspective so both are included.

Cedar Rapids Citywide Energy Profile

Residential, commercial, industrial, municipal, and transportation activities within the city limits of Cedar Rapids collectively consumed an estimated 36.7 trillion BTUs of energy in FY08. Approximately 78% of this energy is used in facilities (electricity and natural gas) and the remaining 22% is used in vehicles.

To put municipal operations in context, the 685 billion BTUs consumed by the City in FY08 represent 1.9% of total community energy use. Total community energy use by fuel type is broken down for FY08 in Figure 2.

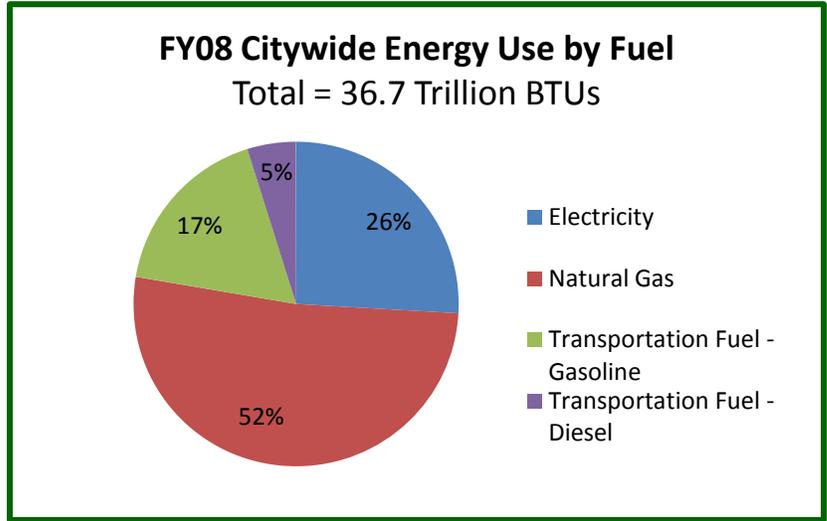


Figure 2 – Citywide Energy Use in FY08 by Fuel

Figure 3 illustrates citywide energy use by sector and reveals that the industrial sector consumes the most energy in Cedar Rapids (42%).

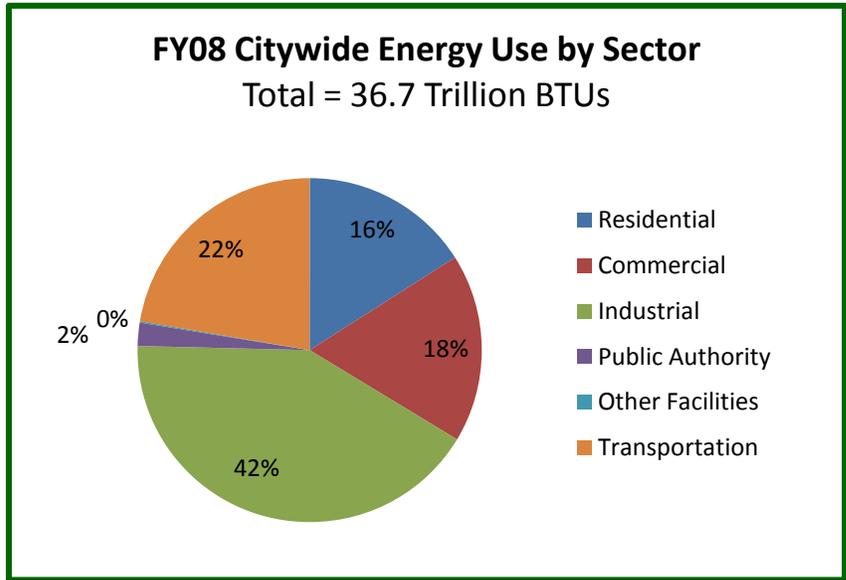


Figure 3 – Citywide Energy Use in FY08 by Sector

More details on municipal and citywide baseline energy use can be found in Technical Memoranda 6-4 and 6-5.

History of Energy Efficiency and Conservation in Municipal Operations

Prior to the initiation of the Energy Management Planning process, several departments had made notable progress towards more sustainable energy management.

In FY01, the City invested in an energy management system (EMS) to help monitor and control the energy usage in 22 municipal buildings. The EMS helped identify energy conservation projects in

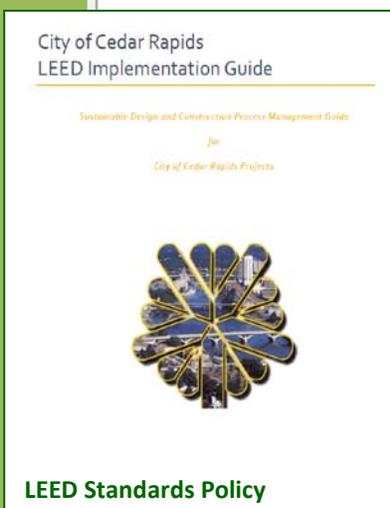


Energy Management System

because of the high value of savings achieved in its first years of operation (it saved the city over \$440,000 annually in energy costs).

Many other projects have been implemented that have reduced municipal energy use. The city installed LED traffic signals that maintained associated electricity costs despite 33% growth in the number of signals. A biogas project at the Cedar Rapids Water Pollution Control Plant has achieved natural gas savings of as much as \$500,000 annually.

many existing facilities including lighting retrofits, high efficiency motors, peak load shifting, and an energy management system (EMS) in twenty-two major facilities. The EMS provided real-time electric meter data on 10-13 MW of electricity demand, allowing the City to monitor peak usage and identify unusually large loads. The EMS was lost in the flood, but is getting replaced



LEED Standards Policy

Moving Forward with Energy Efficiency and Conservation in Municipal Operations

As the Energy Management Plan was being developed, several subsequent energy efficiency and conservation projects were being developed. These projects address energy use in new building construction, planning for a new incinerator with possible energy recovery, evaluating the installation of a wind turbine.



LED Signals

The city has also taken actions to improve efficiency in new construction, most notably by leveraging FEMA and EECBG funding to advance the energy performance of new facilities. FEMA recovery funding is being used to replace flood damaged

buildings and equipment with highly efficient alternatives identified, in many cases, via the Utilities' design assistance modeling program. The design assistance program helped inform energy systems design decisions made during the rehabilitation of the Police Department Building , for example.

Using EECBG funding, the city developed a LEED Implementation Guide that supports City staff and construction teams with the implementation of LEED on their projects. The Guide was developed to support direction from City Council to achieve Gold level certification on all new City funded facilities.

The city funded several other energy efficiency projects using its EECBG allocation including:

- Waste to Energy Feasibility Study that recommends production of renewable energy from wastewater biosolids
- Renewable Energy Feasibility Study that recommends wind power generation at the Northwest Water Treatment Plant in lieu of rehabilitation of the City's flood damaged hydro power generation plant
- Approximately \$300,000 in municipal energy efficiency retrofits.



The Utilities' Design Assistance Modeling Program was applied to the Police Department Building

More details on these projects can be found in the Energy Efficiency and Conservation Strategy submitted to the DOE in January 2010.

The city was recently awarded several grants totaling \$475,000 from the Iowa Office of Energy Independence to implement additional lighting retrofits and traffic signal coordination. The Energy Management Team is charged with the ongoing identification of high priority projects and appropriate sources of additional funding for implementation.

Both of the major energy utilities, Alliant Energy (electricity) and MidAmerican Energy (natural gas) have many existing policies and programs to increase energy efficiency and promote growth in renewable energy citywide. Many of these programs can support the incorporation of sustainable design features in the reconstruction and repair of the hundreds and thousands of flood damaged residential and commercial properties in Cedar Rapids.

The energy utilities also provide many programs to advance efficiency in existing facilities and offerings such as free home and business assessments, energy efficiency measure rebates and incentives, demand management initiatives. These existing programs provide residents and businesses with many resources to increase energy efficiency that will be leveraged and supported by the EMP.

Additional information on the current state of energy efficiency programs and projects can be found in Technical Memorandum 6-7.

Forecasted Future Energy Use

In order to understand the magnitude of the challenge ahead with respect to reducing energy use, expected energy use growth rates in the City of Cedar Rapids have been established through review of historical data provided by Alliant and Mid-American as well as census data collected by the State, projections for expansion in City operations, and projections for baseline efficiency improvements. Business-As-Usual (BAU) projections modeled with these growth rates following initial recovery to pre-flood energy use indicate that, in the absence of any energy management activities, municipal energy use will grow by roughly 0.9% to approximately 690 billion BTU by 2020. This means that even if the city does nothing, energy use is not expected to grow drastically. Therefore, even modest action can lead to reductions in use below FY08 levels and the city determined that aggressive reduction targets are feasible and appropriate. No energy cost projections were developed, however even with level growth in energy use, energy costs could grow more substantially depending on future energy prices.

Several potential aggressive reduction targets were considered by the EMT, including the reduction goals established by the American Clean Energy and Security Act (which was derived from the Copenhagen Accord) and the two possible reduction targets established by the Iowa Climate Change Advisory Council (ICCAC).

These targets, relative to the most likely BAU scenario for municipal energy use, are illustrated in Figure 4. Figure 4

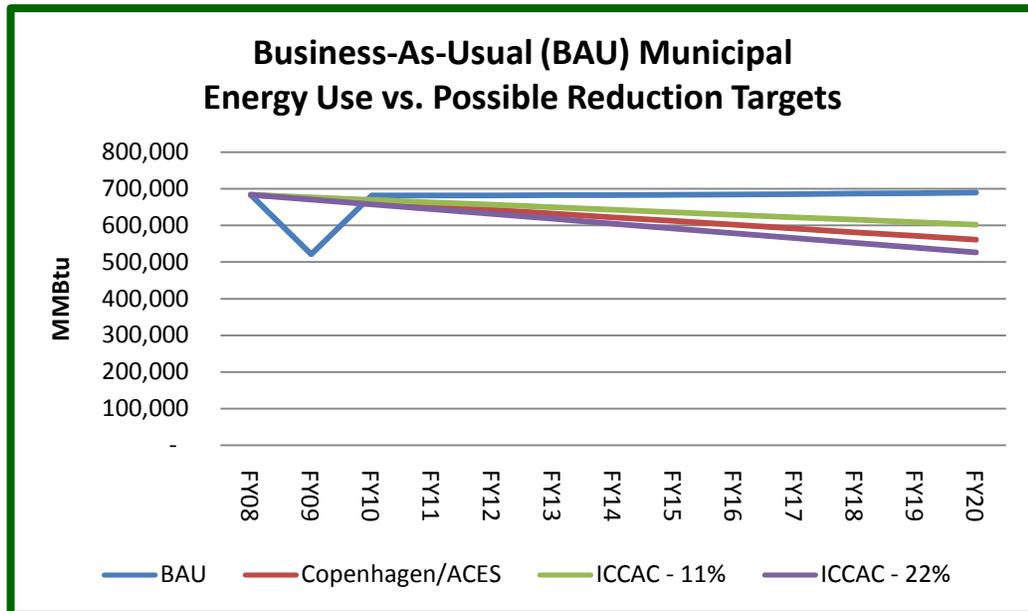


Figure 4 – BAU Municipal Energy Use Compared to Several Sample Reduction Targets.

Similarly, community energy use is expected to exhibit little to negative growth over the next ten years. BAU analysis projected growth of between -1% and 3%. The EMT believes that community energy use can be significantly reduced by continued commitment on behalf of the Utilities, large energy users, and residents. Many of the strategies included in the EMP target community energy use.

Further discussion of expected future energy use can be found in Technical Memorandum 6-6.

Energy Policies Adopted

The EMT has identified seven overarching policies to reduce energy use in Cedar Rapids. These policies were presented to the City Council in January, 2010 and the EMT was directed to proceed with policies as presented. These policies are provided in order of priority in Table 2.

Table 2 – Energy Policies adopted by the City of Cedar Rapids

Energy Policies
<i>1 – Reduce Municipal Energy Use</i>
<i>2 – Reduce Capital Funding Barriers to Energy Projects</i>
<i>3 – Increase Use of Renewable and Alternative Energy</i>
<i>4 – Support Energy Education and Information</i>
<i>5 – Encourage Non-process Energy Efficiency in Commercial and Industrial Facilities</i>
<i>6 – Encourage Residential Energy Efficiency</i>
<i>7 – Reduce Energy Use in Vehicles</i>

These policies were identified and prioritized via a significant community input process and are intended to guide planning and investment decisions in the city towards a more efficient and sustainable outcome. Specific strategies were identified to implement each of the seven policies. These strategies were also prioritized according to expected costs and benefits, implementation details, feasibility and other criteria identified by the EMT. The result of the process is a laundry list of possible implementation strategies, ranked in order of priority by EMT members, along with implementation guidance and an analysis of expected impacts. This list of strategies will be consulted and expanded by the EMT over the course of the plan’s implementation.

Details on the adopted energy policies and priority implementation strategies can be found in Technical Memorandum 6-8.

Goals for Energy Management

Goals for the Energy Management Plan were identified for each policy adopted by the City. Several potential goals for each policy were drafted and reviewed by the EMT. The Energy Management Team examined multiple factors in the development of these goals including:

- Future growth in energy use (BAU projections)
- Sample targets adopted by other actors (cities, the state, and the federal government)
- The expected impact of actions planned and underway



Energy Goals

The results were presented to the community in a public open house. Both groups of stakeholders provided input regarding which of the potential goals were most appropriate for the city based on a balance of desired aggressiveness and achievable results.

Goals are set for 2020, a target year found in most national and international policies related to energy and greenhouse gas emissions.

The final goals recommended by the EMT reflect the stakeholder involvement process and detailed data analysis, such that the EMT believes these goals are both appropriate for Cedar Rapids and achievable. The EMT also believes that achieving the goals will generate significant benefits for the City. For example, the goal for Policy #1 – Reduce Municipal Energy Use correlates to a potential annual savings of approximately \$2.5 million at today’s energy cost.



Energy Savings

Final goals for the EMP are summarized in Table 3. A detailed discussion of how final goals were developed can be found in Technical Memorandum 6-6.

Table 3 - Summary of Goals

Policy	Goal by 2020
1 – Reduce Municipal Energy Use	26% reduction from FY08 in facility energy use
2 – Reduce Capital Funding Barriers to Energy Projects	Establish a sustainable revolving fund for municipal energy projects
3 – Increase Use of Renewable and Alternative Energy	10% of municipal energy provided by onsite renewable energy systems
4 – Support Energy Education and Information	Leverage existing training and education programs to train 100% of city staff in energy management
5 – Encourage Non-process Energy Efficiency in Commercial and Industrial Facilities	5% reduction in sector energy use from FY08
6 – Encourage Residential Energy Efficiency	5% reduction in sector energy use from FY08
7 – Reduce Energy Use in Vehicles	30% increase in the fuel economy of the municipal fleet; 5% reduction in citywide vehicle fuel use

Implementation

Perhaps the single most important aspect for the successful implementation of the Energy Management Plan is the identification of appropriate and invested parties responsible for the implementation of the proposed strategies. These parties must also be responsible for monitoring how well the adopted policies are succeeding in achieving the City's goals and periodically proposing revisions to the EMP as needed to enhance the success of the program.

Parties responsible for implementation should include:

1. Energy Management Coordinator (EMC) – the EMC is a proposed position that will serve as the primary “champion:” of energy efficiency in the city. The EMC will work across departments to continually ensure that energy conservation is at the forefront in city decision-making.
2. Energy Management Team (EMT) – the current EMT represents support to the EMC in identifying and implementing energy measures within their departments. The EMT will continue to play an essential role in translating policies to action in an effective way that is appropriate for the City.
3. City staff – the success of the plan will be significantly enhanced if all City employees not only understand, but also buy-into the programs adopted by the City. Awareness training sessions are already planned that mimic model programs provided in the private sector.



Energy Management Coordinator

Also critical to successful implementation of the Energy Management Plan is the ability to measure and monitor success. Periodic updates to municipal and community energy use estimates must be made in order to understand how well the adopted policies are achieving the desired results.

Moreover, monitoring and reporting will provide the City with better information for making sound operational decisions and energy investments across departments. According to the Massachusetts Department of Energy Resources:

“Centralizing energy costs as a line item often increases awareness of energy efficiency. If municipalities treated energy as a single expense, it would probably be the largest single budget item.”

Presently, the City of Cedar Rapids has over 350 separate municipal electric accounts with Alliant Energy, over 80 separate municipal natural gas accounts with MidAmerican Energy, and roughly 30 separate vehicle fuel accounts. Developing a system to readily compile, monitor, and trend energy consumption for at least those accounts representing the greatest energy consumption is imperative and will be one of the first responsibilities of the Energy Management Coordinator.

Monitoring the success of the EMP will also entail the tracking and reporting of various other metrics related to energy management. Example metrics to be collected beyond municipal energy accounts include: quarterly budget spent on outreach/education pertaining to energy efficiency, municipal fleet fuel economy, staff use of alternative modes of transportation, building permit applications with renewable energy or energy conservation features, community energy use by sector, energy efficiency resources allocated by local utilities, and others. The EMC will be responsible for coordinating with the appropriate city departments to collect and aggregate energy management metrics.



Monitoring & Reporting Progress

More details on the monitoring and reporting plan can be found in Technical Memorandum 6-9.

Conclusion

The City of Cedar Rapids is presented with windows of opportunity to enhance the sustainability of the community and significantly reduce operating costs while serving as a leader in energy management. The Energy Management Plan provides the long-term framework for meeting aggressive, yet achievable, reduction targets. The success of the plan will depend largely on the will and determination of the people responsible for turning the plan into action – both internal city staff and citizens alike.

Cedar Rapids is, and always has been, a vibrant city, committed to providing its residents with a safe, healthy, and quality place to live and work. This Energy Management Plan is part of continued commitment to a better future for the citizens of Cedar Rapids.