

To:	City of Cedar Rapids		
From:	Lauren Casey/HDR Dave Dechant/HDR	Project:	Energy Management Plan
CC:			
Date:	June 24, 2010	Job No:	City – 615189-01 HDR - 0112623

Re: Technical Memorandum 6.4 – Current Municipal Energy Use

This technical memorandum (TM) characterizes baseline energy use in Municipal operations. It is organized as follows:

- Objective
- Summary
- Dates of Baseline Data
- Overall Energy Use
- Electricity
- Natural Gas
- Steam
- Vehicle Fuel
- Greenhouse Gas Emissions
- Implications

Objective

Provide decision makers with a “base case” describing the current energy use patterns by the City. Future efforts to increase efficiency, reduce energy use or to shift to alternative fuels can then be compared and evaluated against this base case.

The baseline energy profile also provides a framework for goal setting, both short and long term. This baseline is a data set from which to estimate future business-as-usual growth, and it is a yardstick against which to measure the success of future strategies and policies adopted by the City.

Summary

This memo describes the baseline municipal energy use for the City of Cedar Rapids, for fiscal years 2008 and 2009. Fiscal year begins July 1 and ends June 30 of the following year. Municipal energy use includes electricity, natural gas, and vehicle fuels. The baseline was developed by working closely with members of the City Energy Management Team to review inventories of City

facilities and equipment and annual utility and fuel use data, and to consolidate that data across consistent years for analysis.

Total municipal energy use for FY 2008 was 672 Billion BTUs (57% electricity, 27% natural gas, and 16% vehicle fuel). The majority of energy use was in buildings and facilities (84% of municipal energy use). Within buildings and facilities (and excluding transportation), the largest total energy using facilities were the water pollution control center (47%), water works (15%) and street lighting (9%).

Dates of Baseline Data

The summary above describes the baseline energy use in the fiscal year prior to the 2008 flood. FY 2008 would typically be used for the baseline, as the most recent year for which data was available; however 2008 data cannot be considered a complete representation of typical energy use because of the impacts of the severe flooding that occurred in June 2008. Because of the flood, both 2008 and 2009 will be considered important benchmark years. Post-flood activity represents the current reality of energy consumption in the City and energy use patterns in the foreseeable future while efforts to rebuild damaged buildings are undertaken. However, pre-flood activity may more accurately represent 'normal' energy use in the City and provide a more accurate picture of which buildings are occupied, and which are being used at a level consistent with the actual demands of the City's population and economic activity. Therefore, the development of the energy strategy will consider both 2008 and 2009 to be important benchmark years.

To date, complete data for fiscal year 2008 and 2009 was not available for all activities. For example, electricity data was only available on a fiscal year basis, and natural gas data was only available on a calendar year basis. Historic information and estimates based on available data are included as placeholders wherever possible.

Overall Energy Use

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 represents only a small percentage, approximately 1.9% of total estimated citywide energy use (see Tech Memo 6-5).

Of the City's annual energy consumption approximately 84% was attributed to building and facility energy use and 16% was for fleet vehicles.

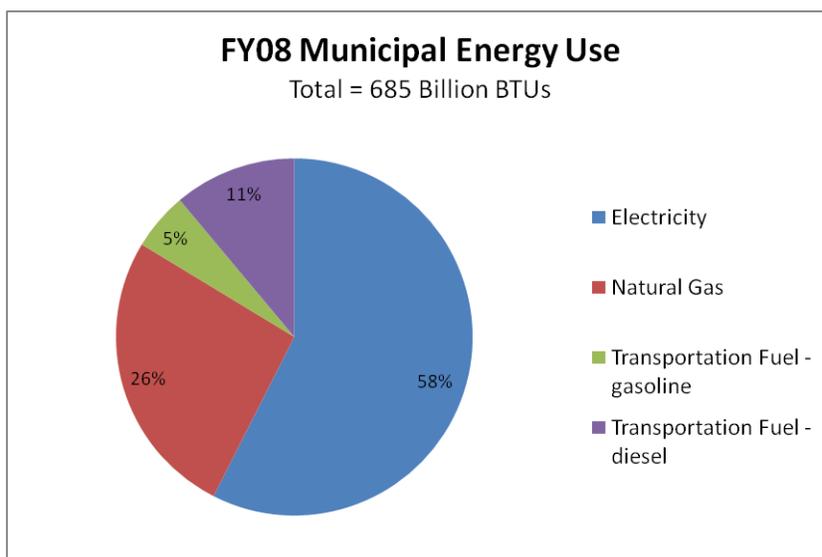


Figure 1 – Total municipal energy use in FY2008

Municipal vehicle fuel use data was lost in the flood and therefore no total energy use comparison can be made between FY08 and FY09. Variation in electricity and natural gas use from year to year is discussed in the following sections.

Electricity

The City obtains the bulk of its electricity from Alliant Energy. In aggregate, total electricity use by all facilities in the City was 115.4 million kWh in FY08 (see Figure 2), resulting in a total cost of \$6.7 million. The Water Pollution Control facility located at 7525 Bertram Road was the biggest electricity user at 44%.

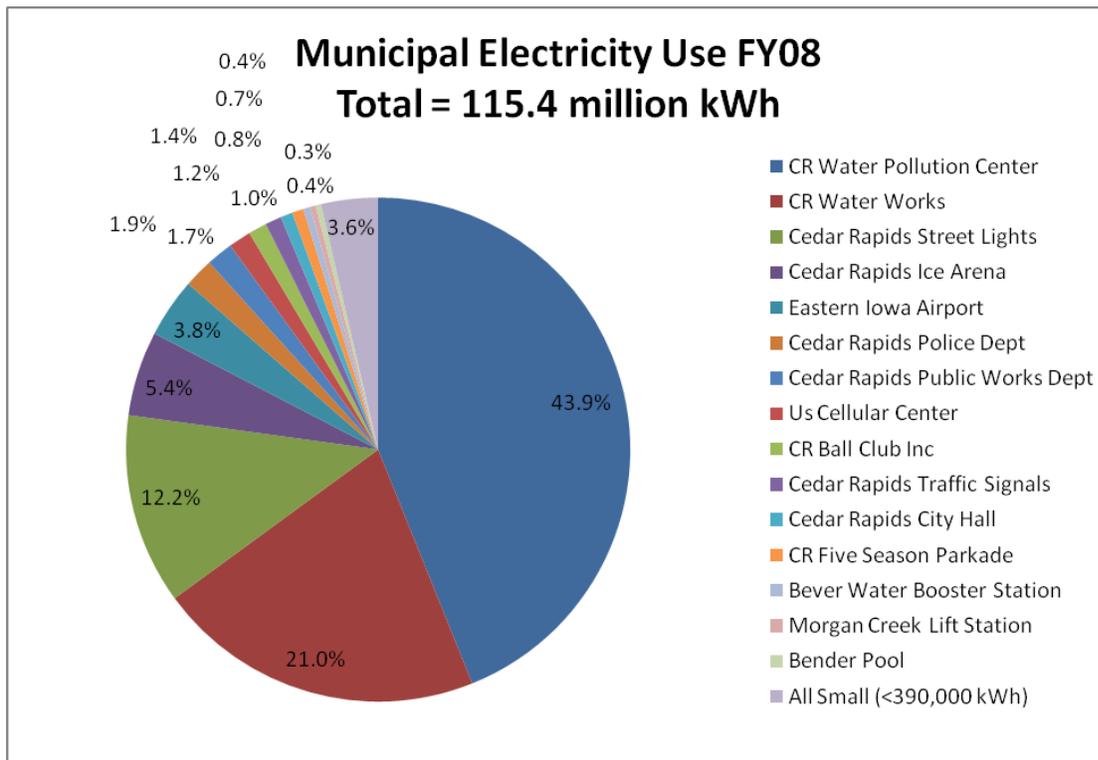


Figure 2 – Municipal electricity use in FY08

In FY09, total electricity use in City facilities after the flood was roughly 84.5 million kWh at a cost of \$7.6 million. This was a reduction in use of approximately 25% from the previous year. The Water Pollution Control facility still dominated use after the flood at 42% of total (see Figure 3).

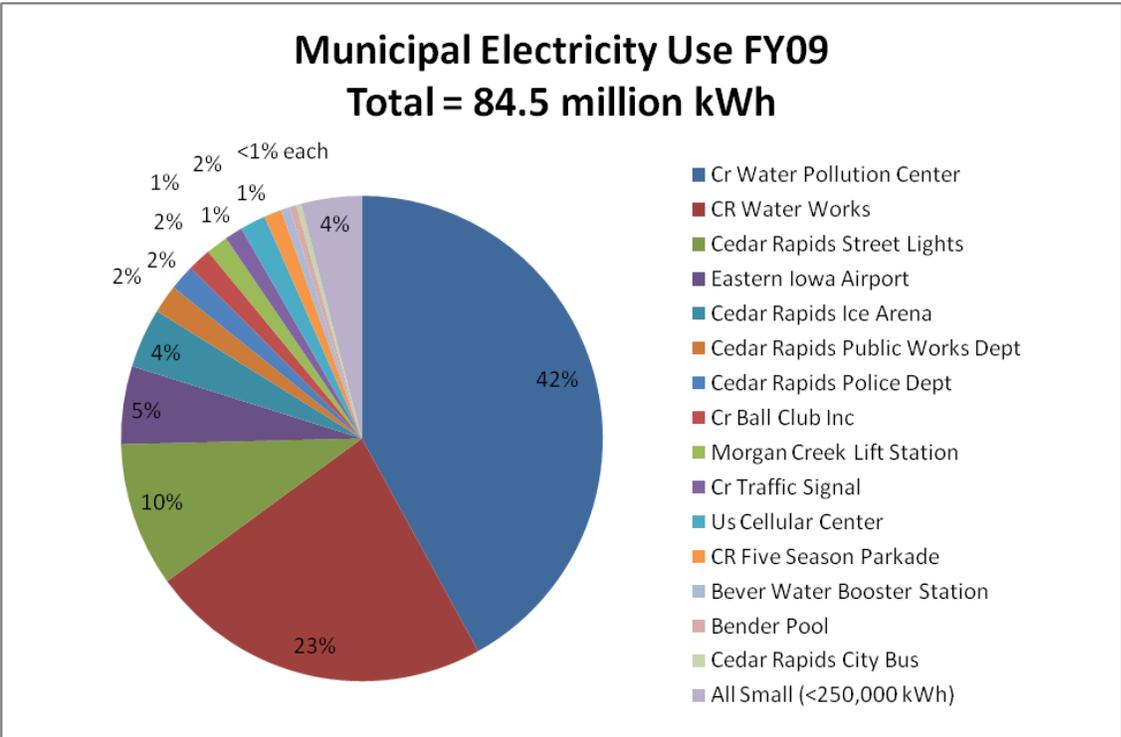


Figure 3 – Municipal electricity use in FY09

Most of municipal electricity use is in large facilities with significant process or HVAC loads such as the Water Pollution Control Facility, the Airport, the Cedar Rapids Ice Arena, and the US Cellular Center, and in street lights. The top 15 largest electricity using facilities account for 96% of the City total. These facilities are listed in Table 1. Many smaller electricity accounts are administrative buildings and parking facilities.

Table 1 – Top 15 largest municipal electricity accounts in FY08.

Facility	Address	07-08 Electricity Use (kWh)
CR Water Pollution Center	7525 Bertram Rd Se	50,692,800
CR Water Works	Ellis/Seminole/Shaver	24,296,400
Cedar Rapids Street Lights	n/a	14,126,134
Cedar Rapids Ice Arena	1100 Rockford Rd Sw	6,271,600
Eastern Iowa Airport	3425 Wright Bros Blvd SW	4,391,742
Cedar Rapids Police Dept	505 1st St Sw	2,172,600
Cedar Rapids Public Works Dept	1201 6th St Sw	1,976,400
Us Cellular Center	370 1st Ave Ne	1,660,280
CR Ball Club Inc	1100 Rockford Rd Sw	1,360,000
Cedar Rapids Traffic Signals	n/a	1,210,672
Cedar Rapids City Hall	51 1st Ave SW Bridge	892,080
CR Five Season Parkade	400 1st Ave NE	849,300
Cedar Rapids Water Dept	2355 Linden Dr Se	514,200
Morgan Creek Lift Station	Ellis Rd. NW	429,120
Bender Pool	940 14th Ave Se	394,240
TOTAL (top 15)		115,445,614

Natural Gas

The City purchases natural gas from MidAmerican Energy. Natural gas consumption in all municipal facilities was 1.8 million therms in FY08 (the year before the floods) at a cost of \$1,177,380. The single largest user of natural gas in municipal operations is the Water Pollution Control facility located at 7525 Bertram Rd which represented 57% of total annual natural gas use (see Figure 4).

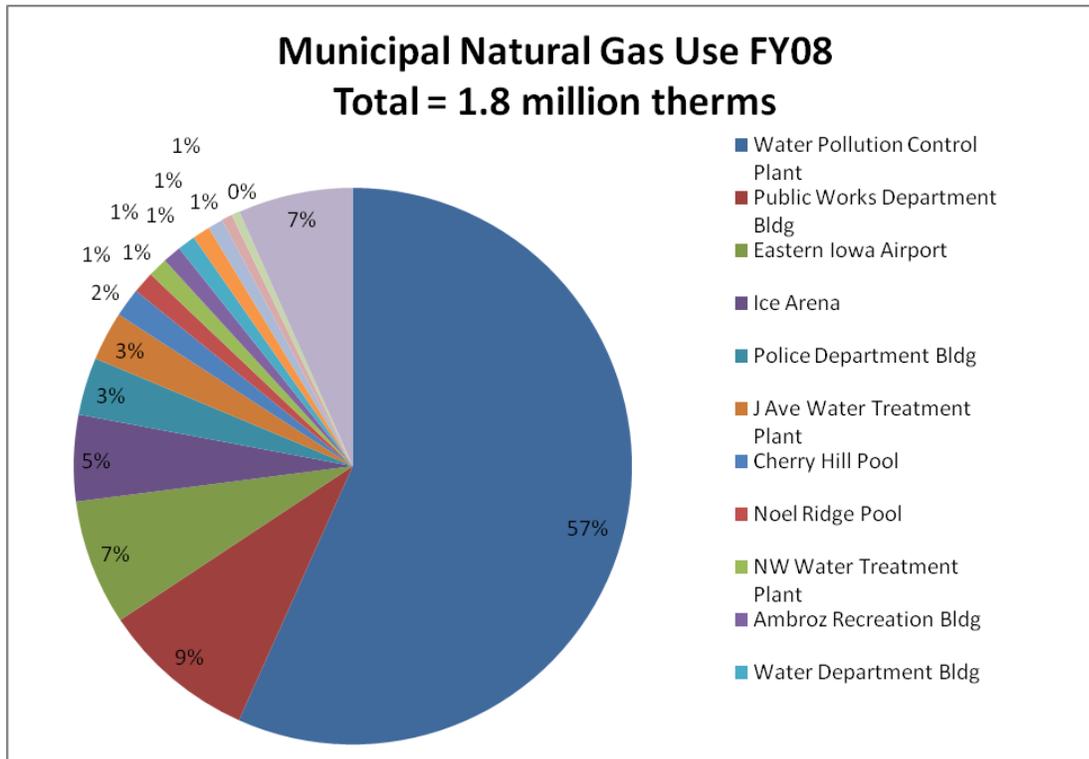


Figure 4 – Municipal natural gas use in FY08

In the year after the flood, from July 2008 to June 2009, natural gas use in municipal facilities dropped 31% to 1.2 million therms. Costs also dropped to \$461,380. The Water Pollution Control facility located at 7525 Bertram Rd still dominated natural gas use at 41% of total (see Figure 4).

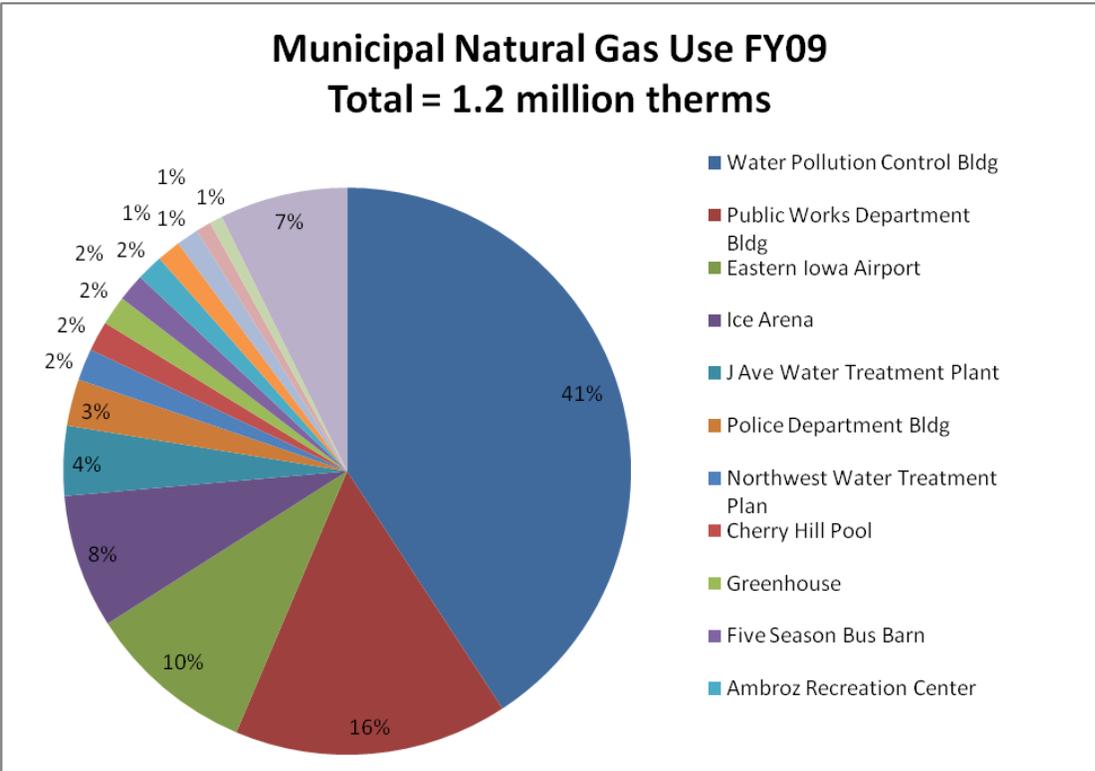


Figure 5 – Municipal natural gas use in FY09

The fifteen largest gas users together represented 93.3% of total municipal natural gas use in FY08. These facilities are shown in Table 2.

Table 2 – Top 15 largest municipal natural gas accounts

Facility	Address	07-08 Natural Gas Use (therms)
Water Pollution Control Plant	7525 BERTRAM RD SE	1,015,662
Public Works Department Bldg	1201 6TH ST SW	160,970
Eastern Iowa Airport	2121 ARTHUR-COLLINS PKWY SW	130,261
Ice Arena	1100 ROCKFORD RD SW	89,656
Police Department Bldg	505 1ST ST SW	59,858
J Ave Water Treatment Plant	761 J AVE NE	50,916
Cherry Hill Pool	341 STONEY-POINT RD NW	29,954
Noel Ridge Pool	1248 42ND ST NE	22,629
NW Water Treatment Plant	7807 ELLIS RD NW	20,246
Ambroz Recreation Bldg	2000 MOUNT-VERNON RD SE	19,226
Water Department Bldg	1111 SHAVER RD NE	18,645
Greenhouse	4900 COUNCIL ST NE	18,197
Central Fire Station	222 3RD ST NW	15,872
Five Season Bus Barn	427 8TH ST NW	11,164
Site I Landfill	2250 A ST SW	8,538
Total Top 15		1,671,794

Steam

Before the June 2008 flood, the City purchased steam from Alliant Energy at only a few sites. Total steam use at these sites amounts to only 6 MMBTU per year, at a cost of approximately \$210,000. This represents less than one thousandth of the City's total energy use. Alliant is not going to rebuild the downtown steam generating plant that was damaged in the flood; the City will not be purchasing steam in existing facilities in the future.

Vehicle Fuel

The City operates a fleet of gasoline and diesel vehicles, which are all owned and operated by the City. Vehicles are refueled at four refueling stations that are all served by Fauser Energy Resources. Fuel use data was provided by the City Fleet Services Manager. Flood damage caused the loss of most recent fuel use data. FY07 was the most recent year for which data was still complete and intact; therefore this year was assumed to be typical (and included in the single year total Municipal energy consumption discussion).

The City fleet consumed 286,866 gallons of motor gasoline in FY07. The two largest gasoline users were the Police Department (42% of total) and the Water Department (15% of total) (see Figure 6).

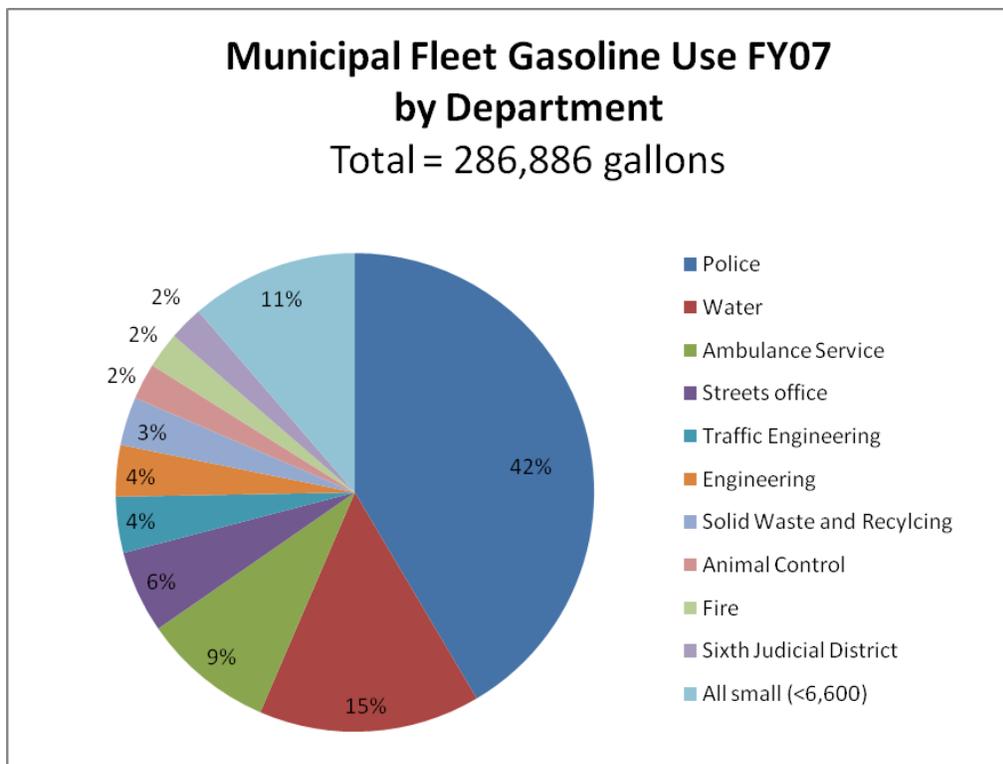


Figure 6 – Municipal gasoline use in FY07 by department

City operations consumed a total of 549,308 gallons of diesel fuel in FY07. Diesel fuel is also purchased from Fauser refueling stations. The two largest diesel users were Public Transit (44% of total) and Solid Waste and Recycling (22% of total) (see Figure 7).

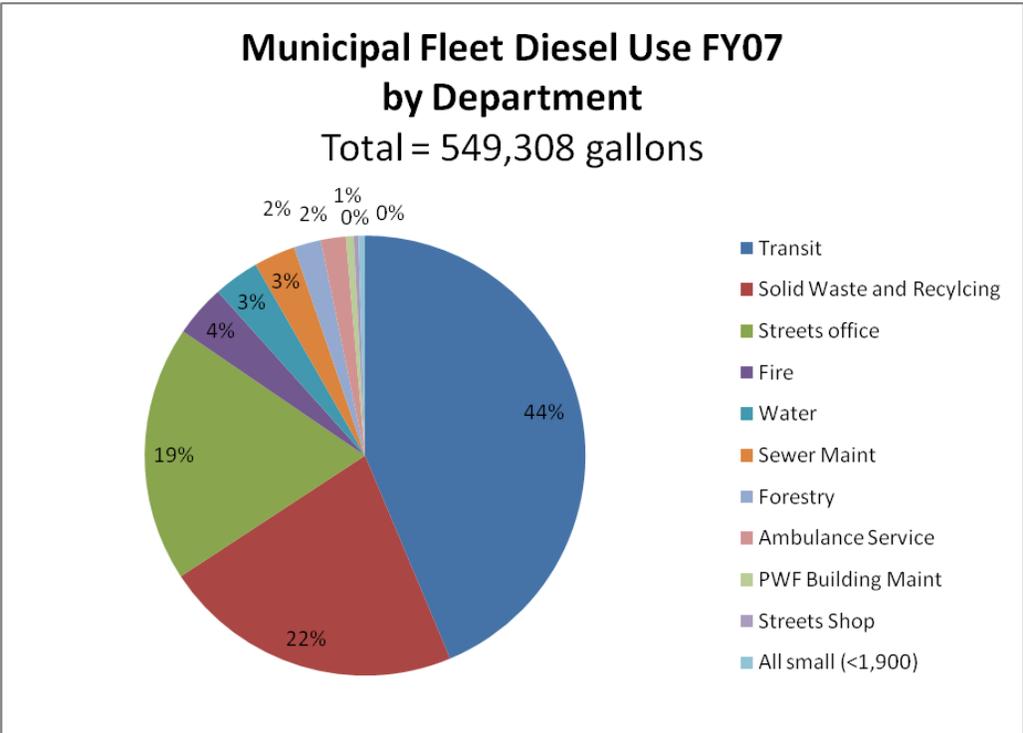


Figure 7 – Municipal diesel use in FY07 by department

The total cost of fuel in FY07 was \$1.8 million. The departments with the highest fuel costs were Transit (28%), Solid Waste and Recycling (16%), Streets (15%), and Police (14%).

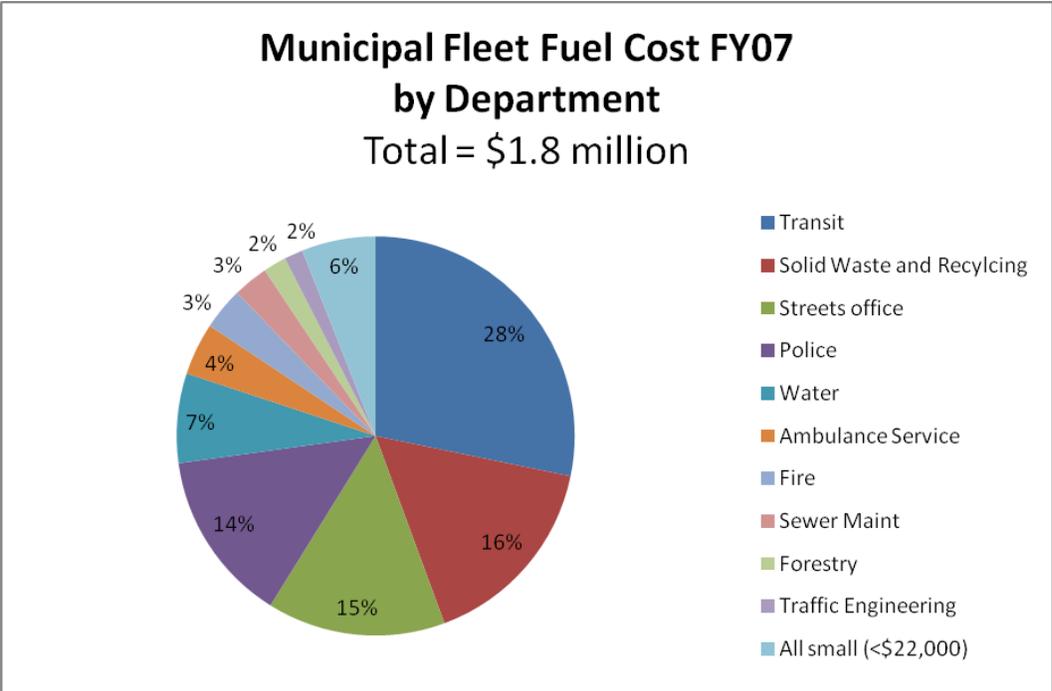


Figure 8 – Municipal transportation fuel costs in FY07 by department

The annual mileage for the entire fleet for FY07 is not presently known since the relevant data was lost in the 2008 flood. The fuel economy of every individual vehicle is not currently tracked. Fleet average economy could be estimated based on data from automated fueling stations that collect

data individual by vehicle fuel use and mileage. Currently only one fueling station has automated data collection, but the city is in the process of upgrading the three other refueling stations to have automated data collection that will enable comprehensive mileage reporting. The average fuel efficiency of Cedar Rapids vehicles that refueled at the automated fueling station is not presently known.

If the actual fuel economy of the existing fleet was known, the potential for fuel savings could be more accurately estimated. Vehicle fuel reduction programs may be coordinated with the U.S. Department of Energy's Clean Cities program, and may involve activities such as the following:

- Replace petroleum with nonpetroleum-based alternative fuels and blends
- Reduce petroleum consumption by promoting smarter driving practices and vehicle technologies
- Eliminate petroleum use by encouraging the use of mass transit, trip elimination measures, and other congestion mitigation approaches.

Greenhouse Gas Emissions

A baseline estimate for greenhouse gas (GHG) emissions was prepared based on the energy data collected for municipal operations. The estimates provided are based exclusively on the energy data collected, and do not include additional sources of emissions present in Cedar Rapids including wastewater treatment, solid waste, personal vehicle use, and others. Emissions estimates were produced using The Climate Registry's General Reporting Protocol version 1.1. Only carbon dioxide emissions were estimated; these estimates do not include other greenhouse gases. Other GHGs such as methane and nitrous oxide, while more potent than CO₂, make up less than 15% of the emissions produced in the United States on a carbon dioxide equivalent scale.¹ Carbon dioxide is therefore expected to be the biggest contributor to global warming in Cedar Rapids, and many of the opportunities to reduce CO₂ will also reduce other GHGs.

Total municipal GHG emissions were estimated to be 112,992 metric tons of CO₂ (MTCO₂) in FY08. The majority (85%) of those emissions were generated by electricity use.

¹ U.S. EPA, 2009. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007.
<http://epa.gov/climatechange/emissions/downloads09/GHG2007-ES-508.pdf>

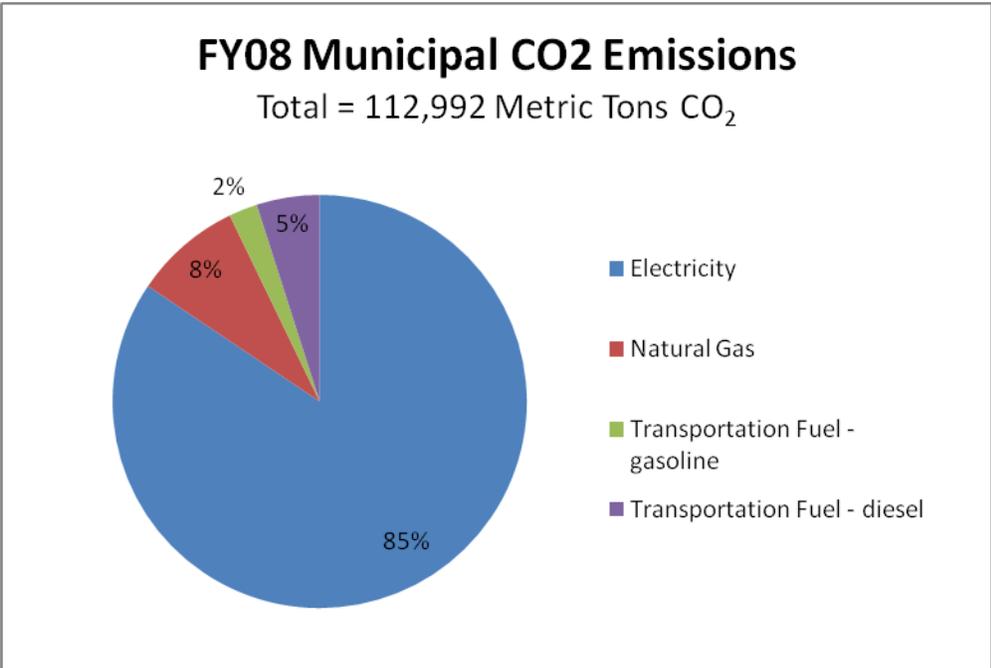


Figure 9 – Municipal GHG Emissions in FY08

Municipal emissions are estimated to be approximately 2.8% of the citywide total. Citywide emissions were estimated to be 3.9 million MTCO₂ in FY08 (See TM 6.5).

Implications of Baseline Energy Use

The baseline energy profiles for the City's municipal operations provide important insights for establishing energy management goals and reduction strategies.

This baseline data can be used to guide future energy management in the following way:

- Site comparison data can be used to focus and prioritize reduction efforts (for example focus on the largest contributing sites).
- If combined with other data such as total occupied space (square feet), number of employees, population served, and total occupied space (square feet), this data can be used to track progress using metrics such as BTU use per square foot, BTU per employee, etc.

The baseline data shows that municipal energy use contributes only a tiny fraction to community wide energy use (See TM 6.5). In total, municipal operations account for only 1.8% of total energy use in Cedar Rapids. Should the City choose to set municipal only reduction targets and to develop policies that only affect municipal operations, it will only marginally reduce the environmental footprint of the Cedar Rapids community. On the other hand, should the City choose to address community-wide energy use, by the development of a range of targets or policies (voluntary or mandatory), that impact the residential and commercial / industrial sectors, as well as the municipal sector, then it may have a significant impact on energy use in the entire area.

Further, municipal energy use decreased by approximately 30% in the year following the flooding. This substantial drop in use presents a unique challenge for energy management and goal-setting. If goals are set with respect to energy use before the flood, they may not be stringent enough because new buildings, by meeting current energy code are automatically going to be more efficient than some of the older buildings and building energy systems lost in the floods. If energy goals are set with respect to energy use after the flood, they may be too stringent because the City has been operating at lower energy use levels than if it were occupying and operating the facilities needed for normal, full-scale operations. In order to address this challenge, it will be important to compare future trends to both the pre-flood and post-flood baselines.

The baseline data shows that a significant percentage of municipal energy use occurs at process-intensive facilities, such as the wastewater treatment facilities. While citywide energy management efforts may not focus on a single facility such as the wastewater plant, there may still be opportunities for citywide policies and programs to improve end-use water efficiency, thereby reducing energy use in the wastewater plant indirectly.