



ENERGY ASSESSMENT CONFIDENTIAL

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Executive Summary

City of Mahtomedi requested that Xcel Energy perform an energy assessment to identify energy-saving opportunities that show potential for improvement and investment options for the facility located at 600 Stillwater Rd in Mahtomedi, MN. This is the first step toward developing a long-term energy plan for City of Mahtomedi. Michaels Engineering visited City of Mahtomedi business site on November 17, 2009, and met with Bob Goebel. This energy assessment recommends strategic opportunities such as eligibility for direct load control (Saver's Switch) and areas for energy-related process improvement and describes key energy conservation opportunities.

The City Hall lighting consists of T8 fixtures and recessed fixtures with both fluorescent and incandescent bulbs. The Fire Department lighting consists of T8 fixtures and a small amount of incandescent fixtures. Lighting controls consist of manual switching.

The City Hall is heated and cooled by split-style furnace and condensing unit systems, controlled with programmable thermostats. The Fire Department is heated by a gas-fired boiler and gas-fired radiant heaters. Sections of the Fire Department are cooled with rooftop condensing units. Manual thermostats control the heating and cooling systems at the Fire Department. Domestic hot water is supplied by gas water heaters in both facilities.

The building construction is masonry. The insulation and roofing could not be observed at the time of the audit. Regardless, the addition of insulation is not considered cost effective for this situation. The cost of adding insulation would be prohibitively expensive because it would require re-roofing of the building. Weather-stripping appeared to be intact on the facility doors and windows.

Key strategic opportunities include direct load control (Saver's Switches) and using Energy Star rated equipment whenever replacement is necessary.

The project cost and energy savings results presented in this report are based on rough quantities, load estimates, and hours of operation, etc. The energy calculations are performed based on similar applications in different facilities, rules of thumb, and engineering experience. The calculations and cost estimates are intended to be ballpark estimates for planning purposes only and should not be considered investment-grade.

1. Energy Conservation Opportunities

Table 1: Recommended Measures

	Energy Conservation Opportunities	Estimated Annual Cost Savings (\$)	Estimated Capital Cost (\$)	Simple Payback (Years)	Estimated Xcel Energy Incentives (\$)*
1	Program City Hall Thermostats to Setback	\$ 160	\$ -	0.00	\$ -
2	Install Programmable Thermostats in Fire Station	\$ 358	\$ 400	1.12	\$ -
3	Replace Incandescent Bulbs	\$ 106	\$ 130	1.22	\$ -
4	Repair/Maintain Weather Stripping	\$ 356	\$ 500	1.40	\$ -
5	Install Occupancy Sensors	\$ 188	\$ 480	2.17	\$ 72
6	Install Garage Door Timers	\$ 236	\$ 600	2.55	\$ -
7	Install Condensing Boiler**	\$ 436	\$ 1,500	3.44	*
8	Install High Efficiency Water Heater**	\$ 100	\$ 500	5.00	*
9	Install Saver's Switches	n/a	\$ -	0.00	\$ 130
10	Use Energy Star Equipment	Varies	Varies	Varies	\$ -

*Items marked with an asterisk are custom efficiency projects and may require pre-approval to qualify for an Xcel Energy rebate. Please check with your Xcel Energy representative before purchasing/implementing the measure.

**Items marked with two asterisks include incremental costs, the difference between high efficiency and standard efficiency equipment.

2. Facility and Operations Description

City Hall is approximately 2,500-ft², which includes approximately 50% office space with the remaining space being a large meeting room and mechanical areas. The Fire Department is approximately 8,400 ft². The main level of the Fire Department comprises of a large apparatus bay, a control center and day-room and mechanical space. The second level contains an office, a small kitchen, and a meeting room. The City Hall schedule is from 8:00 AM to 4:30 PM on weekdays with evening meetings and limited weekend occupancy. The Fire Department is in use 24/7. City of Mahtomedi owns the buildings and has plans to combine the two buildings into one within the next few years.

City Hall is heated and cooled by four split-style furnaces and condensing units, controlled by programmable thermostats. The apparatus bay in the Fire Department is heated by two gas-fired radiant heaters and a gas-fired boiler heats the remaining areas with condensing units for cooling, all controlled with manual thermostats. The domestic hot water for both facilities is provided by gas-fired water heaters.

The City Hall is lit with 4-foot 3-lamp 32-Watt T8 fixtures in the office area and meeting room, along with a small amount of recessed incandescent lighting in the meeting room. The hallway is lit with recessed fluorescent fixtures. The Fire Department is lit with 4-foot 2-lamp T8 fixtures throughout the apparatus bay, office, day room and rest rooms. The meeting room is lit with 4-foot 1-lamp T8 fixtures. Manual switching is used to control lights.

The Fire Department has a 5-horsepower air compressor, a Breathing Air System and an oxygen fill station as well as battery charges and additional fire/safety equipment. The Fire Department also has laundry machines including an industrial size washer and an electric dryer.

The utility rates used in the analysis are based upon 2009 data and represent the approximate incremental expenses.

3. Energy Profile

The following figures and tables identify your electric and natural gas use.

Figure 1: Total Annual Energy Expense

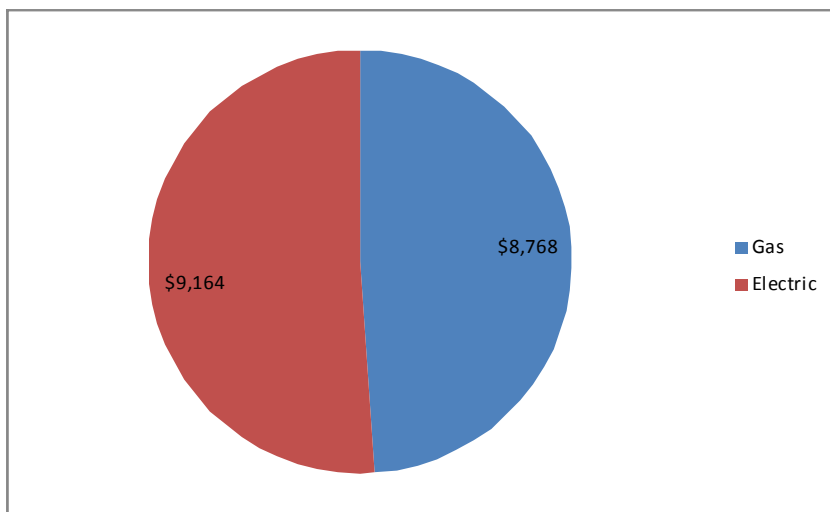


Table 2: City Hall Annual Electric Consumption – Previous 12 months

Month	Days	Total Energy	Total Cost	Cost/ kWh
		kWh	\$	\$
Jan	32	2,939	\$ 295	\$ 0.10
Feb	31	2,724	\$ 281	\$ 0.10
Mar	29	2,337	\$ 249	\$ 0.11
Apr	30	2,316	\$ 242	\$ 0.10
May	29	2,152	\$ 217	\$ 0.10
Jun	32	2,347	\$ 152	\$ 0.06
Jul	30	2,584	\$ 198	\$ 0.08
Aug	29	2,502	\$ 193	\$ 0.08
Sep	32	2,705	\$ 212	\$ 0.08
Oct	29	2,249	\$ 229	\$ 0.10
Nov	29	2,327	\$ 229	\$ 0.10
Dec	33	2,866	\$ 289	\$ 0.10
Total	365	30,048	\$ 2,786	
Avg	30	2,504	\$ 232	\$ 0.09

Definition of terms can be found in the glossary.

Figure 2: City Hall Electric Energy End Use Profile

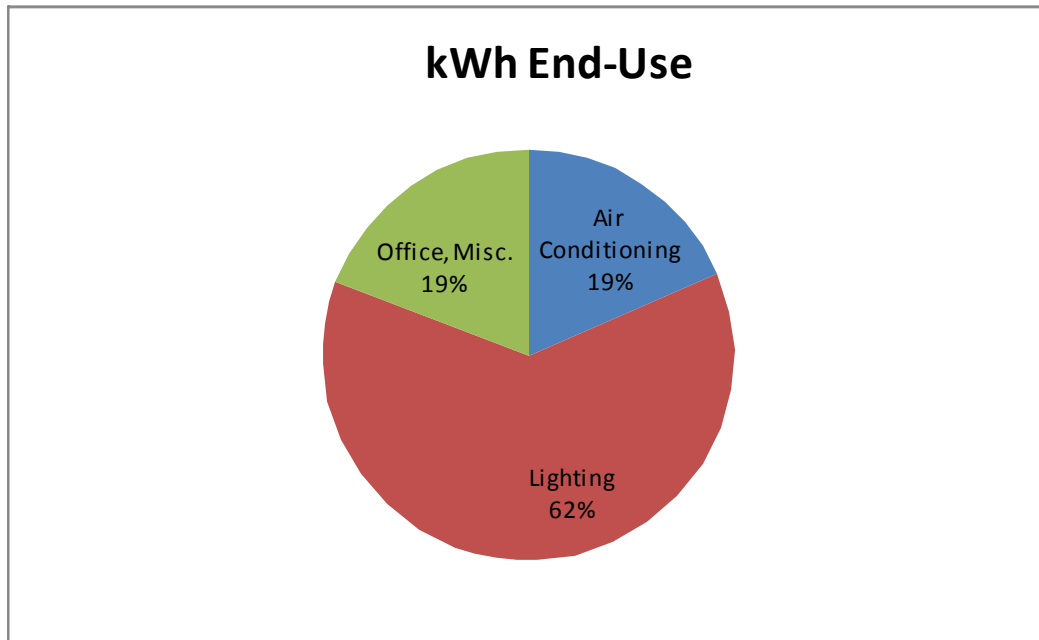


Table 3: Fire Department Annual Electric Consumption – Previous 12 months

Month	Days	Actual Demand	Power Factor	Billed Demand	Total Energy	Total Cost	Cost/ kWh	Load Factor
		kW		kW	kWh	\$	\$	
Jan	35	18.00	0.916	18.00	6,120	\$ 518	\$ 0.08	0.40
Feb	28	17.00	0.919	17.00	5,120	\$ 466	\$ 0.09	0.45
Mar	30	16.00	0.927	16.00	4,840	\$ 454	\$ 0.09	0.42
Apr	30	16.00	0.927	16.00	5,120	\$ 460	\$ 0.09	0.44
May	31	17.00	0.917	17.00	4,880	\$ 437	\$ 0.09	0.39
Jun	30	17.00	0.891	17.00	5,960	\$ 531	\$ 0.09	0.49
Jul	30	19.00	0.881	19.00	6,760	\$ 648	\$ 0.10	0.49
Aug	31	19.00	0.871	20.00	7,080	\$ 692	\$ 0.10	0.50
Sep	30	19.00	0.862	20.00	6,520	\$ 651	\$ 0.10	0.48
Oct	30	19.00	0.916	19.00	6,200	\$ 541	\$ 0.09	0.45
Nov	29	20.00	0.897	20.00	5,440	\$ 485	\$ 0.09	0.39
Dec	32	18.00	0.906	18.00	5,640	\$ 497	\$ 0.09	0.41
Total	366				69,680	\$ 6,378		
Avg	31	17.92	0.903	18.08	5,807	\$ 532	\$ 0.09	0.44

Definition of terms can be found in the glossary.

Figure 3: Fire Department Electric Energy End Use Profile

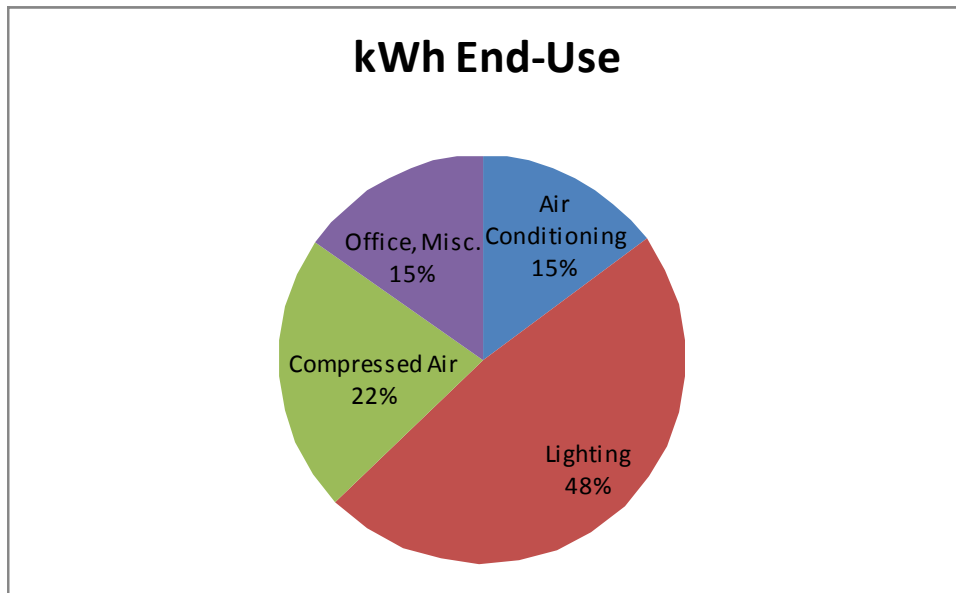


Table 4: City Hall Annual Gas Consumption – Previous 12 months

Month	Days	Total Energy	Total Cost	Cost/CCF	Degree Days (DD)	CCF/DD
		Therms	\$	\$		
Jan	32	491	\$ 525	\$ 1.07	1,812	0.27
Feb	31	448	\$ 450	\$ 1.00	1,545	0.29
Mar	29	357	\$ 313	\$ 0.88	1,223	0.29
Apr	30	227	\$ 185	\$ 0.82	714	0.32
May	29	88	\$ 77	\$ 0.88	279	0.32
Jun	32	56	\$ 53	\$ 0.95	110	0.51
Jul	30	7	\$ 25	\$ 3.64	6	1.17
Aug	29	8	\$ 26	\$ 3.28	5	1.60
Sep	32	9	\$ 26	\$ 2.94	17	0.53
Oct	29	26	\$ 43	\$ 1.67	138	0.19
Nov	29	138	\$ 137	\$ 0.99	527	0.26
Dec	33	362	\$ 375	\$ 1.04	1,328	0.27
Total	365	2,217	\$ 2,238		7,704	
Avg	30	185	\$ 186	\$ 1.60		0.50

Definition of terms can be found in the glossary.

Figure 4: City Hall Gas Energy End Use Profile

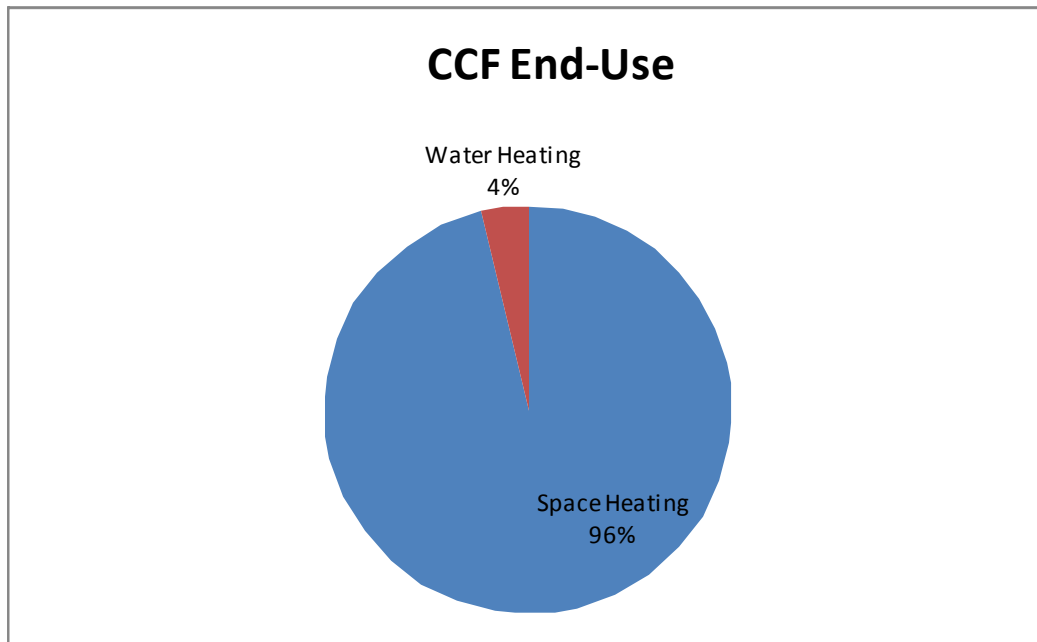
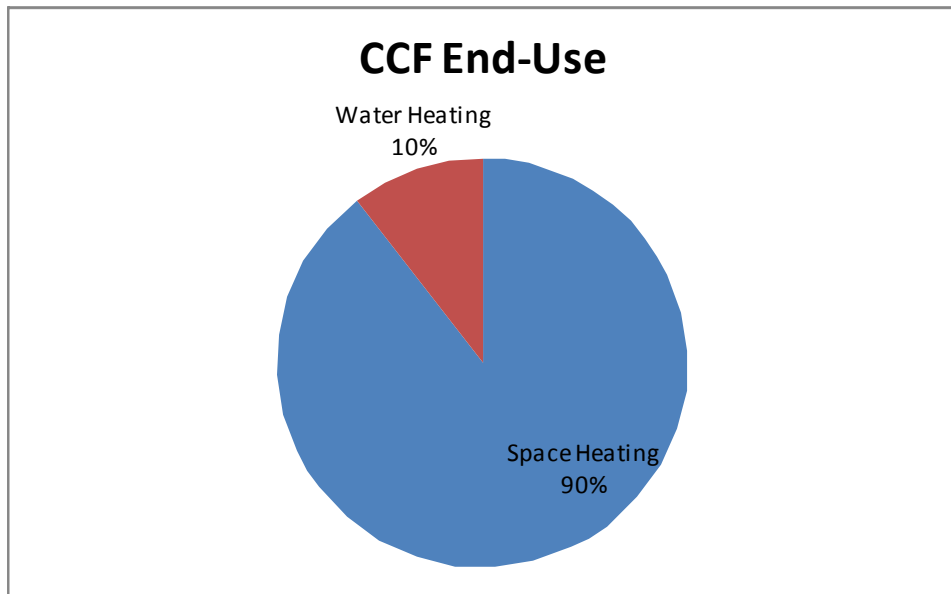


Table 5: Fire Department Annual Gas Consumption – Previous 12 months

Month	Days	Total Energy	Total Cost	Cost/CCF	Degree Days (DD)	CCF/DD
		Therms	\$	\$		
Jan	32	1,566	\$ 1,649	\$ 1.05	1,812	0.86
Feb	31	1,288	\$ 1,259	\$ 0.98	1,545	0.83
Mar	29	961	\$ 826	\$ 0.86	1,223	0.79
Apr	30	523	\$ 419	\$ 0.80	714	0.73
May	29	157	\$ 142	\$ 0.90	279	0.56
Jun	32	104	\$ 99	\$ 0.95	110	0.95
Jul	30	58	\$ 74	\$ 1.27	6	9.67
Aug	29	61	\$ 78	\$ 1.27	5	12.20
Sep	32	69	\$ 81	\$ 1.17	17	4.06
Oct	29	104	\$ 127	\$ 1.22	138	0.75
Nov	29	524	\$ 484	\$ 0.92	527	0.99
Dec	33	1,277	\$ 1,293	\$ 1.01	1,328	0.96
Total	365	6,692	\$ 6,530		7,704	
Avg	30	558	\$ 544	\$ 1.03		2.78

Definition of terms can be found in the glossary.

Figure 5: Fire Department Gas Energy End Use Profile



4. Energy Conservation Opportunities

The project cost and energy savings results presented in this report are based on rough quantities, load estimates, and hours of operation, etc. The energy calculations are performed based on similar applications in different facilities, rules of thumb, and engineering experience. The calculations and cost estimates are intended to be ballpark estimates for planning purposes only and should not be considered investment-grade.

4.1. Summary of Recommendations

For detailed description, please refer to the Conservation Opportunity Analysis section following this table.

Table 6: Energy Conservation Opportunities

Energy Conservation Opportunity	Estimated Demand Savings (kW)	Estimated Energy Savings (kWh)	Estimated Thermal Savings (Therms)	Estimated Annual Cost Savings (\$)	Estimated Capital Cost (\$)	Simple Payback (Years)	Estimated Xcel Energy Incentives (\$)*	
Payback less than 2 years (low/no cost opportunities)								
1	Program City Hall Thermostats to Setback	-	458	131	\$ 160	\$ -	-	
1a	Install Programmable Thermostats in Fire Station	-	424	338	\$ 358	\$ 400	1.12	
2	Replace Incandescent Bulbs	0.5	814	-	\$ 106	\$ 130	1.22	
3	Repair/Maintain Weather Stripping	-	538	286	\$ 356	\$ 500	1.40	
Payback 2 – 10+ years								
1	Install Occupancy Sensors	-	2,519	-	\$ 188	\$ 480	2.17	\$ 72
2	Install Garage Door Timers	-	-	244	\$ 236	\$ 600	2.55	
3	Install Condensing Boiler**	-	-	452	\$ 436	\$ 1,500	3.44	*
4	Install High Efficiency Water Heater**	-	-	104	\$ 100	\$ 500	5.00	*
Discount Rate Opportunities								
1	Install Saver's Switches	n/a	n/a	n/a	n/a	\$ -	-	\$ 130
2	Use Energy Star Equipment	Varies	Varies	Varies	Varies	Varies	Varies	

*Items marked with an asterisk are custom efficiency projects and may require pre-approval to qualify for an Xcel Energy rebate. Please check with your Xcel Energy representative before purchasing/implementing the measure.

**Items marked with two asterisks include incremental costs, the difference between high efficiency and standard efficiency equipment.

4.2. Conservation Opportunity Analysis

Task 1 – Install Programmable Thermostats With Setback / Setup Features

The Fire Department heating and cooling systems are currently controlled by manual thermostats.

Install wall-mounted programmable thermostats in the Fire Department and set the temperature back 10°F during low occupancy periods such as over night. Additionally, ensure the thermostats at City Hall are

programmed to setback 10°F during unoccupied periods. Programmable thermostats allow the spaces to be set back to lower conditioning requirements when not in use, saving energy.

Task 2 – Replace Incandescent Bulbs

Some of the lighting in the meeting room at City Hall and in the Women’s restroom at the Fire Department consists of incandescent fixtures.

Replace the incandescent bulbs with screw-in compact fluorescent lamps (CFLs). CFLs consume approximately one-quarter the energy incandescent bulbs consume. Be sure to install dimmable CFLs in fixtures with dimming capabilities. Note that there is no rebate available for screw-in compact fluorescent fixtures.

Task 3 – Maintain/Repair Weather-stripping

Weather –stripping deteriorates over time, especially around heavily used doors, which can leaves gaps of 1/8-inch or larger between doors and windows and their frames.

Regularly inspect windows and doors and repair worn weather-stripping in these openings to reduce heating and cooling costs. This task will save energy, but is not eligible for an Xcel Energy rebate, since it is replacing existing deteriorated equipment.

Task 4 – Install Occupancy Sensors

Restroom, break room, the kitchen and day room lighting is currently controlled by manual switching. Lights are sometimes left on at times when these spaces are unoccupied.

Install wall-mounted infrared occupancy sensors in single restrooms and offices. Ceiling-mounted dual technology occupancy sensors may be required in the larger restrooms and the day room. This would reduce lighting energy usage. Xcel Energy offers incentives of \$12 per wall-mounted sensor and \$36 per ceiling mounted sensor, contact your account representative for more details.

Task 5 – Install Garage Door Timers

The Fire Department garage doors are currently manually controlled and often stay open when the crew responds to a call.

Install garage door timers to close the doors to reduce the heating costs for the apparatus bay. The estimated savings is rough due to limited information.

Task 6 – Install High Efficient Boiler

The Fire Department is currently heated with an 80 percent efficient boiler.

Replace the boiler with a condensing boiler when it is time to replace the existing boiler. Condensing boilers recover energy normally discharged through the flue. A condensing boiler uses a heat exchanger to pre-heat the incoming water by condensing the water vapor produced by the burning of the natural gas. Typical condensing boilers have an efficiency of 90% or greater, compared to about 80% for conventional

designed boilers. Xcel Energy does offer incentives for installing high efficient boilers, contact your account representative for more details.

Task 7 – Install High Efficiency Water Heaters

The water heaters that supply hot water for these buildings have a rated efficiency of 80%.

Install high-efficiency water heater with a rated efficiency of 94% or higher when the time comes to replace the water heater in the Fire Department, for example the A.O. Smith Cyclone is 97 percent efficient. Xcel Energy may offer incentives for this measure, check with your account representative for more details.

4.3. Strategic Opportunity Analysis

Task 8 – Install Saver’s Switches on Air Conditioning

Saver’s Switches cycle air conditioning for short periods during peak usage periods determined by Xcel Energy. The use of Saver’s Switches results in a credit of \$5 per ton of air conditioning installed and controlled (per month for the four summer months). Install Saver’s Switches on the Fire Department air conditioners as the City Hall is already taking advantage of this incentive.

Task 9 – Use Energy Star Equipment

Whenever equipment replacement is necessary, consider installing Energy Star rated equipment. Possible items include refrigerators, water heaters, printers, copiers, and computers.

5. For More Information

In addition to the energy conservation measures we recommend in this energy assessment, Xcel Energy offers cash rebates and a variety of payment and billing programs to better manage your cash flow. *BillWise* from Xcel EnergySM programs include payment options like:

- Auto Pay – a simple and convenient way to have monthly energy payment automatically withdrawn from a bank account on the day it is due.
- EFT (Electronic Funds Transfer) – allows simplification of the bill paying process and improving cash management by directly transferring money from your account to Xcel Energy.
- Pay By Phone – allows quick and secure transfer of energy payment from a bank account directly to Xcel Energy, right over the phone, at no cost.
- Credit/Debit Cards Payments – allows payment of energy bill online or by phone using a credit or debit card for a small fee.

The Billing options include – EDI (Electronic Data Interchange), which allows receipt of your energy bill electronically the day after the billing cycle is complete. More information on all these programs can be obtained by discussing eligibility requirements with your Xcel Energy representative. You also can call the Business Solution Center at 1-800-481-4700 or visit us at xcelenergy.com for more information about qualifying for cash rebates, discount rates or billing/payment options.

6. Equipment Inventory

Table 7: Natural Gas Equipment Inventory

Equipment	Location	Quantity	BTUH Input	Efficiency	Estimated Therms/yr
Carrier Furnace	City Hall	1	60,000	93%	356
Carrier Furnace	City Hall	1	80,000	93%	474
Carrier Furnace	City Hall	1	100,000	93%	593
Carrier Furnace	City Hall	1	120,000	93%	711
AO Smith Water Heater	City Hall	1	50,000	80%	84
Slant Fin Boiler	Fire Dept	1	275,000	80%	3,471
Radiant Heaters	Fire Dept	2	100,000	80%	2,525
Bradford White Water Heater	Fire Dept	1	76,000	80%	696
TOTAL					8,909

Table 8: Electric Equipment Inventory

Equipment	Location	Quantity	HP	Tons	Estimated Kwh/yr
Carrier Condensing Unit	City Hall	1	n/a	3	2,160
Carrier Condensing Unit	City Hall	1	n/a	4	2,880
Carrier Condensing Units	City Hall	2	n/a	5	7,200
Lennox Condensing Unit	Fire Dept	1	n/a	5	8,000
Lennox Condensing Unit	Fire Dept	1	n/a	1.5	2,400
Air Compressor	Fire Dept	1	5	n/a	5,115
Oxygen Fill Station	Fire Dept	1	4	n/a	4,092
Breathing Air System	Fire Dept	1	6	n/a	6,139
TOTAL					37,986

Table 9: Lighting Inventory

Fixture Type	Location	Quantity	Watts	Estimated kWh/yr
4' 3L T8	City Hall- Offices	23	85	4,888
Recessed- Fluorescent	City Hall- Hallway	15	26	975
Recessed- Incandescent	City Hall- Mtg Rm	10	100	500
4' 3L T8	City Hall- Mtg Rm	16	85	1,360
4' 2L T8	Fire Dept- Bay & Day Rm	60	58	24,360
4' 2L T8	Fire Dept- Rst Rms	12	58	1,392
4' 1L T8	Fire Dept- Mtg Rm	20	34	1,360
Metal Halide	Fire Dept- Exterior	6	295	6,195
TOTAL				41,030

7. Glossary

The following definitions will help you understand the information and how it relates to your energy bills.

Actual Demand is the highest average 15 minutes of demand over a billing period.

Billed Demand is the actual demand plus the adjusted demand for power factor correction.

CCF is 100 cubic feet of natural gas. For the purposes of measuring energy use, a therm and a CCF of natural gas are equivalent.

Load Factor is a measure of efficiency. Load factor is the ratio of average load in kilowatt supplied during a designated period to the peak load occurring that period.

$$\text{Load Factor} = \frac{\text{kWh supplied in a period}}{\text{Peak kW in a period} \times \text{Hours in a Period}}$$

Power Factor measures how effectively your equipment uses electric current from the utility. Power factor is a measure of how effectively the current delivered to the equipment is converted into useful energy, and is shown as a percentage. If your power factor is below 90 percent Xcel Energy, like many utilities, charges extra for low power factor, because it costs the utility more to build and operate the additional equipment that carries the extra current to operate your equipment.

Therm: A therm is a unit of energy equivalent to 100,000 BTU.