

# MCES ENERGY PERFORMANCE FOR 2010

*MAY 2011*



**Focusing on energy  
conservation, costs and  
alternative energy sources.**

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### MCES Energy Team

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*In addition to the energy team, special thanks to Ricky Arora, Gordy Backlund, Paul Dietz, Laura Fletcher, Linda Henning, Mike Reith, Adam Sealock and Chris Voigt for their contributions to the MCES Energy Performance for 2010 report.*

## 1. Introduction

The primary goal of Metropolitan Council Environmental Services (MCES) is to collect, treat and discharge wastewater to acceptable permit standards while providing these services at fair and reasonable user rates. In 2010, energy costs accounted for about 13% of MCES's operations and maintenance costs (Appendix A: MCES Utility Costs). As the metropolitan area population continues to grow and tighter permit standards are established, wastewater treatment operations will continue to expand to meet these new demands thus potentially increasing MCES's energy consumption and associated costs. In an effort to minimize the economic and environmental impact of MCES's current and future energy demand, Bill Moore, MCES General Manager, formed the MCES Energy Team in 2006.

The Energy Team, made up of individuals from across MCES, works with MCES business units to identify and implement energy conservation and renewable energy opportunities. At the end of 2010 and over the last four years MCES has successfully reduced its total energy use by 13%, which equates to a savings of about \$2.5 million per year.

The Energy Team also collaborates with external groups to: research and identify energy saving opportunities, participate in state energy policy discussions and utility rate case investigations, evaluate utility tariffs to ensure MCES accounts are getting the best rates, track carbon emissions and develop tools to track MCES energy consumption and purchases.

This report summarizes MCES's energy goal and benchmarks and energy accomplishments for 2010.

## 2. Energy Goal and Benchmarks

### A. 2010 MCES Energy Goal

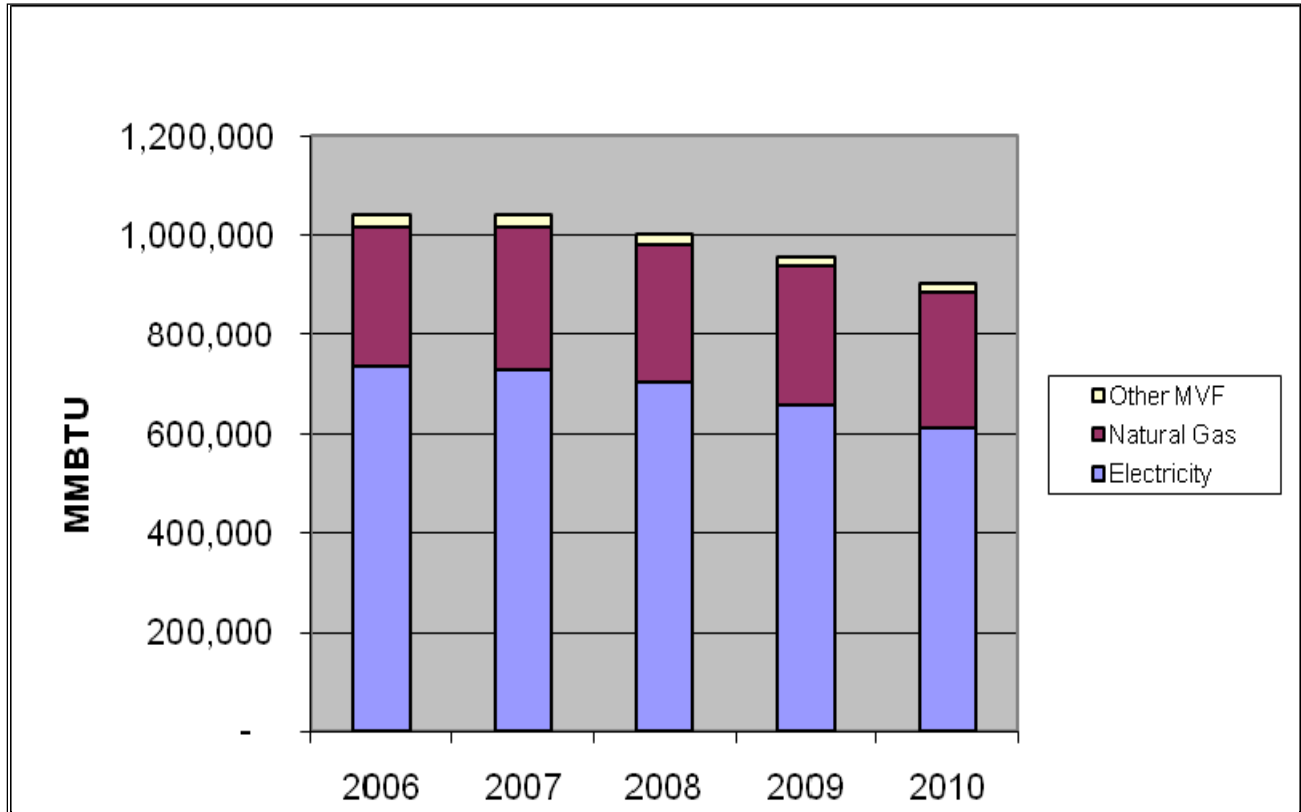
In 2006 Bill Moore, MCES General Manager, set an aggressive goal to reduce, or offset by renewable energy purchased, the net non-renewable purchased energy needed for MCES's continuing operations and facilities by 15% of 2006 consumption by 2010<sup>1</sup>. By year end 2010, MCES has implemented energy conservation measures that substantially achieve this goal. However, some of the initiatives were completed during 2010, so a full year of conservation from those activities will not be realized until 2011. The 2010 energy goal considered all fuels at all MCES facilities. Figure 1 shows a significant reduction in MCES consumption of electricity, natural gas, and motor vehicle fuels between 2006 and 2010.

MCES focused its conservation efforts on reducing electric use because electricity accounts for the largest share of energy use and is the most expensive. Since 2006, MCES electric use has declined 17%.

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<sup>1</sup> Results are normalized for permit changes and weather variability.

**Figure 1: MCES Energy Use All Fuels**



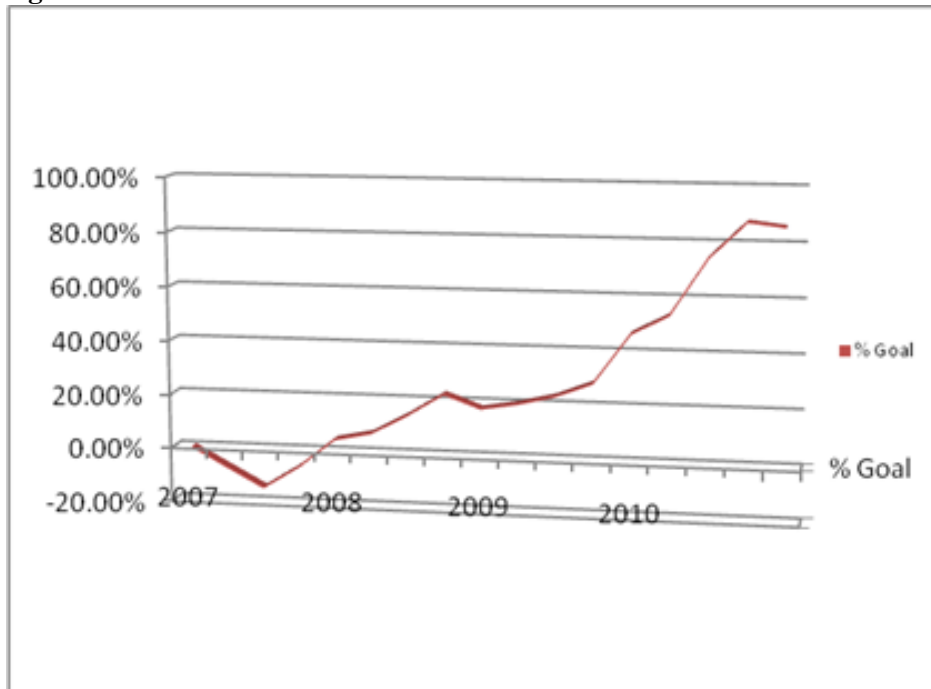
**Table 1: MCES Energy Use by Fuel (for full calendar years)**

	2006	2007	2008	2009	2010	%Change
<b>Electricity</b>	734,349	724,505	699,995	656,639	611,467	-17%
<b>Natural Gas</b>	280,386	290,333	279,304	278,647	273,352	-3%
<b>Other Fuels<sup>2</sup></b>	22,723	27,475	25,577	22,258	20,943	-8%
<b>Total</b>	<b>1,037,458</b>	<b>1,042,313</b>	<b>1,004,876</b>	<b>957,544</b>	<b>905,762</b>	
<b>% Change</b>		0%	-3%	-8%	-13%	
<b>% of Goal (entire year)</b>		-3%	21%	51%	85%	

<sup>2</sup> Propane, diesel, unleaded gas, and E85

Figure 2 shows the MMBTU goal tracked on a historical annual basis. It shows the annual reduction in energy for all facilities and all fuels as a % of the 15% reduction goal.

**Figure 2: Realized % of MMBTU Goal**



Although Figure 2 shows that only 85% of the goal was achieved for the full year, there were conservation measures that were implemented late in 2010 for which the savings have not yet been fully realized. After a measure is implemented the conservation savings begin immediately, but many of these activities were not realized for all of 2010, but will be in 2011. Late in 2010, aeration optimization measures were implemented at Metro Wastewater Treatment Plant (WWTP), which result in an *annual* savings of 4.5 million kWh; however, this was only completed in fall of 2010 and the full benefits will not be realized until fall of 2011. Figure 2 does not show the energy savings from this project. Finally, some projects that are underway were not completed and in operation at all in 2010; these reductions once completed will provide savings in excess of the goal.

While the goal looked at annual energy usage, it is worth noting that some of the implemented energy conservation activities are seasonal in nature. As a notable example, in summer of 2010, MCES total energy use was down 20% at all plants as compared to summer 2006.

#### **How the goal was met**

MCES began its energy reduction effort by collaborating with local utilities, initiating an engineering energy assistance contract, and performing engineering intern studies to identify energy conservation opportunities. The list of projects identified from this effort fell into three categories: Capital projects, in-house maintenance projects and process operation projects.

Projects from all categories were implemented but emphasis was placed on maintenance and operation projects, as these projects generally required less time and were lower in cost to implement.

Some of the larger projects that contributed to MCES meeting its goal include:

- Dissolved Oxygen set point change at Metro WWTP - annual savings of 6 million kWh (operations project).
- Diffuser cleaning at Metro WWTP - annual savings of 10 million kWh (maintenance project).
- Tunnel lighting redesign at Metro WWTP - annual savings of 2 million kWh (capital project).
- New dissolved oxygen control strategy at Seneca - annual savings of 3 million kWh (operations project).
- A new scrubber heat exchanger at Seneca WWTP – annual savings of 125,000 therms (capital project).
- Decommissioning several MCES facilities – annual savings of 4.5 million kWh (operations project).

Appendix C includes a list of all projects completed between 2007 and 2010.

## ***B. 2015 MCES Energy Goal***

Early in 2011, with the expiration of the 2010 energy goal the MCES General Manager set a new, more aggressive goal for 2015. The new goal calls for reducing MCES purchased energy use for continuing operations by 25% compared to 2006 energy use by year-end 2015 (Appendix B: 2015 MCES Energy Goal). To accomplish this goal, MCES will implement energy efficient technologies and optimizing processes that result in energy savings. In addition, the purchased energy may be reduced by the implementation of renewable energy technologies such as solar, thermal recovery, and biomass and biogas production.

With many of the “lower hanging fruit” projects already implemented, in order to meet the 2015 goal, MCES is changing its primary focus from maintenance and operations projects to capital projects.

Projects that are already underway and anticipated to be completed by year-end 2015 include:

- Installing a non-condensing steam electric generating turbine at Metro WWTP to replace a pressure reducing station. This is estimated to save 3 million kWh/yr.
- Installing anaerobic digesters at Blue Lake WWTP to produce enough digester gas to offset most of the drying operation’s natural gas load. This is estimated to save 960,000 therms/yr.
- Completing the lighting redesign measures. This is estimated to save 3 million kWh/yr.
- Installing new membrane aeration diffusers which will allow decreased operating header pressure. Estimated savings are 1 million kWh/hr.

Other initiatives are also under study. The challenge for meeting the 2015 goal will likely be to get energy projects integrated into the capital project process with high enough priority to get them implemented within the time-frame of the goal. It will also require operators and business unit managers to champion energy initiatives as part of day to day operations.

## ***C. Benchmarking: Energy Star Rating***

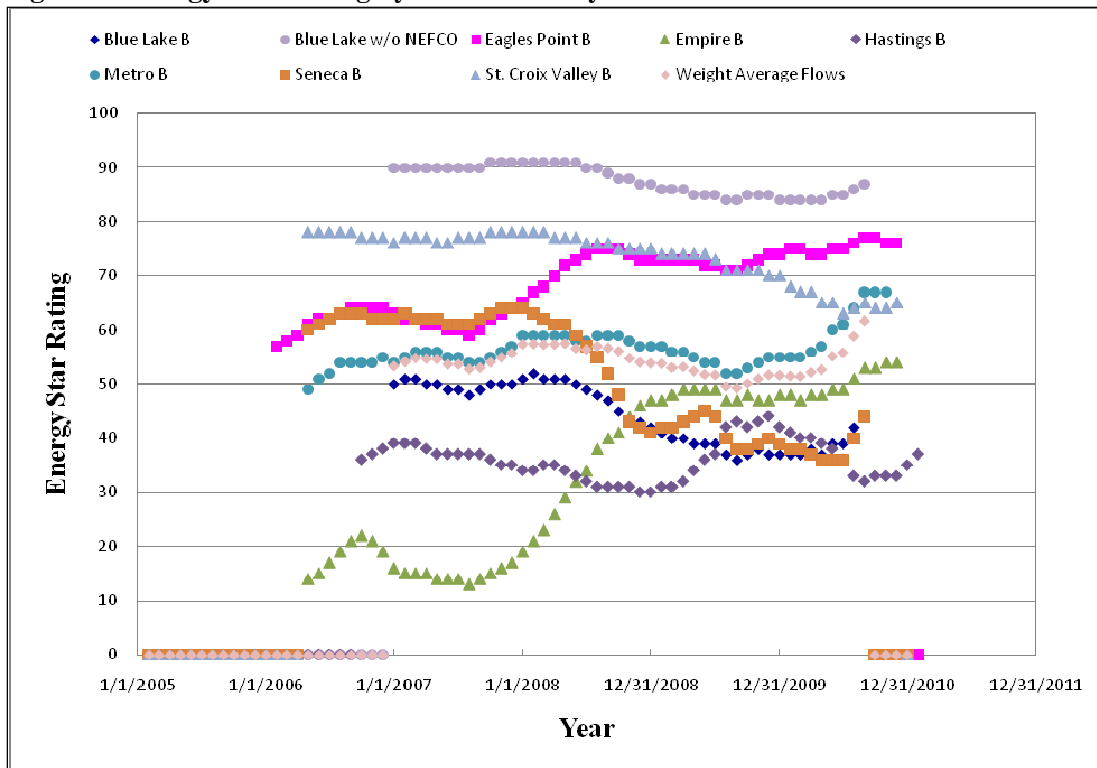
Understanding that changes occur in an operation (such as the number of widgets produced or building occupancy), that can materially affect energy use and produce a false impression of energy saving from our initiatives, MCES uses benchmarks to normalize for these changes. MCES uses an online

benchmarking tool (portfolio manager) for wastewater treatment facilities developed by the United States Environmental Protection Agency (EPA). This tool gives a rating (Energy Star rating) from 1 to 100 based on energy use and plant loading - the higher the rating, the better the energy performance for the function being performed.

MCES began tracking its Energy Star rating for each facility and the weighted average for all facilities in 2006. Since then, MCES's weighted average Energy Star rating has increased from 53 to 62. While Energy Star awards are not yet given to wastewater treatment plants, facilities that are eligible for the Energy Star award must receive a rating of 75 or higher to be considered an Energy Star facility. Even though its wastewater treatment plants are not eligible for the Energy Star award, MCES still strives for a rating of 75 or higher at each of its facilities. While most MCES facilities are making progress in increasing their ratings most still have room for improvement. (Figure 3: Energy Star Ratings by MCES Facility).

MCES believes that Energy Star is a good tool for tracking trends at individual facilities but not appropriate for comparing one facility to the next due to the differences in technologies and size. The trends will show if an individual facility is improving and sustaining its energy performance.

**Figure 3: Energy Star Rating by MCES Facility<sup>3</sup>**



<sup>3</sup> Points at zero indicate missing data.

### 3. 2010 Energy Action Highlights

#### A. Energy Conservation

Savings from energy conservation and energy efficiency continued in 2010 with major efforts in aeration optimization, control loop tuning, turbine utilization, plant air compressor modifications, and new energy efficient equipment.

Projects with the most energy savings include: (Appendix C: Completed Energy Projects (2006 – 2010))

- Improvements to the aeration control strategy to allow Seneca WWTP to distribute process air in a more efficient manner while assuring compliance with annual phosphorous and ammonia discharge limits. The MCES process control group designed and implemented the new control strategy, and along with changes to manual valves resulted in decreased air use saving 3,122,100 kWh/year. This is a cost savings of \$194,600 per year.
- West Secondary aeration diffusers at Metro WWTP were cleaned with acid in the autumn of 2010 by MCES maintenance crews. The effort resulted in a 20% decrease in air use, which amounts to a decrease of 4,579,300 kWh/, and a cost savings of \$288,300 per year.
- Piping modifications to the compressed air system at Metro WWTP to allow for better utilization of the plant air compressors. This project also extended the regeneration cycle times of the air dryers resulting in a savings of ~ 800,000 kWh and a cost savings of \$52,000/yr.
- Installed new premium efficient motors and drives at Blue Lake WWTP.

#### B. Finance and Utility Management

##### Local Renewable Energy Grant for Local Governments

MCES was selected by the State of Minnesota, Office of Energy Security, to receive \$200,000 for the installation of a 750 kW non-condensing steam turbine generator in the Solids Management Building at the Metro WWTP. The funding comes from the State Energy Program<sup>4</sup>, Renewable Energy Grant for Local Governments. The estimated savings of installing the turbine generator is 3.7 million kWh (\$250,000) per year.

##### Green Infrastructure Grant

Through the Green Infrastructure Grant, administered by the Minnesota Public Facilities Authority, MCES received \$2,196,000 for solids improvement at Blue Lake WWTP (\$2 million) and for tunnel lighting retrofits at the Metro WWTP (\$196K). The solids improvement project, when completed in 2012, is expected to result in typical annual savings of 960,000 therms/yr. The lighting retrofit, which was completed in 2010, resulted in an annual savings of 2 million kWh.

##### Utility Rebates

MCES works closely with utilities to identify opportunities for rebates. The rebates received in 2010 contributed funding for the Seneca WWTP incinerator heat recovery project, Metro WWTP tunnel lighting redesign, St. Croix Valley WWTP and Eagles Point WWTP looping tuning, and peak control projects.

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<sup>4</sup> The State Energy Program (SEP) is federally funded through the U.S. Department of Energy's (USDOE) Office of Energy Efficiency and Renewable Energy. This program allows states to design and implement energy efficiency and renewable energy programs. SEP promotes energy conservation, energy efficiency and renewable energy to Minnesota consumers, businesses and policymakers through educational outreach and technical assistance, targeted financial incentives, and demonstrations of market-ready new technologies. Learn more about the [U.S. Department of Energy's State Energy Programs](#).

## C. Research and Development and Renewable Energy

### Activated Sludge Aeration

Activated sludge aeration is the largest process use of electricity at MCES wastewater facilities (\$3 million per year). This is the case even though, in the 1990s, the retrofit to more efficient “fine bubble” aeration cut aeration energy usage in half. In recent years, MCES has performed experiments to better its understanding of the effects of diffuser deterioration, diffuser cleaning and aeration control on sustained energy usage. In the summer of 2009, MCES placed removable diffusers made from different materials side-by-side in an aeration tank. During the summers of 2009 and 2010, ten foot in-situ columns were placed over the diffusers to monitor their oxygen transfer performance (efficiency) against a new diffuser. In this controlled experiment, it appears that diffuser performance shows a slight (but significant) short-term loss in performance; future monitoring will show if substantial longer term effects are present. Cleaning techniques that can be done more frequently (versus biennial dewatering and pressure washing) will be examined in the summer of 2011 to see if the short-term performance losses can be better mitigated.

### Algae

The MCES and the University of Minnesota collaborative project exploring Metro WWTP centrate treatment using algae completed two project phases in 2010. Phase 3 examined the process using artificial light in a small pilot plant in the basement of the Solids Managements Building (SMB) at Metro WWTP. Results of phase 3 confirmed conclusions from previous work. The soluble phosphorus, soluble total Kjeldahl<sup>5</sup> nitrogen, and soluble chemical oxygen demand removal from Metro WWTP centrate averaged approximately 70%, 60% and 90% respectively. Phase 4 of the project examined process performance under natural light conditions. A greenhouse containing a slightly smaller reactor than SMB was operated from June to September 2010 at Metro WWTP. During that period, a total of four operating modes (liquid depth and hydraulic residence time) were utilized. The removals of soluble phosphorus, total soluble nitrogen, and soluble chemical oxygen demand averaged approximately 80%, 80%, and 90% respectively. In addition to possibly generating energy from the produced algae (oil and biomass), the reduction in COD could mean substantial energy savings via reduced secondary aeration. More research is needed.

### Off-Gas Testing

In 2010, process engineering and R&D staff performed off-gas testing at the Metro WWTP and Seneca WWTP to investigate the impacts of cleaning aeration tank diffusers. The off-gas method involves placing floating hoods in the aeration tanks to cover a 4’x8’ section of the tank surface to capture the gas being emitted. A special analyzer draws a sample of the off-gas from the hood using a vacuum pump, removes water vapor and carbon dioxide from the gas and analyzes its oxygen content. Multiple off-gas measurements over time are used to determine the average oxygen transfer improvements and airflow savings from cleaning the tanks. At Metro WWTP and Seneca WWTP, the experimental protocol involved multiple off-gas tests of a tank before and after diffuser cleaning.

## D. Collaborations

### Climate Registry <http://www.theclimateregistry.org/>

The Climate Registry is a nonprofit collaboration among North American states, provinces, territories and Native Sovereign Nations that sets consistent and transparent standards to calculate, publicly report, and in some forms of membership independently verify greenhouse gas emissions into a single registry. The Metropolitan Council joined the Climate Registry as a founding member in 2007.

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<sup>5</sup> The **Kjeldahl method** in analytical chemistry is a method for the quantitative determination of nitrogen in chemical substances developed by Johan Kjeldahl in 1883.

In 2010, the Council evaluated its participation and elected to continue based on the following benefits:

- The Council's "seat at the table" has had an impact on wastewater treatment protocols developed by the Climate Registry.
- If EPA regulatory reporting thresholds for CO<sub>2</sub>e emissions from internal combustion sources are lowered then Council is in a position to report its emissions.
- The data gathering and analysis performed for 2008 and 2009 emissions reports places the Council in the forefront within Minnesota in regard to awareness and action toward GHG emissions.
- In depth knowledge and historical data pertaining to GHGs from the Metropolitan Council's participation in the Climate Registry may assist the Council in influencing the scope and content of Climate Change rules and legislation proposed and eventually promulgated.
- The Council's involvement in Climate Registry may be helpful in support future applications for federal grant funds.

**Metropolitan Counties Energy Coalition (MEPC)** <http://www.mepc-mn.org/>

Leading by example, the MEPC provides a forum for member counties and the Metropolitan Council to exchange ideas, network across agencies and collaborate on issues of energy conservation and efficiency, renewable energy and greenhouse gas emissions reduction. Amongst other accomplishments, in 2010, MEPC:

- Sponsored two workshops for member entity's facility managers
- Provided information for members (Commissioners) regarding legislation around energy policy
- Engaged the Office of Energy Security to better understand and provide recommendations for the reallocation process for unspent ARRA funding earmarked for energy related projects
- Initiated two projects to assess: i) carbon management and ii) opportunities for geothermal systems.

**Minnesota Chamber of Commerce**

In December 2010, the Metropolitan Council began participating in an "intervention group" organized by the Minnesota Chamber of Commerce to provide input, ask questions and potentially challenge some of Xcel Energy's rate requests (in the general rate case only, not the renewable energy or the transmission riders) to the Public Utilities Commission. While most of the Minnesota Chamber of Commerce group's work may be defensive (challenging Xcel Energy's assertions and rate increase proposals) we are using this opportunity to bring up rate design issues with which we have concerns. The rate case is expected to be resolved toward the end of 2011.

**State interagency energy team (E&E team)**

The state interagency energy team was formed to align and organize state agency energy activities - and those of the Metropolitan Council. The team works to advance the Governor's initiatives, coordinate legislative actions and reporting on energy matters, coordinate state responses to business initiatives on energy, and implement cross-agency energy policies that promote reliable, low-cost and environmentally-superior energy systems and conservation in Minnesota.

**University of Minnesota**

MCES and the University of Minnesota (U of M) signed a Joint Powers Agreement (JPA), which provides a framework for collaborating on energy research projects. Using this agreement the Council and the U of M have been collaboratively evaluating the economic feasibility of using algae to remove nutrients from a Metro WWTP recycle system and recover energy from algae oil and cell mass. In 2010,

the Council and the U of M also used this agreement to initiate a biofuel demonstration project at the Empire WWTP. The project will measure the carbon content in the soil under of a rotation of woody crops and strips of perennial grasses and track the changes in carbon content in the soil over a four year period. The Council and U of M may continue to use the JPA in future energy collaborations.

### **Xcel Energy**

In 2010, MCES received the Energy Partner Award for the second year consecutive year for its energy saving results and its collaborative working relationship with Xcel Energy. In addition, MCES has two agreements with Xcel Energy to help leverage energy optimization resources – the Memorandum of Understanding II (MOU II) and the Memorandum of Understanding III (MOU III). The MOU II is geared toward energy efficient *studies* of MCES facilities for which Xcel Energy agreed to fund a significant portion.

## **E. Energy Tracking and Carbon Management**

### **Energy Database**

MCES made considerable progress in its effort to provide online access to gas and electric billing data and real time data for all wastewater treatment facilities and interceptor accounts this year. Notable accomplishments for 2010 included:

- Completed a web application to enter data from electric, gas and water bills on monthly basis for all treatment plants and the largest lift stations (L13, L19, L21, L26, L29, L32, L41, L65 and RMF).
- Automated processes to upload electric and gas data sent by utility providers such as Xcel Energy, CenterPoint and Minnesota Energy in electronic files on annual basis for ES accounts.
- Updated and synchronized utility database with Accounts Payable master list containing all ES accounts and their utility providers to identify and correct discrepancies with discontinued and new accounts ensuring a single version of the master list.
- Developed comparative analysis and performance charts to trend utility usage.
- Treatment and Interceptor Services directors and managers are receiving automated emails every month with links to electric, gas and water use reports, comparison charts with up-to-date utility data along with links to actual bill images. In addition, exception emails are sent to managers if utility use or cost are significantly different from the same month one year ago. These emails provide single stop one click easy access to utility data and bills.
- Conducted one-on-one sessions across Treatment and Interceptor Services departments to demonstrate utility data reporting capabilities and bring directors and managers up-to-speed on utility data availability, accessibility, and familiarity with reporting tools and functionality.

### **Carbon Management**

In 2010, MCES performed an internal review of the process to collect and enter the data into the Climate Registry Information System (CRIS) using Metropolitan Council 2008 data. The internal review found no significant issues and that the process used for collecting and entering the data represents fairly the intent to report greenhouse gases (GHG) emissions for all Council activities.

A better understanding of the protocols and the formulas used in determining emitter activity is resulting in improved accuracy of the result for MCES. It will be important to continue the reporting process to determine repeatability and data consistency from one year to the next. The reported data will provide a control chart to demonstrate effectiveness of the work GHG reduction efforts.

MCES total emissions in 2009 were 424,163 metric tons CO<sub>2</sub>(e)<sup>6</sup> (direct emissions 104,712 metric tons CO<sub>2</sub>(e), biogenic emissions 142,325 metric tons CO<sub>2</sub>(e), and indirect emissions 177,126 metric tons CO<sub>2</sub>(e)).

#### **Utility Billing Tracking**

MCES and Metro Transit hired LPB Energy Management to perform a post-payment utility invoice processing service for electricity, natural gas and public water supply accounts. As part of the processing service, LPB will configure a database, store an electronic image of each utility invoice (January 2009 – current day), and transmit to the Council electronic copies of reports containing evaluation information. MCES will have access to database via a website to track utility bill payments and utility usage.

## **4. Conclusion**

The Metropolitan Council Environmental Services (MCES) spent about \$15 million in 2010 on energy to collect, treat and discharge nearly 88 billion gallons of wastewater. The costs associated with this energy consumption, along with other costs to provide MCES services, are passed along to rate payers. While savings to metropolitan ratepayers is the primary focus on the energy work, the work also contributes to energy security and independence for Minnesota and the United States as well as a reduction of greenhouse gases for the world.

In the effort to keep lifecycle costs down and further these goals, MCES has committed itself to a goal of reducing its energy consumption by 25% (of 2006 consumption) by 2015. In order to meet the extended energy goal, the Energy Team will continue to meet monthly and work with MCES business units to sustain existing energy savings and to identify new energy conservation and renewable energy opportunities. Sustaining energy savings will require continued tracking of energy consumption, enhancing preventative and corrective maintenance practices, and assuring the most current energy efficiency requirements in capital upgrades. New energy projects that have already begun or are planned to begin in 2011 include installing a non-condensing steam turbine generator, new diffusers and mixers at the Metro WWTP, and an anaerobic digester at Blue Lake WWTP.

While not explicitly included in the energy goal, the Energy Team will continue to collaborate with external groups on energy related issues, evaluate utility rates to ensure MCES is getting the best rates for its accounts, participate in utility rate cases, and pursue energy funding opportunities and policies relevant to MCES.

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<sup>6</sup> Does not include emissions from NEFCo operations at Blue Lake WWTP or emissions from Robert Street office. NEFCo emissions are reported to CR on a purely voluntary basis.

## Appendix A: MCES Utilities Costs (dollars) per Accounting Records (2006 – 2010)

Dept	Description	2006	2007	2008	2009	2010
	Electric Total	13,809,309.60	13,509,612.22	14,414,559.05	13,643,533.39	13,188,375.64
	Fuel Oil Total <sup>7</sup>	20,512.89	27,049.25	54,703.39	107,279.63	26,774.51
	Natural Gas Total	2,816,841.10	2,724,430.64	2,840,012.04	2,063,172.16	1,843,585.58
	Motor Vehicle Fuel Total	480,568.22	570,845.92	567,929.92	338,101.99	403,859.99
	<b>Total Utility Costs</b>	<b>17,127,231.81</b>	<b>16,831,938.03</b>	<b>17,877,204.40</b>	<b>16,152,087.17</b>	<b>15,215,920.08</b>

<b>5501 - Electric by Department</b>						
73310	Interceptor Administration	49,576.24	45,581.76	0.00	0.00	0
73311	Interceptor Admin Administration	0.00	0.00	(75.64)	0.00	0
73312	Interceptor Administration Operations	0.00	0.00	46,009.64	45,989.58	52,983.61
73320	Interceptor Lift Stations	997,065.78	1,115,065.92	(2,957.44)	0.00	0
73322	Interceptor Lift Stations Operations	0.00	0.00	1,215,729.38	1,246,459.41	1,263,249.49
73330	Interceptor Meter Stations	92,641.34	88,195.51	0.00	0.00	0
73331	Interceptor Meter Administration	0.00	0.00	15.28	11.49	0
73332	Interceptor Meter Operations	0.00	0.00	131,558.79	149,139.42	106,094.57
73333	Interceptor Meter Maintenance	0.00	0.00	22.48	0.00	39.19
73340	Interceptor Sewers	0.00	0.00	0.00	0.00	0
73350	Interceptor Engineering	0.00	0.00	0.00	0.00	0
73360	Interceptor Septage Management	0.00	0.00	4,060.08	7,234.94	7,773.44
	<b>Interceptor Services Department Total</b>	<b>1,139,283.36</b>	<b>1,248,843.19</b>	<b>1,394,362.57</b>	<b>1,448,834.84</b>	<b>1,430,140.30</b>
73820	Empire Operations	881,153.43	827,512.40	910,810.83	771,135.81	828,429.73
73910	WW Treatment Services Admin	186,838.74	175,765.43	184,397.19	177,048.70	164,002.69
73940	Metro Liquids Business Unit	5,596,332.71	5,307,366.11	0.00	0.00	0
73942	Metro LBU Operations	0.00	0.00	5,584,215.09	4,710,973.89	4,410,569.68
73950	Metro Solids Business Unit	0.00	0.00	0.00	0.00	0
73960	Metro Solids Management Business Unit	3,388,846.52	3,215,608.39	0.00	0.00	0

<sup>7</sup> Does not include propane.

<b>Dept</b>	<b>Description</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
73962	Metro SMBU Operations	0.00	0.00	3,395,573.06	3,728,456.40	3,445,546.22
73970	MBU-Plant Services	5,384.85	4,248.14	4,300.12	4,513.89	5,431.79
73980	Support Services Bus Unit	0.00	0.00	0.00	(5,400.00)	0
74120	Seneca Operations	1,082,264.76	1,097,961.71	1,241,642.16	1,314,845.30	1,214,929.61
74150	Seneca Incineration	0.00	0.00	0.00	0.00	0
74220	Blue Lake Operations	708,144.06	758,680.18	834,167.62	802,023.21	913,316.79
74280	Blue Lake NEFCO	161,169.46	181,907.51	191,258.81	178,526.94	213,335.10
74620	Eagles Point Operations	288,768.25	275,568.40	256,206.64	229,904.83	249,966.41
74720	Hastings Operations	73,131.01	82,991.32	98,317.19	90,213.85	94,708.18
74820	St Croix Valley Operations	120,190.73	129,303.53	142,003.34	140,819.72	155,611.23
75020	Rosemount Operations	152,023.66	176,990.25	152,343.03	26,273.92	35,193.77
	<b>Treatment Services Department Total</b>	<b>12,644,248.18</b>	<b>12,233,903.37</b>	<b>12,995,235.08</b>	<b>12,169,336.46</b>	<b>11,731,041.20</b>
75310	Technical Services Administration	265.35	0.00	0.00	0.00	0
75362	Technical Services Engineer Plan	0.00	33.01	0.00	0.00	0
75363	Technical Services Construction	331.20	0.00	0.00	0.00	0
	<b>Technical Services Department Total</b>	<b>596.55</b>	<b>33.01</b>	<b>0.00</b>	<b>0.00</b>	<b>0</b>
81210	EQA-IWPP Admin	15,704.06	17,007.03	14,618.73	14,404.84	16,207.89
81420	EQA-Water Quality Monitor/Test	7,239.14	7,237.16	7,993.37	8,077.82	7,993.49
86620	EQA-MN River-03 Monitor/Test	0.00	0.00	0.00	0.00	0
86720	EQA-WOMP2-04 Monitor/Test	1,040.86	0.00	0.00	0.00	0
86820	EQA-MN River-04 Monitor/Test	0.00	0.00	0.00	0.00	0
86920	EQA-WOMP Monitor/Test	1,122.73	2,536.24	2,349.30	2,879.43	2,992.76
86950	EQA-WOMP Public Education	27.08	0.00	0.00	0.00	0
	<b>Environmental Quality Assurance Department Total</b>	<b>25,133.87</b>	<b>26,780.43</b>	<b>24,961.40</b>	<b>25,362.09</b>	<b>27,194.14</b>
	<b>Electric Total</b>	<b>13,809,309.60</b>	<b>13,509,612.22</b>	<b>14,414,559.05</b>	<b>13,643,533.39</b>	<b>13,188,375.64</b>
<b>5502 Fuel Oil by Department</b>						
73320	Interceptor Lift Stations	0.00	0.00	0.00	0.00	0.00
73322	Interceptor Lift Stations Operations	0.00	0.00	0.00	21,183.29	22,015.51
	<b>Interceptor Services Department Total</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>21,183.29</b>	<b>22,015.51</b>

Dept	Description	2006	2007	2008	2009	2010
73960	Metro Solids Mgmt Bus Unit	14,464.99	19,210.85	0.00	0.00	0.00
73962	Metro SMBU Operations	0.00	0.00	45,075.01	84,476.34	0.00
73970	MBU-Plant Services	1,618.80	0.00	9,628.38	1,935.00	4,759.00
74040	Maintenance Routine	4,429.10	7,750.66	0.00	0.00	0.00
74120	Seneca Operations	0.00	0.00	0.00	0.00	0.00
74280	Blue Lake NEFCO	0.00	87.74	0.00	0.00	0.00
	<b>Treatment Services Department</b>	<b>20,512.89</b>	<b>27,049.25</b>	<b>54,703.39</b>	<b>86,411.34</b>	<b>4,759.00</b>
96300	MCES Materials/Supplies Adjs	0.00	0.00	0.00	(315.00)	0.00
	<b>Environmental Services Wide Total</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>(315.00)</b>	<b>0.00</b>
	<b>Fuel Oil Total</b>	<b>20,512.89</b>	<b>27,049.25</b>	<b>54,703.39</b>	<b>107,279.63</b>	<b>26,774.51</b>

#### 5503 Gas by Department

73310	Inter Administration	21,360.58	33,710.96	0.00	0.00	0.00
73312	Inter Admin Operations	0.00	0.00	38,493.55	29,612.77	24,643.26
73320	Inter Lift Stations	110,102.42	116,689.71	2,957.44	0.00	0.00
73322	Interceptor Lift Stations Operations	0.00	0.00	147,454.29	169,077.46	149,923.56
73323	Interceptor Lift Stations Maintenance	0.00	0.00	(311.51)	70.96	0.00
73330	Interceptor Meter Stations	4,878.15	4,725.06	0.00	0.00	0.00
73332	Interceptor Meter Operations	0.00	0.00	4,876.79	5,276.10	4,938.22
73340	Interceptor Sewers	0.00	0.00	0.00	0.00	0.00
73343	Interceptor Sewers Maintenance	0.00	0.00	0.00	0.00	311.68
73360	Interceptor Septage Management	0.00	0.00	9,259.13	13,199.62	10,484.83
	<b>Interceptor Services Department Total</b>	<b>136,341.15</b>	<b>155,125.73</b>	<b>202,729.69</b>	<b>217,236.91</b>	<b>190,301.55</b>
73820	Empire Operations	208,668.36	237,287.85	154,764.37	139,397.19	110,047.40
73940	Metro Liquids Business Unit	2,838.43	3,378.03	0.00	0.00	0.00
73942	Metro LBU Operations	0.00	0.00	5,740.75	3,104.65	714.98
73960	Metro Solids Management Bus Unit	860,904.37	680,809.23	0.00	0.00	0.00
73962	Metro SMBU Operations	0.00	0.00	705,743.73	506,080.88	414,190.13
74040	Maintenance Routine	0.00	57.29	0.00	0.00	0.00
74150	Seneca Incineration	418,971.83	386,383.58	456,004.25	336,279.72	266,977.05
74220	Blue Lake Operations	183,306.92	198,987.08	145,822.13	136,532.74	137,412.79

Dept	Description	2006	2007	2008	2009	2010
74250	Blue Lake Solids	4,184.33	18,941.33	18,113.32	18,952.96	23,976.43
74280	Blue Lake NEFCO	802,646.09	831,780.64	941,897.62	553,135.24	567,667.81
74620	Eagles Point Operations	44,207.84	46,276.28	45,150.07	34,658.75	27,884.89
74720	Hastings Operations	79,260.58	82,657.11	77,767.46	43,258.36	46,424.54
74820	St Croix Valley Operations	57,047.65	59,789.89	56,461.52	54,397.04	42,386.22
75020	Rosemount Operations	10,424.20	12,880.99	18,807.02	12,249.24	6,458.57
	<b>Treatment Services Department Total</b>	<b>2,672,460.60</b>	<b>2,559,229.30</b>	<b>2,626,272.24</b>	<b>1,838,046.77</b>	<b>1,644,140.81</b>
81210	EQA-IWPP Admin	8,039.35	10,126.08	10,994.01	7,798.96	9,166.85
81420	EQA-Water Quality Monitor/Test	0.00	0.00	0.00	89.52	0.00
81510	EQA-Analytical Lab Services	0.00	(50.47)	0.00	0.00	0.00
86920	EQA-WOMP Monitor/Test	0.00	0.00	16.10	0.00	0.00
	<b>Environmental Quality Assurance Department Total</b>	<b>8,039.35</b>	<b>10,075.61</b>	<b>11,010.11</b>	<b>7,888.48</b>	<b>9,166.85</b>
95500	MCES Reserve & Liability Fund	0.00	0.00	0.00	0.00	(23.63)
96300	MCES Materials/Supplies Adjs	0.00	0.00	0.00	0.00	0.00
	<b>Environmental Services Wide Total</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>(23.63)</b>
	<b>Gas Total</b>	<b>2,816,841.10</b>	<b>2,724,430.64</b>	<b>2,840,012.04</b>	<b>2,063,172.16</b>	<b>1,843,585.58</b>

#### 5330 Motor Vehicle Fuel by Department

73310	Interceptor Administration	165,035.72	169,489.48	0.00	0.00	0.00
73311	Interceptor Admin Administration	0.00	0.00	0.00	417.59	270.14
73312	Interceptor Administration Operations	0.00	0.00	14,623.14	47,713.89	68,020.85
73313	Interceptor Administration Maintenance	0.00	0.00	0.00	0.39	0.00
73320	Interceptor Lift Stations	29,571.34	24,822.70	0.00	0.00	0.00
73322	Interceptor Lift Stations Operations	0.00	0.00	129,203.82	25,188.52	37,288.54
73323	Interceptor Lift Stations Maintenance	0.00	0.00	150.72	70.59	747.97
73332	Interceptor Meter Operations	0.00	0.00	41,179.95	23,894.73	22,647.63
73333	Interceptor Meter Maintenance	0.00	0.00	0.00	3,476.08	0.00
73342	Interceptor Sewers Operations	0.00	0.00	42,694.21	25,465.70	38,778.61
73343	Interceptor Sewers Maintenance	0.00	0.00	365.76	6,604.89	3,722.28
73350	Interceptor Engineering	0.00	0.00	1,203.92	0.00	0.00

<b>Dept</b>	<b>Description</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
	<b>Interceptor Services Department Total</b>	194,607.06	194,312.18	229,421.52	132,832.38	171,476.02
73820	Empire Operations	68,389.66	118,940.31	51,636.16	37,836.82	42,162.22
73830	Empire Maintenance	0.00	16,473.97	38.33	0.00	0.00
	Wastewater Treatment Services					
73910	Administration	0.00	0.00	0.00	0.00	0.00
73920	Plant Engineering	68.28	0.00	0.00	0.00	0.00
73940	Metro Liquids Business Unit	1,364.23	5,407.68	0.00	0.00	0.00
73942	Metro LBU Operations	0.00	0.00	11,001.20	0.00	0.00
73943	Metro LBU Maintenance	0.00	0.00	3,237.47	5,202.71	2,187.36
73960	Metro Solids Management Business Unit	0.00	0.00	0.00	0.00	0.00
73970	MBU-Plant Services	0.00	0.00	4,835.56	5,591.46	6,308.73
73980	Support Services Business Unit	475.49	743.84	47.97	1.81	47.28
74040	Maintenance Routine	33,276.71	39,850.01	41,684.69	25,079.40	26,865.96
74120	Seneca Operations	0.00	0.00	0.00	0.00	0.00
74150	Seneca Incineration	0.00	0.00	42.05	0.00	0.00
74160	Seneca N-Viro to 74150	0.00	0.00	0.00	0.00	0.00
74170	Seneca Plant Services to 74130	0.00	0.00	0.00	0.00	0.00
74210	Blue Lake Administration	0.00	0.00	0.00	0.00	0.00
74220	Blue Lake Operations	15,649.80	16,340.11	17,249.11	11,788.09	12,702.85
74230	Blue Lake Maintenance	52.07	0.00	320.64	3,301.55	3,244.65
74620	Eagles Point Operations	52,310.62	60,334.74	63,744.33	37,765.70	43,245.73
74630	Eagles Point Maintenance	0.00	413.00	172.19	2,125.80	65.29
74720	Hastings Operations	32,884.45	32,600.27	43,533.97	15,577.57	27,938.70
74730	Hastings Maintenance	0.00	74.77	87.55	54.41	0.00
74820	St Croix Valley Operations	30,591.86	34,018.56	37,304.05	24,499.48	25,120.18
74830	St Croix Valley Maintenance	10.00	0.00	7,180.36	0.00	0.00
75700	WWS Warehouse	0.00	0.00	0.00	0.00	0.00
75800	Fleet Management	2,889.42	3,333.75	5,338.53	2,642.40	2,288.22
	<b>Treatment Services Department Total</b>	237,962.59	328,531.01	287,454.16	171,467.20	192,177.17
75310	Technical Services Administration	18,315.18	19,866.91	19,185.29	1,433.96	4,045.80
75362	Technical Services Engineer Plan	0.00	0.00	0.00	0.00	38.00
75363	Technical Services Construction	171.38	118.35	192.30	9,852.05	12,988.79

<b>Dept</b>	<b>Description</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
	<b>Technical Services Department Total</b>	18,486.56	19,985.26	19,377.59	11,286.01	17,072.59
80912	EQA-WRA Watershed Coordination	0.00	0.00	0.00	0.00	0.00
80925	EQA-WRA Environmental Assessment	27.40	0.00	0.00	0.00	0.00
81210	EQA-IWPP Administration	10,370.71	9,591.73	13,044.65	8,596.88	8,291.72
81220	EQA-IWPP Direct Programs	1,221.74	2,485.21	1,166.76	781.86	561.04
81240	EQA-IWPP Services	0.00	0.00	0.00	52.00	0.00
81310	Research & Development Administration	641.59	768.07	645.09	808.84	484.12
81410	EQA-Water Quality Administration	9,610.40	8,162.25	8,812.69	6,804.38	7,087.39
81420	EQA-Water Quality Monitor/Test	1,599.55	1,647.99	1,704.54	1,115.43	2,092.85
81510	EQA-Analytical Lab Services	1,064.04	702.78	732.03	575.28	491.52
81610	EQA-Air Quality Administration	4,241.05	3,710.52	3,271.40	2,404.94	2,475.17
86620	EQA-MN River-03 Monitor/Test	0.00	0.00	0.00	0.00	0.00
86720	EQA-WOMP2-04 Monitor/Test	45.24	0.00	0.00	0.00	0.00
86820	EQA-MN River-04 Monitor/Test	0.00	0.00	0.00	0.00	0.00
	<b>Environmental Quality Assurance</b>					
	<b>Department Total</b>	28,821.72	27,068.55	29,377.16	21,139.61	21,483.81
90110	MCES Safety	690.29	948.92	2,299.49	1,376.79	1,650.40
	<b>Environmental Services Mangers Office</b>					
	<b>Total</b>	690.29	948.92	2,299.49	1,376.79	1,650.40
	<b>Motor Vehicle Total</b>	<b>480,568.22</b>	<b>570,845.92</b>	<b>567,929.92</b>	<b>338,101.99</b>	<b>403,859.99</b>

## Appendix B: MCES 2015 Energy Goal

### GOAL

Reduce MCES facilities' estimated purchase of energy for continuing operations by 25% as compared to 2006 baseline use by year end 2015 - while achieving or exceeding our current levels of service.

### APPROACH

We will reduce our energy usage by implementing energy efficient technologies and optimizing processes that result in actual energy savings. In addition, the purchased energy may be reduced by the implementation of renewable energy technologies for internal energy use such as solar, wind, thermal recovery, biomass and biogas production.

We will use 2006 as the base year with the subsequent years normalized for weather (for non-process weather dependant loads), permit changes, new plants for new service areas excluded, and other parameters (as may be approved by Environmental Services Management Team (ESMT) to yield a fair comparison of the result of energy initiatives on continuing operations.

### MEASUREMENT

We will track annual purchased energy by converting all energy use to BTUs. For example, the electricity use in BTU's shall be derived by multiplying each KWh purchased by 3413 to get BTUs used and for natural gas use each therm of natural gas purchased by 100,000 to get its BTUs.

### RESPONSIBILITIES

Net energy purchased (in BTUs) shall be computed by the Plant Support Services group, and monitored and reported quarterly by the Environmental Quality Assurance Team to the ESMT. The MCES Energy Team will provide oversight throughout the term of the goal.

### DEFINITIONS

"MCES facilities" includes:

- all Council owned facilities and vehicles used for wastewater purposes (managed by MCES)
  - o *excluding* any capital project energy use where use is not included/ metered at existing MCES facilities
  - o *excluding the* Robert Street offices (used mostly by other divisions)
- Metro 94 space managed by MCES

"Energy Purchased" means the BTU value of all types of energy used for MCES facilities during the calendar year, including but not limited to: electricity (kWh), natural gas (therms), diesel fuel, propane and motor vehicle fuel.

## Appendix C: Completed Energy Projects (2007 – 2010)

	<u>Location</u>	<u>kwh Saved</u>	<u>MMBTU Saved</u>	<u>Cost Saved</u>
DO set point change	Metro	6,957,995		\$ 469,665
Diffuser cleaning East Basin	Metro	7,075,231		\$ 477,578
Diffuser cleaning West Basin	Metro	4,590,092		\$ 309,831
LBU operating changes	Metro	3,000,000		\$ 202,500
Decommissioning WWTP	Rosemount	1,500,000		\$ 101,250
Increased turbine utilization	Metro	1,300,000		\$ 87,750
New diffusers	Eagles Point	824,136		\$ 55,629
Scrubber packing	Metro	688,000		\$ 46,440
L35 lift station	RMF	25,000		\$ 1,688
Admin recommissioning	Metro	175,917		\$ 11,874
Compressed air modifications	Metro	336,500		\$ 22,714
Sequencing blowers	Metro	85,000		\$ 5,738
FLT recommissioning	Metro	135,780		\$ 9,165
Seneca aeration	Seneca	3,122,100		\$ 210,742
Blue Lake aeration	Blue Lake	3,000,000		\$ 202,500
VFD	RMF	300,000		\$ 20,250
Tunnel Lighting	Metro	1,949,301		\$ 131,578
Compressor Building Lighting	Metro	172,949		\$ 11,674
Decommissioning 408	Metro	3,055,865	23,212	\$ 345,542
WAS Storage	Empire	583,200		\$ 39,366
ASD and EE Motors	Blue Lake	554,000		\$ 37,395
Scrubber Heat Exchanger	Seneca		12,500	\$ 75,000
Aeration Control Loop Tuning	SCV	372,809		\$ 25,165
Aeration Control Loop Tuning	Eagles Pt	424,032		\$ 28,622
Plant Air Compressor Modifications	Metro	637,000		\$ 42,998
Recommission FLT Building	Metro	805,920		\$ 54,400
Repair Compressor Air Leaks	Metro	189,326		\$ 12,779
<b>Total</b>		<b>41,860,153</b>	<b>35,712</b>	<b>\$ 3,039,831</b>

## Appendix D: Key to Acronyms

<b>ARRA</b>	American Recovery and Reinvestment Act
<b>B&amp;C</b>	Brown & Caldwell, energy engineer on master contract with MCES
<b>B3</b>	Building Energy Efficiency Standards outlined by State of Minnesota
<b>BTU</b>	British Temperature Unit (heat required to raise the temperature of 1 pound of H <sub>2</sub> O)
<b>CO<sub>2</sub>e</b>	Carbon Dioxide Equivalent Emissions
<b>CRIS</b>	Climate Registry Information System
<b>DG</b>	Distributed Generation (at a customer site instead of a utilities power plant)
<b>DO</b>	Dissolved Oxygen
<b>ECO</b>	Energy Conservation Opportunity
<b>EFPM</b>	Energy Forward Pricing Mechanisms
<b>EPA</b>	US Environmental Protection Agency
<b>EQAT</b>	Environmental Quality Assurance Team
<b>ESMT</b>	Environmental Services (senior) Management Team
<b>GHG</b>	Greenhouse Gases
<b>HID</b>	High Intensity Discharge; type of light fixture
<b>HVAC</b>	Heating, ventilation and air conditioning
<b>IREE</b>	Initiative for Renewable Energy and the Environment
<b>IWPP</b>	Industrial Waste and Pollution Prevention
<b>kWh</b>	Kilowatt hours
<b>JPA</b>	Joint Powers Agreement
<b>LCCMR</b>	Legislative-Citizen Commission on Minnesota Resources
<b>LRT</b>	Light Rail Transit
<b>MAPP</b>	Midwest Area Power Pool
<b>MCCAG</b>	Minnesota Climate Change Advisory Group
<b>MOU</b>	Memo of Understanding with Xcel regarding Process Efficiency Program
<b>MEPC</b>	Metro Counties Energy Coalition
<b>MMBTU</b>	British Thermal Unit; one thousand BTU where M is the Roman equivalent 1000
<b>MnSCU</b>	Minnesota State Colleges and Universities
<b>MVF</b>	Motor Vehicle Fuels
<b>Mw</b>	Mega Watts
<b>NEFCO</b>	New England Fertilizer Company

<b>OTE</b>	Oxygen Transfer Efficiency
<b>PDA</b>	Project Delivery Analysis Process
<b>PDL</b>	Predetermined Demand Levels (in Peak Control Agreements)
<b>PFA</b>	Minnesota Public Facilities Authority
<b>SMB</b>	Solids Management Building
<b>SSBU</b>	Support Services Business Unit
<b>VFD</b>	Variable Frequency Devices
<b>WAS</b>	Waste Activated Sludge
<b>WRA</b>	Water Resources Assessment
<b>WWTPs</b>	Wastewater Treatment Plants