# MCES ENERGY PERFORMANCE FOR 2012



Blue Lake WWTP; Thickening/Dewatering and NEFCO buildings (on top); Digester complex (on right)



# **MCES Energy Team**

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In addition to the Energy Team, thanks to Linda Henning, Chris Voigt, Laura Fletcher, Chris Read, Mike Rechtman, Marty Caneff, Nick Davern and Ruth Estes for their contributions to this MCES Energy Performance report for 2012. Special thanks to the many MCES staff - outside of the Energy team - that continue to suggest and develop energy savings. MCES would also like to thank its partners in funding these energy achievements, our ratepayers, the Minnesota Public Facilities Authority, the Minnesota Dept of Commerce, and Xcel Energy.



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### 1. Executive Summary

Metropolitan Council Environmental Services has reduced its energy purchases by 19%, from a baseline use of 1,040,000 MMBtu in 2006 to 843,000 MMBtu in 2012. It is 76% of the way toward meeting its 2015 energy goal of reducing energy purchases by 25%.

Energy specific project components that are now underway and anticipated to provide large energy savings include (Appendix C: 2013 – 2014 MCES Top Energy Projects):

- Installing a non-condensing steam electric generating turbine at Metro WWTP to replace a pressure reducing station. This is estimated to recover 4.4 million kWh/yr.
- Completing the 19 lighting projects at Metro WWTP, with an estimated savings of 1.25 million kWh/yr.
- Replacing centrifuge back drives at Metro WWTP, with an estimated savings of 2.5 million kWh/yr.

In 2012 MCES was the proud recipient the Minnesota Governor's Continuous Improvement Award for its successful effort to reduce energy purchases, which translates into savings for Minnesota taxpayers.

#### 2. Introduction

The primary activity of MCES is to collect, treat and discharge wastewater (Appendix A shows the energy costs associated with providing these services), while meeting or exceeding permit standards at fair and reasonable user rates. 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. Additionally there are increasing pressures from utility providers in the form of rate increases, and demand charges due to the rising costs of primary fuel, generation and environmental regulations on their end. To help reduce the effect of these pressures will have on the Council and rate payers, MCES General Manager issued energy purchases reduction goals. The goals set forth energy reduction targets to be achieved in the next 20 years. The MCES Energy Team tracks and assists in recommending how MCES can meet these goals.

The MCES Energy Team, which is made up of individuals from across MCES, work with MCES business units to develop and maintain a comprehensive and sustainable energy management program for MCES that results in the efficient use of energy and financial resources. 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, and track carbon.

This report summarizes progress toward MCES's energy goals as well as looking at benchmarks and highlighting accomplishments for 2012.

# 3. Energy Goal and Benchmarks

# A. 2015 and 2020 MCES Energy Goals

In 2006, the MCES General Managers set a goal of reducing energy purchases by 15% (with 2006 as the baseline year) by 2010. Upon meeting this goal, the General Manager set two

aggressive energy goals to reduce purchased energy by 25% and 50% (again 2006 is the baseline year), by year-end 2015 and 2020, respectively (Appendix B: 2015 and 2020 MCES Energy Goals). To accomplish these goals, MCES will implement energy efficient technologies and optimize processes that result in actual 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.

Figure 1 shows a significant reduction in MCES purchased electricity, natural gas, and motor vehicle fuels between 2006 and 2012. MCES has 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 for continuing operations has declined 22%.

As of December 31, 2012, MCES purchased energy (all fuels) has been reduced by 19% and is 76% of the way toward meeting the 2015 energy reduction goal. With the natural gas avoided with the new Blue Lake digester, electricity produced in a new turbine generator at Metro plant, and a number of conservation measures MCES anticipates meeting the 2015 goal ahead of schedule.

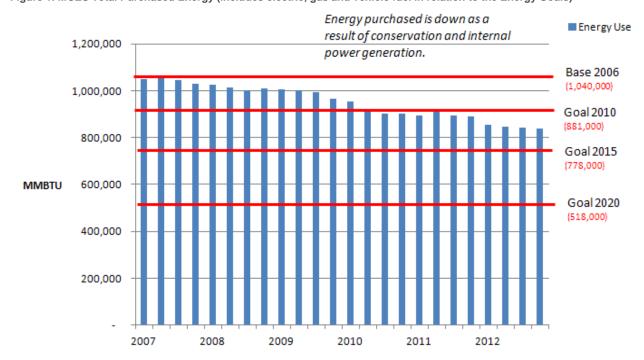


Figure 1: MCES Total Purchased Energy (includes electric, gas and vehicle fuel in relation to the Energy Goals)

To make progress toward meeting the energy goals, MCES has completed most of the "low-hanging fruit" projects. Completed projects include aeration control improvements, increased turbine utilization and decommissioning. Appendix D includes a list of all projects completed between 2007 and 2012.

A key challenge for meeting the 2020 goal will likely be to get energy projects better integrated into the capital project process with high enough priority to get them implemented within the time-frame of the goal. For the 2020 goal, all functional areas of MCES will need to integrate energy decisions into all their work. MCES will need to add some additional capital projects,

most likely to generate renewable energy. Staff believe the goal is achievable, but will require a higher level of attention and investment than during the last few years. Leading the way, the Council, in April 2012, made energy work one of its top 5 initiatives Council-wide in the principles for 2013 budgeting.

# B. Benchmarking: Energy Star

MCES uses an online benchmarking tool (Energy Star 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 believes that Energy Star is a good tool for tracking trends at individual facilities but not for comparing one facility to the next due to the differences in operations (permit requirements, technologies and buildings age and constraints) and economies due to size at the different facilities. The trends lines show if an individual facility is improving and sustaining its energy performance over time.

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 49 to 73. The significant improvement in the weighted average energy star rating demonstrates that MCES energy initiatives are having an impact. (Figure 2: Energy Star Ratings by MCES Facility). Although the total weighted average rating for MCES is up, there is considerable variability within the individual plants.

2010 increase at Metro WWTP due to aeration operating changes .

2008 decrease at Blue Lake and Seneca related to new phosphorus permit limits.

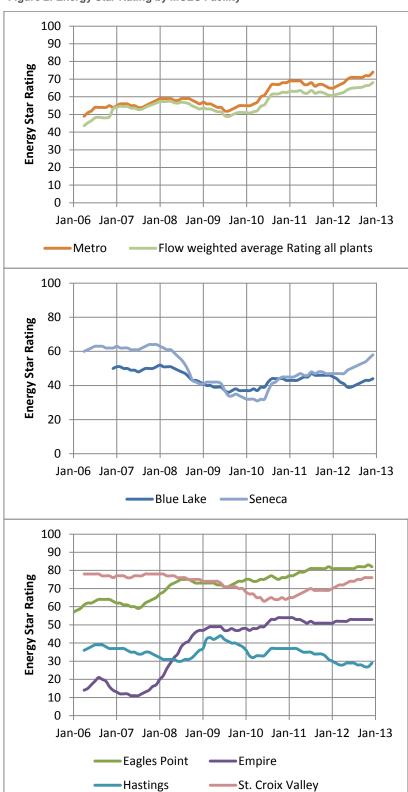
2010 – 2012 increase at Seneca resulting from new DO controls.

2013 increase at Blue Lake due to the digester start-up.

2007 -2008 increase at Eagles Point related to new diffusers.

2007 – 2009 increase at Empire due to capital improvements throughout the plant.

Figure 2: Energy Star Rating by MCES Facility



# 4. Energy Highlights

#### A. Conservation

Energy savings from conservation arise from one-time projects and ongoing efforts to make treatment processes more efficient. Major efforts that contributed to savings in 2012 include aeration optimization, increased steam utilization, facility decommissioning and recommissioning.

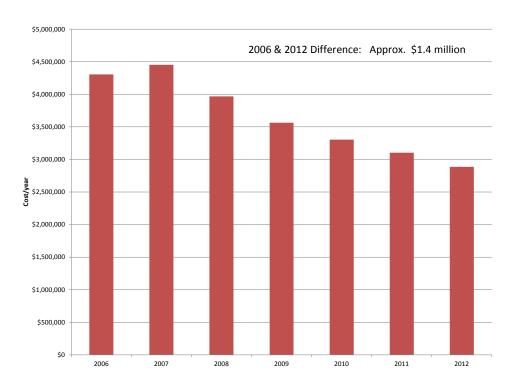
#### **A.1 Aeration Optimization**

Aeration is one of the main process areas for realizing energy cost savings as it can account for 30% - 60% of the total energy costs at a wastewater treatment plant. Operating large horsepower blowers account for a majority of the energy costs associated with aeration, therefore minimizing airflow while meeting process requirements can significantly reduce costs. Minimizing air flow requires ongoing maintenance and optimizing process controls.

#### A.1.1 Metro Wastewater Treatment Plant (in St. Paul)

MCES has saved about \$1.4 million in energy costs (based on 2012 electrical rates) at its Metro Wastewater Treatment Plant between 2006 and 2012 through aeration control improvements. Control improvements included diffuser cleaning and replacement, defining optimal dissolved oxygen levels, achieving optimal DO set points more efficiently through programming, and determining optimal blower combinations, As a majority of the energy costs from aeration are associated with blower usage, Figure 3 provides a representation of the decreasing aeration energy costs at the Metro WWTP over time.

Figure 3: Estimated Metro Blower Energy Costs (2012 electrical rates)



#### A.1.2 Seneca Wastewater Treatment Plant (in Eagan)

MCES has saved nearly \$240,000 in energy costs (based on 2012 electrical rates) at its Seneca Wastewater Treatment Plant between 2006 and 2012. Figure 4 provides a representation of the decreasing aeration energy costs at the Seneca WWTP over time. Specific activities that were implemented in 2012 include cleaning 2 aeration basins and closing down manual air valves in all basins.

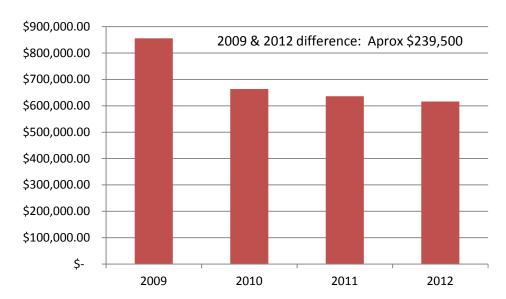


Figure 4: Seneca Blower Costs (2012 electrical rates)

#### A.1.3 Blue Lake Wastewater Treatment Plant (in Shakopee)

In 2012, MCES staff decreased the minimum airflow set-point allowing for lower air flows while continuing to maintain the dissolved oxygen requirements. In addition, the blower header pressure was lowered from 7.6 to 7.2 psi during the winter months and the pond air flow was kept at a minimum.

#### A.1.4 St. Croix Valley Wastewater Treatment Plant (in Oak Park Heights)

The air diffusers at the St. Croix Valley WWTP were fouled with precipitated minerals, in response MCES replaced all the diffusers in one basin were replaced in 2012. The diffusers in the other two basins will be replaced as necessary.

#### A.2 Steam Utilization

The priority for the steam being created during the solids incineration process at the Metro Wastewater Treatment Plant is to supply the plant heating and processing needs. Utilizing the steam reduces the need to use auxiliary boilers which burn natural gas to create heat for the plant.

#### A.2.1 Installation of 830 kW Turbine

MCES constructed and installed a \$1.88 million dollar 830 kilowatt (kW) turbine generator at the Metro Plant (2011-2012). This turbine generator reduces the pressure of the steam coming off the waste heat boilers and captures the energy of the steam to produce electricity to be used elsewhere at the facility. The cost of the project was offset by grants from the Minnesota Department of Commerce, Division of Energy Resources and the Public Facilities Authority, as

well as a rebate from Xcel Energy's Conservation Improvement. The Project was completed in early 2013.

#### A.2.2 Increase 4.7 MW Turbine Utilization

Continual efforts to optimize the use of the 4.7 Megawatt turbine, has led to an increase in the output from the turbine by about 4,000 MWh per year since 2005, when it was first installed. This equates to a savings of about \$240,000 per year.

Plant operators at Metro continued to run the turbine through the 2011-2012 winter months (November – March). In previous years the turbine was rarely used in the winter as the steam was used to heat the plant rather than sent through the turbine to generate electricity. However, with natural gas prices relatively low in 2012, staff closely monitored natural gas prices and determined the best and most efficient use for the steam. Depending on the cost of natural gas, it may be more cost-efficient to use the steam for electricity generation and run auxiliary boilers to heat the plant. This close, ongoing monitoring of conditions translated into the production of about 1900 MWh of electricity and a savings of about \$114,000 in electrical costs.

#### A.3 Recommissioning Study (St. Croix Valley Wastewater Treatment Plant)

A recommissioning study was completed at St Croix Valley in September of 2012. The study identified potential for energy savings in 18 measures. Those measures identified would save 140,000 kwh and 2,700 mmbtu. Of the measures identified 5% were implemented immediately and work instructions issued to accomplish 38% of the measures. Another 40% of the measures were deferred, pending the writing of EMS specifications.

#### A.4 Decommisssioning

The old solids processing and incineration building at Metro decommissioning activities continued in 2012. Service and city water, water tower, air handlers, non-essential lights, and some transformers have been shutdown. Electric use based on metered data at year end had dropped by 250 kw and energy has been reduced by 2.3 million kwh. These efforts continue in 2013.

#### B. Finance

In addition to realizing the financial benefit from reducing energy purchases, MCES has benefitted with about \$1 million in 2012 (\$5 million cumulative total 2006 -2012) from energy activities such as tariff changes, load shifting, utility rebates and grant receipts.

#### **B.1 Utility Rebates**

MCES works closely with utilities to identify opportunities for rebates. MCES received about \$100,000 in rebates from utilities (most of the rebates were from Xcel Energy) in 2012. The rebates were mainly for purchasing more efficient motors, drives and pumps.

#### **B.2 Utility Study Funding**

Xcel Energy provided \$16,000 for the ST. Croix recommisioning study in 2012. Xcel also reviewed several of the lighting studies previously completed for Metro Wastewater Treatment Plant and updated the studies as necessary.

# C. Renewable Energy

#### **C.1 Blue Lake Digester**

Construction began in 2009, on an expansion of the solids processing facility at Blue Lake to

produce bio-energy and repacle purchased natural gas. Construction of the new system was completed in 2012 and the methane biogas recovered from that digester facility is now replacing 9 million BTU/hour of fossil fuel.

Environmental improvements and financial savings from the project at Blue Lake include:

- The conversion of natural gas to biogas for fueling the dryer will save an estimated \$500,000 per year. MCES's private partner, NEFCO, is responsible for the use of the biogas.
- When the dryer is offline, the biogas fuels hot water boilers that heat a digester control building, providing an estimated \$50,000 per year savings.
- During sludge drying operations, hot water used to scrub odors from dryer exhaust is used to preheat the sludge, leading to more savings.
- The new facility reduces the mass (amount) of solids requiring treatment, which increases the capacity and lifespan of the solids facility.
- The project received \$2 million in grant funding (as well as discounted loan interest for the remainder of the capital cost) through the Minnesota Public Facilities Authority from the American Reinvestment and Recovery Act.

#### C.2 Solar facility

MCES has selected a private partner to design, build, own and operate a 1.25MW (AC) solar photovoltaic facility at the Blue Lake Wastewater Treatment Plan tand will reduce on-peak energy purchases. MCES will finalize a power purchase agreement in 2013, which allow the private partner to build, own and operate the solar facility on Council land. In return, the Council will purchase the solar generated energy at a set unit price and use the energy at its Blue Lake WWTP.

#### D. Collaborations

#### D.1 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, report, and in some forms of membership independently verify greenhouse gas emissions. The Metropolitan Council joined the Climate Registry as a founding member in 2007.

#### D.2 Metropolitan Energy Policy 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 2012, MEPC:

- Welcomed the Metropolitan Airports Commission as the newest member;
- Completed a web-based "solar energy toolkit" www.mepcsolartoolkit.org;
- Actively participated in the Environmental Initiative's Clean Air Dialog;
- Facilitated discussions with state representatives and senators to better understand the energy-related policy implecations from the 2012 legislative session; and
- Sponsored a solar energy for public facilities workshop.

#### **D.3 Minnesota Chamber of Commerce**

The Council is participating in an intervention group established by the Minnesota Chamber of

Commerce to review and comment on Xcel Energy's 2012 rate case. The Council is also leading a solar rate reform group, which was established following the 2010 Xcel Energy rate case. The solar rate reform group is promoting appropriate valuation for solar generation thorugh contributions to grid capacity particularly during system peak conditions.

#### D.4 State interagency energy and environment 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 state response to legislative energy bills, report 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.

#### **D.5 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. The Council and the U of M collaboration on the biofuel demonstration project at the Empire WWTP continued in 2012. The project measures the carbon content in the soil as well as plant nutrient uptake through the planting and harvesting of woody crops and strips of perennial grasses. In addition, the MCES continues to hire interns from the U of M to assist with energy related projects.

#### **D.6 Xcel Energy**

MCES successfully met the 2012 energy reduction goal included in a Memorandum of Understanding with Xcel Energy. By meeting the goal, MCES received an additional \$22,000 from Xcel Energy (bonus payment for meeting goal) and is on track for meeting the 2013 goal.

# E. Energy Tracking and Carbon Management

#### **E.1 Energy Database**

A power monitoring and energy system was developed to monitor a manageable number of equipment groups at the Metro Wastewater Treatment Plant. The system focuses on equipment groups that have the largest energy demand and offer the greatest potential for energy savings. The power monitoring system uses power monitoring equipment for the:

- Largest aeration blowers, ID fans, fluidizing air blowers, centrifuges, effluent pumps, 408 compressors, and turbine cooling recirculation pumps;
- RAS pumps; and
- Cake pumps, Solids Management Building compressors, centrifuge feed pumps, EPT foul air fans, SST sludge transfer pumps, grit slurry, thickened primary sludge pumps, and primary clarifier foul air fans.

Energy trending techniques and summary dashboards were developed to assist in identifying actionable energy reduction measures and to track energy improvements over time. Figure 5 is an example of a dashboard. When the blue arrow is in the red zone this lets operators know that the equipment the dashboard is tracking is using more energy than it should prompting the operator to take action. As power metering is installed for additional equipment the techniques can be refined and expanded as necessary.

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Effluent P897

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Figure 5: Sample Energy System Dashboard

#### **E.2 Carbon Management**

A better understanding of the protocols and the formulas used in determining emitter activity continually improves the 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 energy projects' impact on greenhouse gas (GHG) emissions. Also, the prior year emission benchmarks may provide a basis for claiming some sort of early action credits should MCES be subject to regulation on emissions in the future.

Table 1: MCES Emissions (Metric tons CO<sub>2</sub>equivalent)

	2008	2009	2010	2011
Direct Emissions  Metric tons CO <sub>2</sub> equivalent	101,004	104,712	97,538	101,651
Biogenic Emissions  Metric tons CO <sub>2</sub> equivalent	150,711	142,325	163,630	152,668
Indirect Emissions  Metric tons CO <sub>2</sub> equivalent	188,146	177,126	143,345	164,701
Total Emissions  Metric tons CO <sub>2</sub> equivalent	439,861	424,163	404,513	419,020

#### F. Awards

MCES was the proud recipient the 2012 Minnesota Governor's Continuous Improvement Award for its successful effort to reduce energy purchases, which translates into savings for Minnesota taxpayers.

#### 5. Conclusion

The Metropolitan Council Environmental Services (MCES) spent nearly \$16 million in 2012 on energy to collect, treat and discharge nearly 77 billion gallons of wastewater. The costs associated with this energy consumption, along with other costs to provide MCES services, are passed along to ratepayers. While the environmental benefits and savings to metropolitan ratepayers are the primary drivers for 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, and 50% by 2020. In order to meet the extended energy goal, the Energy Team will meet regularly 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.

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 where warranted, and pursue energy funding opportunities and policies relevant to MCES. Moreover we work with Council communications staff to provide information on these efforts to the public at:

http://www.metrocouncil.org/Wastewater-Water/Projects/Energy-Conservation-Renewable-Energy.aspx

# Appendix A: MCES Utility Costs (dollars) per Account Record (2006 – 2012)

, (PPO		my Coole	(dollars) per Account Necord			1 (2000 – 2012)				
Dept	Description	2004	2005	2006	2007	2008	2009	2010	2011	2012
	Electric	11,253,808.69	12,070,813.75	13,809,309.60	13,509,612.22	14,414,559.05	13,643,533.39	13,188,375.64	13,555,123.05	13,346,424.20
	Fuel Oil	412,616.71	39,309.56	20,512.89	27,049.25	54,703.39	107,279.63	26,774.51	27,660.68	10,590.91
	Gas	4,715,585.69	2,652,957.57	2,816,841.10	2,724,430.64	2,840,012.04	2,063,172.16	1,843,585.58	1,923,253.71	1,589,782.32
	Motor Vehicle Fuel	254,235.69	378,487.73	480,568.22	570,845.92	567,929.92	338,101.99	403,859.99	533,845.00	447,347.99
	Total									15,394,145.42
5501 - E	lecric By Department									
73310	Inter Administration	33,070.86	42,625.98	49,576.24	45,581.76	0.00	0.00	0.00	0.00	62,189.93
73311	Inter Admin Administration	0.00	0.00	0.00	0.00	(75.64)	0.00	0.00	0.00	0.00
73312	Inter Admin Operations	0.00	0.00	0.00	0.00	46,009.64	45,989.58	52,983.61	58,484.45	43.33
73320	Interceptor Operations	864,242.96	1,009,682.57	997,065.78	1,115,065.92	(2,957.44)	0.00	0.00	0.00	1,163,785.24
73322	Int Lift Stations Operations	0.00	0.00	0.00	0.00	1,215,729.38	1,246,459.41	1,263,249.49	1,301,287.31	53,179.59
73330	Interceptor Maintenance	63,779.65	77,017.25	92,641.34	88,195.51	0.00	0.00	0.00	0.00	224,145.27
73331	Int Meter Administration	0.00	0.00	0.00	0.00	15.28	11.49	0.00	14.03	0.00
73332	Int Meter Operations	0.00	0.00	0.00	0.00	131,558.79	149,139.42	106,094.57	113,473.46	8,477.35
73333	Inter Meter Maintenance	0.00	0.00	0.00	0.00	22.48	0.00	39.19	0.00	0.00
73340	Inter Sewers	0.00	315.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
73350	Inter Engineering	5,736.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
73360	Inter Septage Management	0.00	0.00	0.00	0.00	4,060.08	7,234.94	7,773.44	7,549.02	9,202.61
73820	Empire Operations	492,873.56	544,523.85	881,153.43	827,512.40	910,810.83	771,135.81	828,429.73	869,379.38	886,631.40
73910	WW Treatment Services Admin	157,429.07	164,007.10	186,838.74	175,765.43	184,397.19	177,048.70	164,002.69	168,691.32	161,612.50
73940	Metro Liquids Business Unit	4,702,180.15	4,909,612.42	5,596,332.71	5,307,366.11	0.00	0.00	0.00	0.00	0.00
73942	Metro LBU Operations	0.00	0.00	0.00	0.00	5,584,215.09	4,710,973.89	4,410,569.68	4,520,735.68	4,324,574.77
73950	Metro Solids Business Unit	1,309,917.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
73960	Metro Solids Mgmt Bus Unit	1,557,561.34	2,975,353.22	3,388,846.52	3,215,608.39	0.00	0.00	0.00	0.00	0.00
73962	Metro SMBU Operations	0.00	0.00	0.00	0.00	3,395,573.06	3,728,456.40	3,445,546.22	3,531,620.91	3,378,268.46
73970	MBU-Plant Srvs	5,189.96	6,328.88	5,384.85	4,248.14	4,300.12	4,513.89	5,431.79	6,881.80	8,011.40
73980	Support Services Bus Unit	19,078.60	7,805.18	0.00	0.00	0.00	(5,400.00)	0.00	18.17	0.00
74120	Seneca Operations	833,005.81	913,705.95	1,082,264.76	1,097,961.71	1,241,642.16	1,314,845.30	1,214,929.61	1,233,797.66	1,156,442.95
74150	Seneca Incineration	7,088.39	1,276.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Dept	Description	2004	2005	2006	2007	2008	2009	2010	2011	2012
74220	Blue Lake Operations	581,578.61	718,514.86	708,144.06	758,680.18	834,167.62	802,023.21	913,316.79	998,996.15	1,103,524.72
74280	Blue Lake NEFCO	133,340.49	160,823.45	161,169.46	181,907.51	191,258.81	178,526.94	213,335.10	192,616.59	233,733.60
74620	Eagles Point Operations	148,315.94	170,151.03	288,768.25	275,568.40	256,206.64	229,904.83	249,966.41	254,339.92	272,441.03
74720	Hastings Operations	68,924.80	88,553.87	73,131.01	82,991.32	98,317.19	90,213.85	94,708.18	105,917.32	108,021.42
74820	St Croix Valley Operations	101,917.55	112,124.76	120,190.73	129,303.53	142,003.34	140,819.72	155,611.23	158,166.48	161,497.49
75020	Rosemount Operations	146,028.40	143,773.57	152,023.66	176,990.25	152,343.03	26,273.92	35,193.77	7,656.91	4,358.15
75310	Tech Srvs Administration	0.00	0.00	265.35	0.00	0.00	0.00	0.00	0.00	0.00
75362	Tech Srvs Eng Plan	0.00	0.00	0.00	33.01	0.00	0.00	0.00	0.00	0.00
75363	Tech Srvs Construction	0.00	0.00	331.20	0.00	0.00	0.00	0.00	0.00	0.00
81210	EQA-IWPP Admin	13,102.58	14,251.92	15,704.06	17,007.03	14,618.73	14,404.84	16,207.89	14,613.99	15,787.94
81420	EQA-Water Qual Monitor - Test	6,658.58	7,785.03	7,239.14	7,237.16	7,993.37	8,077.82	7,993.49	7,499.64	7,369.16
86620	EQA-MN River-03 Monitor/Test	181.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
86720	EQA-WOMP2-04 Monitor/Test	1,946.60	2,404.16	1,040.86	0.00	0.00	0.00	0.00	0.00	0.00
86820	EQA-MN River-04 Monitor/Test	659.47	176.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00
86920	EQA-WOMP Monitor Test	0.00	0.00	1,122.73	2,536.24	2,349.30	2,879.43	2,992.76	3,382.86	3,125.89
86950	EQA-WOMP Public Educ	0.00	0.00	27.08	0.00	0.00	0.00	0.00	0.00	0.00
95600	Future Hasting Site	0.00	0.00	47.64	52.22	0.00	0.00	0.00	0.00	0.00
		11,253,808.69	12,070,813.75	13,809,309.60	13,509,612.22	14,414,559.05	13,643,533.39	13,188,375.64	13,555,123.05	13,346,424.20
5502 - Fu	iel Oil By Department									
73320	Interceptor Operations	14.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,141.18
73322	Int Lift Stations Operations	0.00	0.00	0.00	0.00	0.00	21,183.29	22,015.51	14,333.32	4,571.50
73941	Metro LBU Administration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	133.77
73943	Metro LBU Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	191.38	89.17
73960	Metro Solids Mgmt Bus Unit	229,575.89	34,522.44	14,464.99	19,210.85	0.00	0.00	0.00	0.00	0.00
73962	Metro SMBU Operations	0.00	0.00	0.00	0.00	45,075.01	84,476.34	0.00	0.00	0.00
73970	MBU-Plant Srvs	3,820.97	0.00	1,618.80	0.00	9,628.38	1,935.00	4,759.00	6,772.71	0.00
74040	Maintenance Routine	1,495.24	4,787.12	4,429.10	7,750.66	0.00	0.00	0.00	6,308.59	3,424.39
74120	Seneca Operations	7,709.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74130	Seneca Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	54.68	230.90
74280	Blue Lake NEFCO	0.00	0.00	0.00	87.74	0.00	0.00	0.00	0.00	0.00

Dept	Description	2004	2005	2006	2007	2008	2009	2010	2011	2012
-	MCES Materials Supplies									
96300	Adjs	170,000.00	0.00	0.00	0.00	0.00	(315.00)	0.00	0.00	0.00
		412,616.71	39,309.56	20,512.89	27,049.25	54,703.39	107,279.63	26,774.51	27,660.68	10,590.91
5503 - G	as By Department									
73310	Inter Administration	21,427.63	24,890.10	21,360.58	33,710.96	0.00	0.00	0.00	0.00	28,396.17
73312	Inter Admin Operations	0.00	0.00	0.00	0.00	38,493.55	29,612.77	24,643.26	33,165.82	2,292.82
73320	Interceptor Operations	76,132.61	76,350.47	110,102.42	116,689.71	2,957.44	0.00	0.00	0.00	110,906.53
73322	Int Lift Stations Operations	0.00	0.00	0.00	0.00	147,454.29	169,077.46	149,923.56	148,067.29	4,681.60
73323	Int Lift Stations Maintenace	0.00	0.00	0.00	0.00	(311.51)	70.96	0.00	0.00	0.00
73330	Interceptor Maintenance	7,476.97	5,117.42	4,878.15	4,725.06	0.00	0.00	0.00	0.00	5,415.59
73332	Int Meter Operations	0.00	0.00	0.00	0.00	4,876.79	5,276.10	4,938.22	6,997.97	1,111.72
73340	Inter Sewers	1,238.34	1,053.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00
73343	Inter Sewers Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	311.68	0.00	0.00
73360	Inter Septage Management	0.00	0.00	0.00	0.00	9,259.13	13,199.62	10,484.83	13,067.69	14,155.14
73820	Empire Operations	29,932.04	61,646.11	208,668.36	237,287.85	154,764.37	139,397.19	110,047.40	140,033.94	81,201.45
73940	Metro Liquids Business Unit	2,914.51	212.37	2,838.43	3,378.03	0.00	0.00	0.00	0.00	0.00
73942	Metro LBU Operations	0.00	0.00	0.00	0.00	5,740.75	3,104.65	714.98	0.00	0.00
73943	Metro LBU Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	137.68
73960	Metro Solids Mgmt Bus Unit	3,123,650.25	724,747.68	860,904.37	680,809.23	0.00	0.00	0.00	0.00	0.00
73962	Metro SMBU Operations	0.00	0.00	0.00	0.00	705,743.73	506,080.88	414,190.13	448,093.16	445,302.17
74040	Maintenance Routine	360.81	257.07	0.00	57.29	0.00	0.00	0.00	149.64	(1,033.70)
74150	Seneca Incineration	418,992.14	383,242.62	418,971.83	386,383.58	456,004.25	336,279.72	266,977.05	238,582.14	218,531.63
74220	Blue Lake Operations	152,718.61	208,350.46	183,306.92	198,987.08	145,822.13	136,532.74	137,412.79	169,576.87	128,455.80
74250	Blue Lake Solids	31,502.39	63,127.17	4,184.33	18,941.33	18,113.32	18,952.96	23,976.43	28,286.82	199,367.37
74280	Blue Lake NEFCO	676,740.64	880,605.61	802,646.09	831,780.64	941,897.62	553,135.24	567,667.81	564,439.32	258,503.91
74620	Eagles Point Operations	25,813.03	38,517.21	44,207.84	46,276.28	45,150.07	34,658.75	27,884.89	29,080.25	24,304.13
74720	Hastings Operations	60,404.60	83,515.67	79,260.58	82,657.11	77,767.46	43,258.36	46,424.54	45,396.59	32,874.49
74820	St Croix Valley Operations	50,221.64	79,400.50	57,047.65	59,789.89	56,461.52	54,397.04	42,386.22	45,002.71	23,953.62
75020	Rosemount Operations	9,831.84	12,690.76	10,424.20	12,880.99	18,807.02	12,249.24	6,458.57	7,620.44	3,923.03
81210	EQA-IWPP Admin	8,519.21	9,232.38	8,039.35	10,126.08	10,994.01	7,798.96	9,166.85	5,693.06	7,301.17
81420	EQA-Water Qual Monitor - Test	0.00	0.00	0.00	0.00	0.00	89.52	0.00	0.00	0.00

Dept	Description	2004	2005	2006	2007	2008	2009	2010	2011	2012
81510	EQA-Analytical Lab Srvs	0.00	0.00	0.00	(50.47)	0.00	0.00	0.00	0.00	0.00
86920	EQA-WOMP Monitor Test	0.00	0.00	0.00	0.00	16.10	0.00	0.00	0.00	0.00
95500	MCES Reserve & Liability Fund	0.00	0.00	0.00	0.00	0.00	0.00	(23.63)	0.00	0.00
96300	MCES Materials Supplies Adjs	17,708.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		4,715,585.69	2,652,957.57	2,816,841.10	2,724,430.64	2,840,012.04	2,063,172.16	1,843,585.58	1,923,253.71	1,589,782.32
5330 - M	otor Vehicle Fuel By Departme	ent								
-										
73310	Inter Administration	100,946.19	156,671.95	165,035.72	169,489.48	0.00	0.00	0.00	0.00	112,138.00
73311	Inter Admin Administration	0.00	0.00	0.00	0.00	0.00	417.59	270.14	41,964.93	40,743.66
73312	Inter Admin Operations	0.00	0.00	0.00	0.00	14,623.14	47,713.89	68,020.85	61,910.05	0.00
73313	Inter Admin Maintenance	0.00	0.00	0.00	0.00	0.00	0.39	0.00	3,413.01	0.00
73320	Interceptor Operations	14,791.96	29,175.63	29,571.34	24,822.70	0.00	0.00	0.00	0.00	22,356.31
73321	Inter Lift Stations Admin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6,736.82	0.00
73322	Int Lift Stations Operations	0.00	0.00	0.00	0.00	129,203.82	25,188.52	37,288.54	28,867.53	2,724.62
73323	Int Lift Stations Maintenace	0.00	0.00	0.00	0.00	150.72	70.59	747.97	546.94	0.00
73330	Interceptor Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	421.27
73332	Int Meter Operations	0.00	0.00	0.00	0.00	41,179.95	23,894.73	22,647.63	15,157.10	0.00
73333	Inter Meter Maintenance	0.00	0.00	0.00	0.00	0.00	3,476.08	0.00	8,543.13	0.00
73340	Inter Sewers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,370.08
73342	Inter Sewers Operations	0.00	0.00	0.00	0.00	42,694.21	25,465.70	38,778.61	19,146.50	126.48
73343	Inter Sewers Maintenance	0.00	0.00	0.00	0.00	365.76	6,604.89	3,722.28	6,704.66	0.00
73350	Inter Engineering	0.00	0.00	0.00	0.00	1,203.92	0.00	0.00	0.00	0.00
73820	Empire Operations	18,097.38	40,209.53	68,389.66	118,940.31	51,636.16	37,836.82	42,162.22	56,679.31	63,245.82
73830	Empire Maintenance	505.19	0.00	0.00	16,473.97	38.33	0.00	0.00	105.88	470.92
73910	WW Treatment Services Admin	1,571.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
73920	Plant Engineering	0.00	0.00	68.28	0.00	0.00	0.00	0.00	0.00	0.00
73940	Metro Liquids Business Unit	2,270.66	4.27	1,364.23	5,407.68	0.00	0.00	0.00	0.00	0.00
73942	Metro LBU Operations	0.00	0.00	0.00	0.00	11,001.20	0.00	0.00	24,027.75	0.00
73943	Metro LBU Maintenance	0.00	0.00	0.00	0.00	3,237.47	5,202.71	2,187.36	5,125.63	1,387.01
73960	Metro Solids Mgmt Bus Unit	3,841.31	545.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Dept	Description	2004	2005	2006	2007	2008	2009	2010	2011	2012
73962	Metro SMBU Operations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,704.37	0.00
73963	Metro SMBU Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43.74
73970	MBU-Plant Srvs	0.00	0.00	0.00	0.00	4,835.56	5,591.46	6,308.73	9,445.68	9,844.54
73980	Support Services Bus Unit	554.99	757.95	475.49	743.84	47.97	1.81	47.28	952.33	1,200.01
74040	Maintenance Routine	19,782.41	32,518.77	33,276.71	39,850.01	41,684.69	25,079.40	26,865.96	37,044.78	28,821.67
74120	Seneca Operations	391.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74150	Seneca Incineration	0.00	0.00	0.00	0.00	42.05	0.00	0.00	0.00	0.00
74160	Seneca N-Viro to 74150	812.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74170	Seneca Plant Services to 74130	0.00	307.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74210	Blue Lake Administration	0.00	32.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74220	Blue Lake Operations	12,196.55	12,913.91	15,649.80	16,340.11	17,249.11	11,788.09	12,702.85	18,271.84	1,499.81
74230	Blue Lake Maintenance	1,122.48	0.00	52.07	0.00	320.64	3,301.55	3,244.65	588.31	12,326.54
74620	Eagles Point Operations	12,548.12	15,641.30	52,310.62	60,334.74	63,744.33	37,765.70	43,245.73	62,459.65	59,030.89
74630	Eagles Point Maintenance	0.00	0.00	0.00	413.00	172.19	2,125.80	65.29	242.15	125.12
74720	Hastings Operations	11,499.25	16,066.75	32,884.45	32,600.27	43,533.97	15,577.57	27,938.70	42,017.52	31,051.24
74730	Hastings Maintenance	0.00	0.00	0.00	74.77	87.55	54.41	0.00	91.92	64.14
74820	St Croix Valley Operations	22,362.81	31,575.25	30,591.86	34,018.56	37,304.05	24,499.48	25,120.18	32,954.63	23,894.98
74830	St Croix Valley Maint.	28.15	0.00	10.00	0.00	7,180.36	0.00	0.00	0.00	0.00
75310	Tech Srvs Administration	7,373.52	12,756.75	18,315.18	19,866.91	19,185.29	1,433.96	4,045.80	1,063.71	1,542.34
75362	Tech Srvs Eng Plan	0.00	0.00	0.00	0.00	0.00	0.00	38.00	0.00	0.00
75363	Tech Srvs Construction	0.00	215.79	171.38	118.35	192.30	9,852.05	12,988.79	17,810.89	13,916.54
75700	WWS Warehouse	0.00	6.00	0.00	0.00	0.00	0.00	0.00	0.64	0.00
75800	Fleet Management	2,276.02	2,818.49	2,889.42	3,333.75	5,338.53	2,642.40	2,288.22	2,385.89	2,773.12
80912	EQA-WRA Watershed Coord	29.77	23.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80925	EQA-WRA Env Assessment	0.00	0.00	27.40	0.00	0.00	0.00	0.00	0.00	0.00
81210	EQA-IWPP Admin	7,193.20	9,444.14	10,370.71	9,591.73	13,044.65	8,596.88	8,291.72	8,923.79	4,221.25
81220	EQA-IWPP Direct Progs	978.43	1,476.24	1,221.74	2,485.21	1,166.76	781.86	561.04	1,047.17	1,532.52
81240	EQA-IWPP Services	0.00	0.00	0.00	0.00	0.00	52.00	0.00	0.00	0.00
81310	Research & Dev Admin	466.97	670.05	641.59	768.07	645.09	808.84	484.12	0.00	0.00
81410	EQA-Water Qual Admin	6,219.16	8,089.46	9,610.40	8,162.25	8,812.69	6,804.38	7,087.39	9,074.67	5,501.74
81420	EQA-Water Qual Monitor - Test	2,767.28	1,216.02	1,599.55	1,647.99	1,704.54	1,115.43	2,092.85	2,470.37	450.55

Dept	Description	2004	2005	2006	2007	2008	2009	2010	2011	2012
81510	EQA-Analytical Lab Srvs	1,030.41	1,156.81	1,064.04	702.78	732.03	575.28	491.52	1,342.76	1,271.76
81610	EQA-Air Qual Administration	2,236.19	3,446.25	4,241.05	3,710.52	3,271.40	2,404.94	2,475.17	3,013.22	1,455.00
81700	EQA-Environmental Compliance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.99
86620	EQA-MN River-03 Monitor/Test	(745.18)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
86720	EQA-WOMP2-04 Monitor/Test	456.80	330.46	45.24	0.00	0.00	0.00	0.00	0.00	0.00
86820	EQA-MN River-04 Monitor/Test	52.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
86920	EQA-WOMP Monitor Test	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.37
90110	MCES Safety	578.55	416.52	690.29	948.92	2,299.49	1,376.79	1,650.40	2,009.47	734.96
		254,235.69	378,487.73	480,568.22	570,845.92	567,929.92	338,101.99	403,859.99	533,845.00	447,347.99

# **Appendix B: 2015 and 2020 MCES Energy Goals**

#### GOAL

Reduce MCES facilities' estimated purchase of energy for continuing operations by 25% as compared to 2006 baseline use by year end 2015 and by 50% by year end 2020 - 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 v ehicles used for wastewater purposes (managed by MCES)
  - 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: 2013 – 2014 MCES Top Energy Projects

Process Objective	<u>Project</u>
Decommissioning: 408 F & I2	Combine loads down to 2 transformers
	Steam system modifications/improvements
Optimize Steam Use	Initiate non-condensing steam turbine
Lighting Redesign	Relamp 19 metro facilities
	Relamp Seneca and Empire
Rebuild	(F and I 1 demolition)Service Building construction
Recommissioning	Metro EPT HVAC Improvements
	Metro RAS/WAS Pump drive replacement
Combined Heat and Power	Engine Installation (Empire Solids)
Centrifuge upgrade	Replace Back Drives
Sludge Storage	Mixer replacement
Aeration Energy Reduction	Aeration profile evaluation
Energy Monitoring	Real time ID Fan/FAB
HVAC Automation	SCV building management upgrade/retrofit
Insulation Review	Evaluate insulation needs system wide
Renewable Energy	Solar PV Blue Lake WWTP

# **Appendix D: Completed Energy Projects (2007 – 2012)**

The projects included in the list below are intended to represent the types of projects MCES has completed. The savings are estimated based on preliminary study estimates of savings as well as ongoing monitoring. In some cases, such as in the area of aeration, it is more appropriate to monitor the efficiency of the process area over time rather than to monitor the specific savings associated with a specific project because improvements are continually being implemented.

Table 2: Completed Energy Projects 2007 - 2012

	Location	kwh Saved	MMBTU Saved	<b>Cost Saved</b>
DO set point change	Metro	6,957,995		\$472,726
Diffuser cleaning East Basins	Metro	7,075,231		\$480,691
Diffuser cleaning West Basins	Metro	4,590,092		\$311,851
Lower header pressure	Metro	1,922,715		\$130,629
Winter Nitrification Limit Change	Metro	1,848,692		\$125,600
Add new mixers	Metro	800,000		\$54,352
Blower operating change	Metro	1,255,385		\$85,291
LBU operating changes	Metro	30,000		\$2,038
Decommissioning WWTP	Rosemount	1,500,000		\$101,910
Increased turbine utilization	Metro	1,585,120		\$107,693
Turbin Winter Operation	Metro	1,914,050		\$130,041
New diffusers	Eagles Point	824,136		\$55,992
Scrubber packing	Metro	688,000		\$46,743
L35 lift station	RMF	25,000		\$1,699
Admin recommissioning	Metro	175,917		\$11,952
Compressed air modifications	Metro	336,500		\$22,862
Sequencing blowers	Metro	85,000		\$5,775
FLT recommissioning	Metro	135,780		\$9,225
Seneca aeration	Seneca	3,122,100		\$212,115
Blue Lake aeration	Blue Lake	3,000,000		\$203,820
VFD	RMF	300,000		\$20,382
Tunnel Lighting	Metro	1,949,301		\$132,436
Compressor Building Lighting	Metro	172,949		\$11,750
Decommissioning 408	Metro	2,655,753	23,212	\$322,511
WAS Storage	Empire	583,200		\$39,623
ASD and EE Motors	Blue Lake	933,680		\$63,434
Scrubber Heat Exchanger	Seneca		12,500	\$76,512
Aeration Control Loop Tuning	SCV	372,809		\$25,329
Aeration Control Loop Tuning	Eagles Pt	424,032		\$28,809
Plant Air Compressor Modifications	Metro	637,000		\$43,278
Recommission FLT Building	Metro	805,920		\$54,754
Repair Compressor Air Leaks	Metro	189,326		\$12,863
Anaerobic Digester/Biogas	Blue Lake		40,000	\$244,838
Effluent Pumping Optimization	Metro	1,483,959		\$100,820

	Location	kwh Saved	MMBTU Saved	Cost Saved
Efficient Motors	Seneca	46,405		\$3,153
Lighting Redesign	Metro	213,284		\$14,491
Total		46,895,683	35,712	\$3,767,986

# **Appendix E: Key Acronyms**

ARRA American Recovery and Reinvestment Act

Brown & Caldwell, energy engineer on master contract with MCES

Building Energy Efficiency Standards outlined by State of Minnesota

BTU British Temperature Unit (heat required to raise the temperature of 1 pound of

H2O from 39°F to 40°F)

CIP A Minnesota energy utility's Conservation Improvement Program (funded by a

Ratepayer rider), or

CIP The Council or MCES's Capital Improvement Program (the long term plan

published as part of the capital budget documents)

CO2e Carbon Dioxide Equivalent Emissions, per the Climate Registry's protocols Distributed Generation (at a customer site instead of a utilities power plant)

**DO** Dissolved Oxygen

ECO Energy Conservation Opportunity
US Environmental Protection Agency
EQAT Environmental Quality Assurance Team

**ESMT** Environmental Services (senior) Management Team **GHG** Greenhouse Gases, per the Climate Registry protocols

HID High Intensity Discharge; type of light fixture HVAC Heating, ventilation and air conditioning

IREE Initiative for Renewable Energy and the Environment at the U of M

IWPP Industrial Waste and Pollution Prevention section of MCES

kWh Kilowatt hours

JPA Joint Powers Agreement

**LCCMR** Legislative-Citizen Commission on Minnesota Resources

MOU Memo of Understanding with Xcel regarding Process Efficiency Program

MEPC Metro Energy Policy Coalition

MMBTU British Thermal Unit; one thousand BTU where M is the Roman equivalent 1000

MVF Motor Vehicle Fuels

Mw Mega Watts

NEFCO New England Fertilizer Company, a contractor at the MCES Blue Lake WWTP

**OTE** Oxygen Transfer Efficiency

**PDA** Project Delivery Analysis – the process for developing MCES capital projects

PDL Predetermined Demand Levels (in Peak Control Agreements)

**PFA** Minnesota Public Facilities Authority

RAS Return Activated Sludge

SMB Solids Management Building at Metro WWTP SSBU Support Services Business Unit at Metro WWTP

VFD Variable Frequency Devices
WAS Waste Activated Sludge
WWTPs Wastewater Treatment Plants