

MCES ENERGY PERFORMANCE FOR 2013

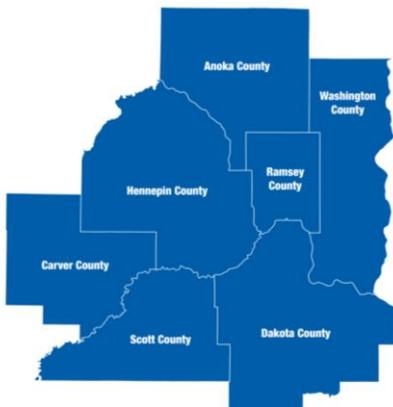


April 2014

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The Metropolitan Council is the regional planning organization for the seven-county Twin Cities area. The Council operates the regional bus and rail system, collects and treats wastewater, coordinates regional water resources, plans and helps fund regional parks, and administers federal funds that provide housing opportunities for low- and moderate-income individuals and families. The 17-member Council board is appointed by and serves at the pleasure of the governor.

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In addition to the Energy Team, thanks to Chris Voigt, Laura Fletcher, Mike Rechtman, and Linda Henning 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, Center Point and Xcel Energy.

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Executive Summary

Metropolitan Council Environmental Services (MCES) has reduced its energy purchases by 21%, from a baseline use of 1,040,000 MMBtu¹ in 2006 to 818,000 MMBtu² in 2013 (reduction equivalent to the energy usage in about 2500 households in Minnesota³). It is 84%² of the way toward meeting its 2015 energy goal of reducing energy purchases by 25%. MCES is confident that it will meet its 2015 goal and has a second goal of reducing its energy purchases by 50% by 2020.

MCES anticipates meeting the 2015 goal based on the energy reductions resulting from the following energy projects, (Appendix C: 2014 – 2015 MCES Top Energy Projects):

- Installation of the Blue Lake Digester, operational 3Q2013, will result in a 25,000 MMBtu savings per year.
- Installation of the non-condensing Turbine at Metro, operational 2Q2013, will result in a 9,000 MMBtu savings per year.
- Replacement of the Return Activated Sludge/Waste Activated Sludge pump drives at Metro, to be completed in 2014, will result in a 4,000 MMBtu savings per year.
- Decommissioning of the 408/ F and I building, to be completed in 2014, will result in a 18,000 MMBTU savings per year.

While there are projects planned that will further reduce MCES energy purchases beyond the 25% reduction goal, MCES does not have enough projects planned to meet the 50% reduction goal. MCES initiated an Energy Master Planning effort in 2013 to develop a roadmap for meeting the 50% energy reduction goal.

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. There are also increasing pressures from utility providers in the form of energy 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's General Manager issued energy purchase reduction goals. The goals set forth energy reduction targets to be achieved in the next 6 years. The MCES Energy Team tracks and assists in recommending how MCES can meet these goals.

¹ A MMBtu is a standard unit of measurement used to denote both the amount of heat energy in fuels and the ability of appliances and air conditioning systems to produce heating or cooling.

² This value is based on annualized 3Q2013 energy data.

³ Source Minnesota Pollution Control Agency

The MCES Energy Team, which is made up of individuals from across MCES, works 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 2013.

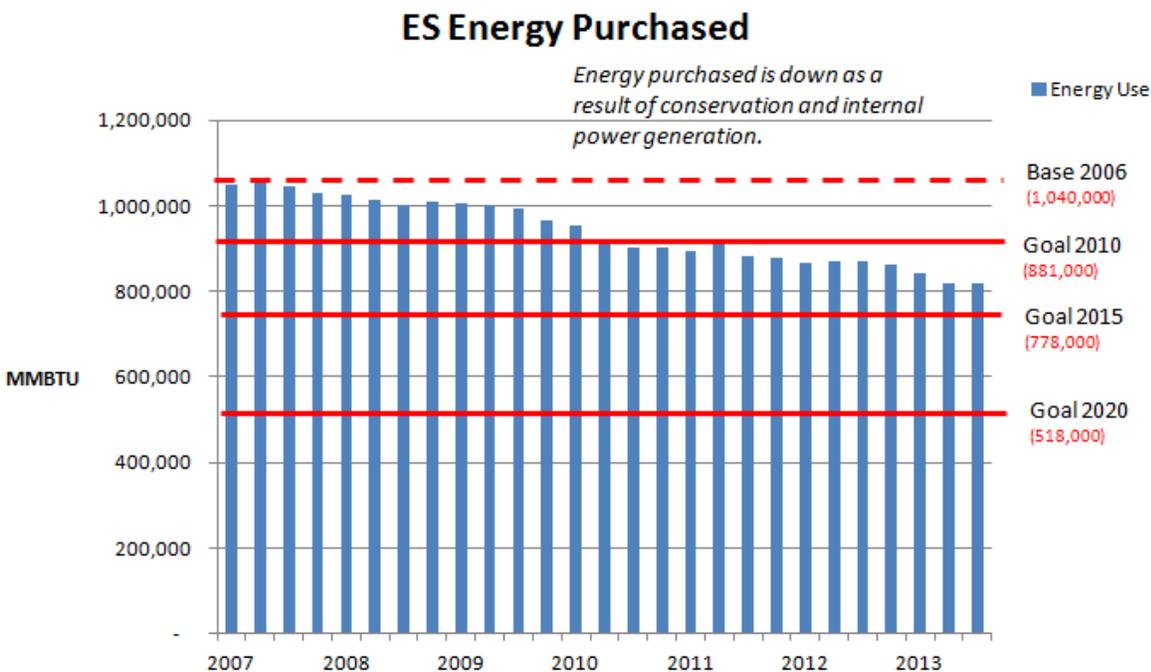
Energy Goal and Benchmarks

A. 2015 and 2020 MCES Energy Goals

The MCES General Manager set two aggressive energy goals in 2010, to reduce purchased energy by 25% and 50% (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 has been and 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.

MCES purchased energy (all fuels) has been reduced by 21% since 2006 and is 84% of the way toward meeting the 2015 energy reduction goal (Figure 2). Appendix D includes a list of all projects completed between 2007 and 2013. Once the natural gas avoided with the new Blue Lake digester and the electricity produced in a new turbine generator at Metro plant is fully realized, and a number of conservation measures MCES plans to complete by 2015, MCES fully anticipates meeting the 2015 goal.

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



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. To align MCES efforts in a direction toward meeting the 2020 goal, it initiated the Energy Master Planning effort in the fall of 2013.

B. Energy Master Plan

MCES initiated an Energy Master Planning process in the fall of 2013, to develop a roadmap for reaching the 50% reduction goal. Brown and Caldwell was hired to develop the plan and MCES Energy Team members are participating in the process by attending workshops and providing data to the consultant. Xcel Energy is also participating in the planning effort by contributing about 85% of the funding for the project as well as participating in planning workshops. The planning effort will culminate with a report that will contain specific projects in sufficient detail for MCES design and implementation. The planning effort is considering demand reduction alternatives as well as energy generation opportunities. The Energy Master Plan report will be completed in spring 2014.

C. 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) of 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 Energy Star rating has improved as the facilities have become more energy efficient. Metro Plant's rating was 54 and it has now climbed to 78. Although the EPA does not give out certifications for wastewater treatment plants, for other types of facilities they do when it has achieved a rating of 75 and above. If EPA were to apply a similar definition to wastewater treatment plants, MCES would now have two facilities that could be classified as energy star facilities, Metro and Eagles Point Plants. On a flow weighted average number MCES is within a couple points of the energy star best in class rating with 73. System wide, the MCES energy star rating has jumped ~20 points. Of all the wastewater MCES treats (weighted average of 73) it is done very efficiently according to this EPA rating.

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 significant improvement in the weighted average energy star rating demonstrates that MCES energy initiatives are having an impact. (Figure 3: Energy Star Ratings by MCES Facility). Although the total weighted average rating for MCES is up, there is considerable variability within the individual plants.

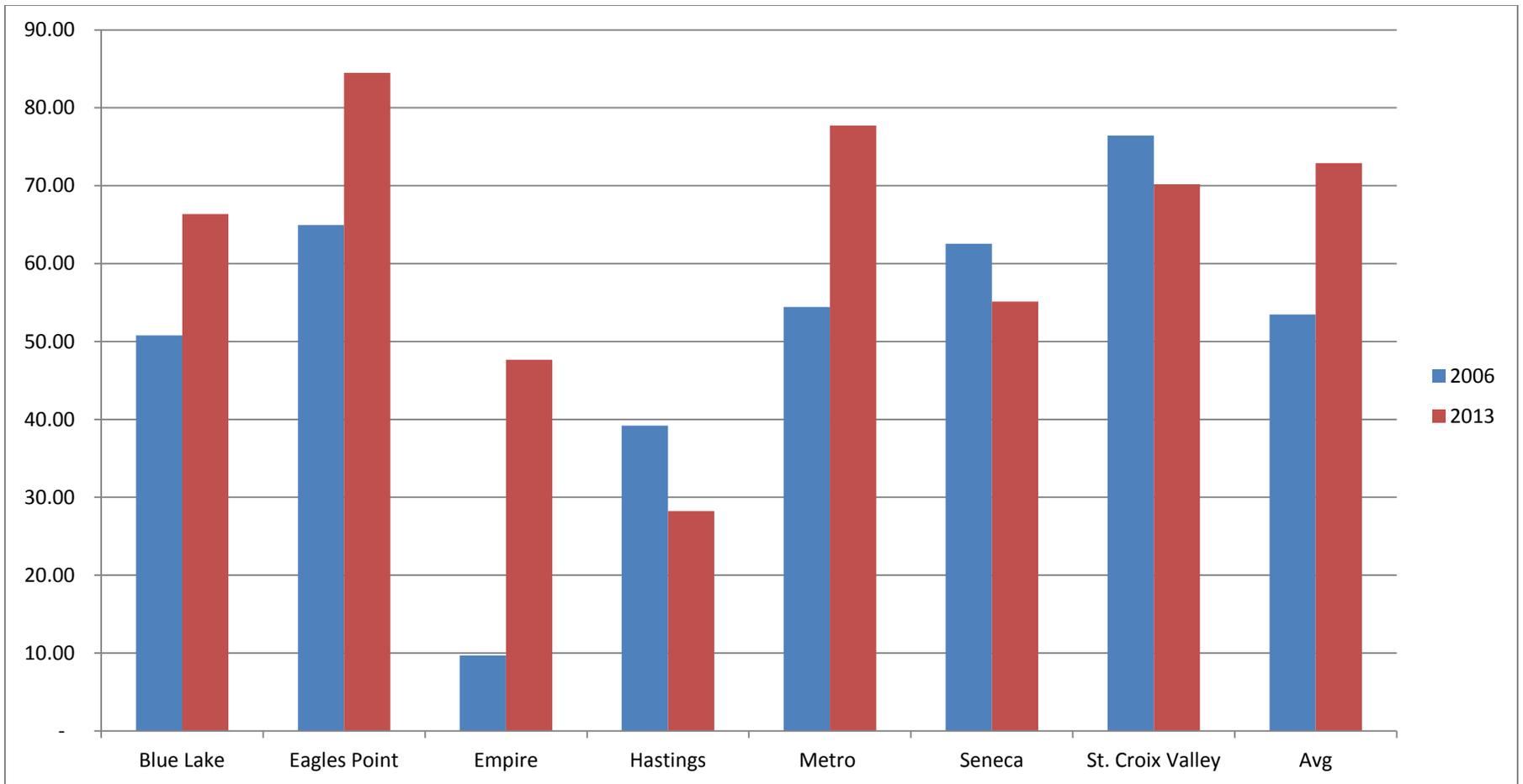


Figure 2: Energy Star Rating by MCES Facility

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 2013 include re-lamping at the Metro plant, improving the Maintenance Warehouse building efficiency, and implementing better mixers.

Metro Plant Relighting

MCES replaced various light sources (incandescent, fluorescent, high pressure sodium (HPS), metal halide (MH) and mercury vapor (MV) with the new generation of fluorescent fixtures or re-lamped and re-ballasted existing fluorescent fixtures with higher efficiency sources at the Metro Plant. The relighting project will save MCES an estimated \$80,000 and 1,100 MWh per year.

Aeration Biowin Modeling

The BioWin model by EnviroSim is a software tool that can be used to model complex wastewater treatment plant processes such as aeration savings based on dynamic actual loading, solids retention time (SRT), and temperature conditions for given process configurations. Based on the aeration airflow savings predicted by BioWin, an energy savings can be calculated. The BioWin model is an improvement compared to the prior model MCES used to calculate aeration savings as each of the zones in the aeration tank can be modeled under dynamic conditions. The prior model treated the aeration tank as a single reactor at steady state. An example of how the Biowin model can be used to estimate aeration savings is the evaluation of the zone 6 airflow reduction at the Metro plant. In this case the Biowin model was the most appropriate model for estimating the savings because the airflow reduction was only in one zone out of twelve and potential effects in downstream zones were important to capture. In addition, the available data was dynamically varying and thus required dynamic model analysis.

Maintenance Warehouse Facility Efficiency

Efforts to increase the energy efficiency at the Maintenance Warehouse Facility include:

- Building a new roof to eliminated the leaking skylights;
- Installing two new HVAC (heating, ventilation, and air conditioning) air handling units along with new electronic controls that are compatible with the upcoming Tridium Niagara Energy Management system (system-wide specification has been completed for this energy management system);
- Replacing high pressure sodium fixtures with new high bay LED (light-emitting diode) fixtures and lighting controls.

In 2014, MCES will continue its efficiency efforts in the Maintenance warehouse facility by replacing the other high intensity discharge fixtures and inefficient fluorescent fixtures.

Mixer Demonstration

A 90-day demonstration test of four 30 horsepower submersible mixers was completed in the sludge storage tank 7. Gravity thickened sludge, stored in Tank 7, is needed to prevent separating that could cause problems with centrifuge dewatering operations. Based on the results of the demonstration, if similar mixers were installed in four of the sludge storage tanks

MCES would save about 18,000 MMBtu per year. Prior to installing the mixers, a Business Case Evaluation will be performed to compare installing the mixers versus leaving the existing system as it is today.

B. Finance

In addition to realizing the financial benefit from reducing energy purchases, MCES has benefitted with nearly \$900,000 in 2013 (\$6 million cumulative for 2006 -2013) from energy activities such as tariff changes, load shifting, utility rebates and grant receipts.

Utility Rebates

MCES works closely with utilities to identify opportunities for rebates. MCES received about \$450,000 in rebates from utilities in 2013. The most notable rebates include the \$150,000 rebate from Centerpoint Energy for the Blue Lake digester (Appendix E: Blue Lake Digester Fact Sheet) and the \$233,000 rebate from Xcel Energy for the non-condensing steam turbine at Metro Wastewater Treatment Plant (Appendix F: Non-condensing Steam Turbine fact sheet). MCES received additional rebates for purchasing more efficient motors, drives and pumps in 2013.

Utility Study Funding

Xcel Energy agreed to contribute \$138,000 to the Energy Master Planning effort that MCES initiated in September 2013. Xcel Energy also paid \$30,000 for a study to evaluate the potential energy production from placing hydro turbine generators in the effluent stream from the Metro Plant (the study concluded that placing turbine generators in the effluent was not a cost effective option, without subsidies, for MCES).

C. Renewable Energy

Blue Lake Solar

MCES has obtained approval to build a solar facility at Blue Lake Plant. This project is a collaboration with a private partner to design, build, own and operate a 1.25 - 1.75 Mega Watt AC (alternating current) facility. In 2013 Oak Leaf was selected as the private partner. A Power Purchase Agreement (PPA) was developed and approved by both parties in 2013. Oak Leaf and MCES worked together to obtain grant funding through Xcel's Renewable Development Fund to further improve the economics of this project. While it sounds likely, the project has not been formally selected to receive the requested \$2 million from the grand fund. The project is currently planned for a fall 2014 completion. Construction notice to proceed is pending a final system size assessment. Also still uncertain are the Public Utility Commission ruling on the solar capacity credit, and final award of an Xcel Energy RDF grant and sale of Solar Renewable Energy Credits (SRECs).

Portfolio Solar

MCES is seriously considering expanding its renewable energy resources, specifically solar, at its Treatment Plants to help meet its 50% reduction goal. MCES has determined through its work on the Blue Lake Solar Project that solar can meet the Council's definition of economically feasible. Future solar projects will benefit from the lessons MCES learned during the Blue Lake Solar project as well as recent and future legislative and utility changes. Specifically the following will likely improve the economics of solar:

- Xcel, in 2013, changed its standby tariff, offering a \$5.15/Kilowatt demand credit for solar capacity. This is an interim tariff but it appears very likely that the final tariff will be in the range of \$5.00 to \$6.00/Kilowatt/month, and be determined in early 2014.
- Renewable Energy Credits for solar will result from the 2013 state law mandating that 4 Minnesota utilities produce 1.5% of their generation from solar resources. There is not a yet a market and the value is uncertain, but likely economically significant.
- The Minnesota Legislature has increased the net metering threshold to 1 Megawatt.

Met Transit also has a strong interest in expanding its solar resources and are working with MCES on a joint RFP. Working together will likely further improve the economics of expanding solar, as the larger project is expected to attract more private vendors and provide them economies of scale.

MCES would like to consider large solar PV systems at Metro, Seneca, Empire and RMF. Met Transit has also identified 7 sites. These facilities all have space available and favorable rate structures for optimum Business Case Evaluation.

Table 1: Portfolio Solar Options and Considerations

Location	Firm Kw	Bill Avg Kw	Price Kwh	Avoided Cost	Solar Size Kw AC (min)	Solar Size Kw AC (max)
Metro	12,500	13,400	\$0.064	\$0.066	2,000	6,500
Seneca	1,900	2,800	\$0.064	\$0.066	1,500	1,900
Empire	1,000	1,800	\$0.068	\$0.066	700	1,000
RMF	113	113	\$0.080	\$0.075	25	113
Blue Lake					500	500
Total					4,075	10,013

Current Status of Portfolio Solar:

- Initial solar site selection, both MCES and Transit
- Engineering evaluation of sites initiated
- SOW draft completed and in review
- Xcel reviewing exclusive franchise rules

This project is planned for implementation in 2015.

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, 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 and annually reports its emissions to the registry.

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 2013, MEPC:

- Performed an organizational review, which resulted in consensus among members that the existing mission, vision, governance, membership, funding and operation policies are still appropriate;
- Completed a web-based Best Practices Repository to share energy-related practices and encourage networking and problem-solving among member entities;
- Actively participated in the Environmental Initiative's Clean Air Dialog;
- Facilitated discussions with state representatives and senators and key state agency heads to better understand the energy-related policy implications from the 2013 legislative session and to anticipate priorities for the 2014 session
- Participated in the Solar Rate Reform Group by contributing funds to assist the MCES-initiated group in its effort to improve the accounting in tariffs for the electrical system benefits (reduced capacity demand and line loss) of and for large solar installations at member entity sites; and
- Sponsored Energy Data Management and Building Automation Systems technical workshops.

Solar Rate Reform Group

Xcel Energy was required to conduct a study of large solar system capacity (1 Megawatt and greater) benefits as an outcome of the 2010 rate case. The Solar Rate Reform Group (SRRG) was formed to support (by MCES staff) and contribute to the solar valuation conversation. The Metropolitan Council has participated in the SRRG since its inception in 2012. To date the SRRG has contributed to the dialogue that resulted in an interim capacity credit of \$5.15 per Kilowatt/month (effective June 1, 2013). The SRRG will conclude its effort to get a fair capacity credit established for large solar in 2014.

State interagency teams

The state interagency Energy and Environment (E&E) 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.

Also in 2013, MCES staff participated in following state teams:

- Interagency Pollution Prevention Team (IPPAT),
- Interagency Climate Adaptation Team (ICAT),
- Climate Change Steering Committee (CCSC), and
- Environmental Quality Board (EQB).

University of Minnesota

MCES and the University of Minnesota (U of M) collaborate on projects and studies of mutual interest. Specific areas of collaboration include:

- The biofuel demonstration project at the Empire Plant continued in 2013. 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.
- A study to identify how to characterize additional waste sources for anaerobic digestion.
- Discussing the potential to reuse of scum, biodiesel production utilizing algae, and alternative solids processing.

Also, MCES will continue to hire interns from the U of M to assist with energy related projects.

Xcel Energy

MCES successfully met the 2013 energy reduction goal outlined in the Memorandum of Understanding (MOU) with Xcel Energy. By meeting the goal, MCES received an additional \$22,000 from Xcel Energy and is on track for meeting the 2014 goal. Through the MOU, Xcel also provides study funding. This year they funded the development of a generic Energy Management System specification, a study on hydrogenation from effluent water flow, and recommissioning studies at Metro Solids Management Building and St. Croix Valley Wastewater Treatment Plant.

E. Energy Tracking and Carbon Management

Energy Management System

MCES has completed the specification for a system-wide Energy Management system. The specification is for the Tridium Niagara AX platform with ASHRAE BACnet protocol compatibility. Tridium Niagara AX is an open source, open license platform that is used by multiple manufacturers and is compatible with the existing building automation controls currently installed in MCES treatment plants. The Niagara AX platform has been successfully installed at other Metropolitan Council facilities including all of Metropolitan Transit and the MCES Regional Maintenance Facility (RMF). The RMF installation is a stand-alone system and could be brought into the system-wide Energy Management System. The St. Croix Valley and Metro Plant Solids Management Buildings are currently installing new HVAC (heating, ventilation and air conditioning) controls that include Tridium Niagara AX controllers.

Tracking Real-Time Data

In recent years MCES has improved its capability to track real-time data. The benefits of tracking real-time data is the ability to monitor equipment performance both in the short-term and long-term. Tracking equipment performance allows MCES to identify and potentially take action in process areas where equipment is not being used efficiently. Specific work that was completed in 2013 includes developing formulas and processes for:

- Tracking the performance and energy efficiency of the effluent pumps,
- Identifying diffuser fouling, and
- Tracking the performance and energy efficiency of the gravity thickened sludge pumps.

In some cases, such as identifying diffuser fouling, the developed process has increased worker efficiency, as well, by allowing staff to track performance electronically rather than in person.

MCES will continue its effort to further track processes using real-time energy data in 2014.

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 is 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. Between 2006 and 2012, energy projects that have reduced electrical purchases have contributed to reducing MCES indirect emissions by about 36,000 metric tons of CO₂ equivalent.

Table 2: MCES Emissions (Metric tons CO₂equivalent)

	2008	2009	2010	2011	2012
Direct Emissions <i>Metric tons CO₂ equivalent</i>	101,004	104,712	97,538	101,651	101,564
Biogenic Emissions <i>Metric tons CO₂ equivalent</i>	150,711	142,325	163,630	152,668	141,643
Indirect Emissions <i>Metric tons CO₂ equivalent</i>	188,146	177,126	143,345	164,701	140,711
Total Emissions	439,861	424,163	404,513	419,020	383,918

Conclusion

The Metropolitan Council Environmental Services (MCES) spent about \$16 million in 2012 on energy to collect, treat and discharge wastewater. The costs associated with this energy consumption, along with other costs to provide MCES services, are passed along to ratepayers. In addition using less energy means less emissions (greenhouse gases and criteria pollutants) that will benefit the region and beyond. 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.

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.

Appendix A: MCES Utility Costs (dollars) per Account Record (2006 – 2013)

Dept	Description	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
	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	14211194.04
	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	16687.23
	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	1785399.12
	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	425708.19
	Total	16,636,246.78	15,141,568.61	17,127,231.81	16,831,938.03	17,877,204.40	16,152,087.17	15,462,595.72	16,039,882.44	15,394,145.42	16,438,988.58
5501 - Electric 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	79,668.44
73311	Inter Admin Administration	0.00	0.00	0.00	0.00	(75.64)	0.00	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	0.00
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	1,456,074.09
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	0.00
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	128,810.78
73331	Int Meter Administration	0.00	0.00	0.00	0.00	15.28	11.49	0.00	14.03	0.00	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	0.00
73333	Inter Meter Maintenance	0.00	0.00	0.00	0.00	22.48	0.00	39.19	0.00	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	0.00
73350	Inter Engineering	5,736.20	0.00	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	0.00
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	1,009,261.34
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	164,008.82
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	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	4,412,093.62
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	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	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	3,444,997.24
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	12,177.24
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	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	1,383,304.59
74150	Seneca Incineration	7,088.39	1,276.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	1,293,864.24

Dept	Description	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
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	223,728.33
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	288,558.01
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	117,471.54
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	164,419.44
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	5,646.42
75310	Tech Srvs Administration	0.00	0.00	265.35	0.00	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	0.00
75363	Tech Srvs Construction	0.00	0.00	331.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81200	EQA-Ind Waste & Poll Prev	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15,401.90
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	0.00
81400	EQA-Water Quality	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8,053.96
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	0.00
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	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	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	0.00
86900	EQA-WOMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,576.02
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	0.00
86950	EQA-WOMP Public Educ	0.00	0.00	27.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
91800	MCES General Manager Office	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	78.02
95600	Future Hasting Site	0.00	0.00	47.64	52.22	0.00	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	14211194.04

5502 Fuel 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	13,832.85
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	0.00
73941	Metro LBU Administration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	133.77	297.22
73943	Metro LBU Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	191.38	89.17	534.41
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	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	0.00
73963	Metro SMBU Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	234.75
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	1,788.00
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	0.00
74120	Seneca Operations	7,709.70	0.00	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	0.00
74280	Blue Lake NEFCO	0.00	0.00	0.00	87.74	0.00	0.00	0.00	0.00	0.00	0.00
96300	MCES Materials Supplies Adjs	170,000.00	0.00	0.00	0.00	0.00	(315.00)	0.00	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	16687.23

Dept	Description	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
	5503 Gas 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	39,319.12
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	0.00
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	175,543.27
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	0.00
73323	Int Lift Stations Maintenece	0.00	0.00	0.00	0.00	(311.51)	70.96	0.00	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	14,911.96
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	0.00
73340	Inter Sewers	1,238.34	1,053.97	0.00	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	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	0.00
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	160,389.27
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	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	0.00
73943	Metro LBU Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	137.68	0.00
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	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	428,374.87
74040	Maintenance Routine	360.81	257.07	0.00	57.29	0.00	0.00	0.00	149.64	(1,033.70)	0.00
74120	Seneca Operations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	245,105.33
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	0.00
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	432,941.90
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	0.00
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	161,740.13
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	29,545.70
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	49,480.77
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	36,150.39
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	4,212.58
81200	EQA-Ind Waste & Poll Prev	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7,683.83
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	0.00
81420	EQA-Water Qual Monitor -Test	0.00	0.00	0.00	0.00	0.00	89.52	0.00	0.00	0.00	0.00
81510	EQA-Analytical Lab Srvs-old	0.00	0.00	0.00	(50.47)	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	16.10	0.00	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	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	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	1785399.12

5330 Motor Vehicle Fuel by Department

Dept	Description	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
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	135,809.83
73311	Inter Admin Administration	0.00	0.00	0.00	0.00	0.00	417.59	270.14	41,964.93	40,743.66	0.00
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	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	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	16,687.13
73321	Inter Lift Stations Admin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6,736.82	0.00	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	0.00
73323	Int Lift Stations Maintanace	0.00	0.00	0.00	0.00	150.72	70.59	747.97	546.94	0.00	0.00
73330	Interceptor Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	421.27	526.87
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	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	0.00
73340	Inter Sewers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,370.08	155.05
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	0.00
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	0.00
73350	Inter Engineering	0.00	0.00	0.00	0.00	1,203.92	0.00	0.00	0.00	0.00	0.00
73710	Supp Srvc-Adminstration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,519.53
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	45,225.00
73830	Empire Maintenance	505.19	0.00	0.00	16,473.97	38.33	0.00	0.00	105.88	470.92	114.93
73910	WW Treatment Services Admin	1,571.25	0.00	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	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	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	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	2,094.99
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	0.00
73962	Metro SMBU Operations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,704.37	0.00	0.00
73963	Metro SMBU Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43.74	332.59
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	1,660.81
73980	Support Services Bus Unit	554.99	757.95	475.49	743.84	47.97	1.81	47.28	952.33	1,200.01	0.00
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	27,275.35
74120	Seneca Operations	391.11	0.00	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	0.00	0.00	121.90
74150	Seneca Incineration	0.00	0.00	0.00	0.00	42.05	0.00	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	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	0.00
74210	Blue Lake Administration	0.00	32.76	0.00	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	7,299.98
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	11,409.99
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	66,981.82
74630	Eagles Point Maintenance	0.00	0.00	0.00	413.00	172.19	2,125.80	65.29	242.15	125.12	0.00

Dept	Description	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
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	39,886.43
74730	Hastings Maintenance	0.00	0.00	0.00	74.77	87.55	54.41	0.00	91.92	64.14	0.00
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	28,904.17
74830	St Croix Valley Maintenance	28.15	0.00	10.00	0.00	7,180.36	0.00	0.00	0.00	0.00	0.00
75310	Tech Svcs 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	6,702.37
75362	Tech Svcs Eng Plan	0.00	0.00	0.00	0.00	0.00	0.00	38.00	0.00	0.00	0.00
75363	Tech Svcs Construction	0.00	215.79	171.38	118.35	192.30	9,852.05	12,988.79	17,810.89	13,916.54	11,299.71
75700	WWS Warehouse	0.00	6.00	0.00	0.00	0.00	0.00	0.00	0.64	0.00	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	3,580.06
80912	EQA-WRA Watershed Coord	29.77	23.52	0.00	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	0.00
81200	EQA-Ind Waste & Poll Prev	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7,024.40
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	0.00
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	0.00
81240	EQA-IWPP Services	0.00	0.00	0.00	0.00	0.00	52.00	0.00	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	0.00
81400	EQA-Water Quality	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6,774.05
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	0.00
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	0.00
81500	EQA-Analytical Lab Svcs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	938.81
81510	EQA-Analytical Lab Svcs-old	1,030.41	1,156.81	1,064.04	702.78	732.03	575.28	491.52	1,342.76	1,271.76	0.00
81600	EQA-Air Quality	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,884.17
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	0.00
81700	EQA-Environmental Compliance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.99	0.00
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	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	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	0.00
86900	EQA-WOMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	348.49
86920	EQA-WOMP Monitor Test	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.37	0.00
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	149.76
		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	425,708.19

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 Kilowatt-hour 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 (Kilowatt-hour), natural gas (therms), diesel fuel, propane and motor vehicle fuel.

Appendix C: 2014 – 2015 MCES Top Energy Projects

<u>Project</u>	<u>Estimated Energy Savings (MMBtu)</u>
Energy Master Plan	Roadmap to reduce MCES energy purchases by 230,000 MMBtu
Blue Lake Solar Facility	9000
Portfolio Solar	To be Determined
Centrifuge Business Case Evaluation	600 – 12,000
Steam Trap/condensate/plant steam instrumentation	10,000
Comprehensive equipment power/energy Tracking	To be Determined
Seneca Aeration Control Energy Savings Project	1900
Service Building Construction	To be Determined
Metro EPT HVAC Improvements	To be Determined
Engine Installation	29,000
Sludge Storage Mixer	18,000
Lighting Retrofits (ArcFlash Proj)	700
St. Croix Valley HVAC	TBD
Metro SMB Centrifuge Backdrive Replacement	TBD
Metro SMB Re-commissioning	TBD
System wide energy mgmt system	TBD

Appendix D: Completed Energy Projects (2007 – 2013)

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 3: Completed Energy Projects 2007 - 2012

	Location	Kilowatt-hour Saved	MMBtu Saved	Cost Saved
Dissolved Oxygen set point change	Metro	6,957,995		\$487,060
Diffuser cleaning East Basins	Metro	7,075,231		\$495,266
Diffuser cleaning West Basins	Metro	4,590,092		\$321,306
Lower header pressure	Metro	1,922,715		\$134,590
Winter Nitrification Limit Change	Metro	1,848,692		\$129,408
Add new mixers	Metro	800,000		\$56,000
Blower operating change	Metro	1,255,385		\$87,877
Liquid Business Unit operating changes	Metro	30,000		\$2,100
Decommissioning Wastewater Treatment Plant	Rosemount	4,145,006		\$290,150
Increased turbine utilization	Metro	1,585,120		\$110,958
Turbin Winter Operation	Metro	1,914,050		\$133,984
New diffusers	Eagles Point	824,136		\$57,690
Scrubber packing	Metro	688,000		\$48,160
L35 lift station	RMF	25,000		\$1,750
Administration Buidling recommissioning	Metro	175,917		\$12,314
Compressed air modifications	Metro	336,500		\$23,555
Sequencing blowers	Metro	85,000		\$5,950
FlotationThickener recommissioning	Metro	135,780		\$9,505
Seneca aeration	Seneca	3,122,100		\$218,547
Blue Lake aeration	Blue Lake	3,000,000		\$210,000

	Location	Kilowatt-hour Saved	MMBtu Saved	Cost Saved
VFD (variable-frequency drive)	Regional Maintenance Facility	300,000		\$21,000
Tunnel Lighting	Metro	1,949,301		\$136,451
Compressor Building Lighting	Metro	172,949		\$12,106
Decommissioning 408	Metro	2,655,753	23,212	\$327,960
Waste Activated Sludge Storage	Empire	583,200		\$40,824
Adjustable Speed Drive and Energy Efficient Motors	Blue Lake	933,680		\$65,358
Scrubber Heat Exchanger	Seneca		12,500	\$76,512
Aeration Control Loop Tuning	SCV	372,809		\$26,097
Aeration Control Loop Tuning	Eagles Pt	424,032		\$29,682
Plant Air Compressor Modifications	Metro	637,000		\$44,590
Recommission Floatation Building	Metro	805,920		\$56,414
Repair Compressor Air Leaks	Metro	189,326		\$13,253
Anaerobic Digester/Biogas	Blue Lake		40,000	\$244,838
Effluent Pumping Optimization	Metro	1,483,959		\$103,877
Efficient Motors	Seneca	46,405		\$3,248
Lighting Redesign	Metro	1,145,990		\$80,219
Non-condensing Steam Turbine	Metro	2,553,617		\$178,753
Aeration Zone 6 Control Strategy	Metro	2,600,000.00		\$182,000
Total		57,370,660	75,712	\$4,479,354

Appendix E: Blue Lake Digester Factsheet

BLUE LAKE WASTEWATER TREATMENT PLANT FACTS



Introduction

Blue Lake is the third largest among seven wastewater treatment plants in the Twin Cities owned and operated by the Metropolitan Council, which manages the regional system.

Located in Shakopee, Blue Lake is the fourth largest wastewater treatment plant in Minnesota. It treats an average of 29 million gallons of wastewater per day (mgd) from 285,000 residents in 27 communities. The plant provides mechanical, biological and chemical treatment to the wastewater before discharging it into the Minnesota River.

An on-site solids treatment facility opened in 2000 as a joint venture between the Council and the New England Fertilizer Company (NEFCO). Biosolids produced at Blue Lake are dewatered, dried, pelletized and then used as organic agricultural fertilizer.

Energy conservation across the system

Metropolitan Council Environmental Services (MCES), the Council division that manages the wastewater system, launched an energy-savings campaign in 2006 to minimize the economic and environmental impact of its current and future energy demand.

The work focused first on process efficiency, lighting redesign and other facility improvements, and it worked. In 2009 and 2010, MCES received the Efficiency Partner Award from Xcel Energy. In 2011 MCES received the Gold Award from Xcel for the most electrical energy saved in an 18-month period.

Progress on energy conservation projects continues and yields additional savings that increase each year. By the end of 2010, annual purchased-energy consumption was reduced by 17% from the 2006 base year, saving rate payers \$2.5 million each year in energy-related costs.

With many of the easier projects implemented, MCES is adding to its primary conservation focus on maintenance and operations projects to provide conservation and renewable energy from capital projects.

Building on its success, MCES set new energy conservation goals in 2011. MCES now is targeting a reduction of 25% by 2015 and a very aggressive reduction of 50% by 2020 compared to 2006 levels.

Solids processing at Blue Lake

In the mid-2000s, plans were made to add a new solids processing facility at Blue Lake that could produce energy to replace purchased natural gas used to operate the solids facility. Construction of the new system began in 2009 and was completed in 2012. Methane biogas recovered from the digester facility is now used to replace 9 million BTU/hour of fossil fuel (natural gas) that powers the solids facility.

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

- The conversion from natural gas to biogas for fueling the dryer will save an estimated \$500,000 per year. MCES's private partner, NEFCO agreed to substantial contract changes and is responsible of 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 in 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 during treatment, which increases the capacity and lifespan of the solids facility.
- The project received \$2 million in grant funds (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.

Other recent improvements made at Blue Lake yield additional savings. These include new premium efficiency pump motors and motor drives. Air diffusers were replaced and additional valves now provide better control over dissolved oxygen and improved oxygen transfer.

Future plans will continue excellent permit compliance

Despite major construction for expansion, Blue Lake continued its excellent permit compliance record. For its performance through December 2011, the plant earned a prestigious Platinum Award from the National Association of Clean Water Agencies for six consecutive years of perfect compliance with its discharge permits.

The Council is currently studying options for a proposed on-site solar facility that would eliminate the need for some energy from fossil fuels to meet Blue Lake's electricity needs. If built, the proposed facility could generate up to 1.25 megawatts per year from a renewable energy source.

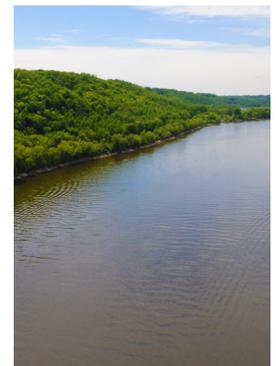
Energy-saving collaborations

MCES is collaborating with many other partners to pursue future energy savings, including the International Climate Registry, the State of Minnesota, Metro Counties Energy Policy Coalition, the University of Minnesota and Xcel Energy.

Read more about MCES Energy Conservation and Renewable Energy at www.metrocouncil.org

The Council's wastewater collection and treatment system has an outstanding record of compliance with its federal clean water discharge permits.

At the same time, the Council charges its customers among the lowest rates in the nation for similar-sized systems.



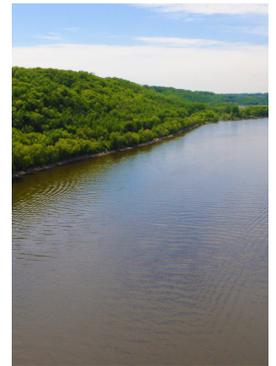
Population served	285,000 people in 27 communities
Service Area	Lake Minnetonka area, Shakopee, Prior Lake and Chaska
Biosolids pellet production	About 30 dry tons per day (dtpd) before digester startup About 17 dtpd after digester startup

FACTS – ANAEROBIC DIGESTION PROCESS

Process tanks	3 tanks with fixed steel covers
Storage tank	1 tank with membrane cover for gas storage
Tank Size	90-foot diameter, 35-foot deep cast in place concrete
Volume	1.4 million gallons
Process	2 stage mesophilic digestion, 98 F, 26 days retention
Gas production	About 26,000 scf/hour 57-61% methane 12 million BTU

FACTS – CONSTRUCTION

Construction Period	Sept. 2009 – April 2012 (32 months)
Project Cost	\$27.8 million
Financing	Minnesota State Revolving Loan, \$25.8 million American Recovery “Green” Infrastructure, \$2 million



Appendix F: Metro Non-Condensing Steam Turbine Factsheet

CAPTURING STEAM AT METRO PLANT FACTS



Focusing on energy efficiency

Energy conservation and efficiency is major goal of Metropolitan Council Environmental Services (MCES), a division of the Metropolitan Council and the operator of the seven regional wastewater treatment plants. As part of MCES' goal, the General Manager set a target of reducing annual "purchased energy" 25 percent by 2015 (compared to base year 2006). To move toward that goal, staff worked to increase the use of steam generated from the wastewater treatment process.

The Metropolitan (Metro) Plant in St. Paul uses fluidized bed reactors, or incinerators, to burn the biosolids removed from the treated water. Waste heat boilers take the heat created during the incineration process and generate steam. These boilers can produce up to 93,000 pounds per hour of steam. This steam is a valuable source of heat and electricity. Harnessing it helps save money and natural resources.

Heating the plant

Being the largest treatment plant in the system, it takes a lot of energy to heat the Metro Plant. In 2011, the plant used approximately 3,940,000 therms to heat the facilities. That's enough energy to heat nearly 3,345 homes for one year in Minnesota.

The priority for the steam being created during the solids incineration process is to supply the plant heating and processing needs. In order to accomplish this, the steam pressure must be reduced in order to distribute throughout the plant. Utilizing the steam reduces the need to use auxiliary boilers which burn natural gas to create heat for the plant.



Photo caption: The new 830 kilowatt (kW) turbine generator at the Metro Plant stands in a climate-controlled room. This turbine generator helps offset heating costs, making the facility more energy efficient.

Generating electricity

Recovering energy from steam heat

While the use of steam for heat is an efficient utilization of resources, there is some energy lost when reducing the pressure in the system. In the spring of 2011, MCES began construction and installation of a \$1.88 million dollar 830 kilowatt (kW) turbine generator at the Metro Plant. 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 rebates from Xcel Energy's Conservation Improvement Program.

Utilizing steam when not needed for heating

With decreased need for heat in warm weather, more steam is available to create electricity. The Metro Plant is equipped with a 4.7 megawatt (MW) turbine generator to create electricity from large quantities of steam. The electricity from this turbine generator is used at the plant.

Outside temperatures aren't the only factor in deciding if the steam is used for heat or electricity. Staff also closely monitors natural gas prices to determine 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 translates into maximum cost savings.

Saving money

With a focus on energy conservation in the wastewater treatment process, MCES is able to provide a cost-effective service to the ratepayers of the metro area. By installing the 830 kW turbine to create electricity from the steam pressure reduction, MCES will save up to \$200,000 a year on electric costs. This is on top of the approximately \$1 million saved each year from the use of electricity generated from the larger 4.7 MW turbine.

The biggest in the system

The Metro Plant is the largest of the seven wastewater treatment plants owned by the Metropolitan Council. When it first opened in 1938, it was the first plant in a metropolitan area on the Mississippi River. Today it is among the nation's largest treatment plants.

The Metro Plant serves 65 communities and 1.8 million people in the Twin Cities region. It treats an average of 185 million gallons of wastewater each day.

For more information

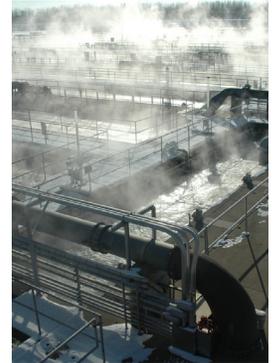
To learn more about MCES' energy conservation work:

Visit www.metrocouncil.org/environment/energy/subindex.htm
Or call 651-602-1005

See related fact sheets:

[Environmental Services](#), [Environmental Service Awards](#)

By installing the 830 kW turbine MCES will save up to \$200,000 a year on electric costs.





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