

DATE: February 23, 2016

TO: Partners in Energy Planning Team

CC: Energy and Environment Commission

FROM: Ross Bintner P.E. - Environmental Engineer

RE: **City Operations Focus Area / Footprint Analysis and Reduction Concept**

The Partners in Energy Planning team chose a focus area around greenhouse gas (GHG) in City of Edina operations. This report was requested by the team, and provides a concept-level estimate of GHG footprint in City operations to inform the effort of the planning team.

The “concept” level of detail is important to note, as I have not been trained to perform GHG analysis. In performing this analysis I worked with planning team member Kyle Sawyer, and Michael Orange with Orange Environmental to translate 2015 City of Edina expenses data into approximate GHG emissions. Mr. Orange has conducted GHG assessments and politely emphasizes my lack of training when asked! In addition to GHG, I also attempted to summarize other notable environmental footprint not directly related to energy, such as water and land to demonstrate the concept of tradeoffs in City operations.

Methodology and Analysis

Mr. Sawyer provided a spreadsheet with all 2015 budget and actual expenses broken down by City of Edina business units and object accounts. The business units were ignored, and the object accounts were used to group like expenses into total dollar values. Those total dollar values were then converted to units of material or energy, or directly translated to GHG using reference factors from a variety of information sources noted in Table 1. To use an analogy: Sometimes we try to get ‘ballpark’ estimates; In this case, I see turf under my feet, and suspect I’m in a ballpark, but I still don’t know if I’m in the right ballpark! Chart 1 presents the same information, in a visual format to draw attention to areas of opportunity. Note that only GHG footprint is represented and that capital expenditure “pathways” are underrepresented in importance. For example, while Edina may only spend a third of the budget on new equipment, vehicles, buildings and roads, these new and replacement facilities and infrastructure write future energy costs into concrete, steel and stone.

Since business units were ignored in the summary, I try to map major sources of GHG back into the business unit framework in Table 2, by summarizing notable city services and footprint that associate highly with each type of expense and GHG. In Table 2, I also provide example indicators where environmental performance is now measured and where policy or tools currently exist. I look forward to the help of the planning team, and the EEC in completing this policy tool mapping exercise.

To extend the concept, and start to point toward solutions, Table 3 provides very rough GHG reduction strategy, estimates and costs and starts to not opportunities and barriers. While this may not be the focus of Partners in Energy meeting 4, we may get to this level of detail in subsequent meetings. Your input is required and welcome. Table 4 demonstrates the level of implementation needed for various levels of reduction.

Attachments:

- Table 1 – GHG Estimate from City Operations
- Chart 1 – GHG Estimate by Category of Major Expense.
- Table 2 – Footprint, Indicators, Tools and Policy
- Table 3 – Concept GHG Reduction Options
- Table 4 – Concept GHG Reduction Plan

Chart 2 - Concept Wedge Diagram (Added for 3/10 EEC)

City of Edina: Municipal Spending and Rough Greenhouse Gas Estimate

Updated: 2/7/16

The purpose of this analysis is to use established conversion factors and data from other cities to derive a very approximate estimate of greenhouse gas (GHG) emissions associated with normal city government operations.

Table 1: Greenhouse Gas Emission Estimate: City Operations

Major Categories	Total Costs ⁹	Equivalencies Units/\$	Energy	Units	GHG Tonnes/Unit	GHG Tonnes	% of Budget	% of GHG	GHG TN/ 1000 \$
Emission sources:			Direct Burn / Energy Conversions / Territorial GHG						
Electricity (kWh) ¹	\$2,037,311	0.081	25,030,842	kWh	0.00048	12136	2.4%	26.6%	5.9566
Natural gas (therms) ²	\$421,502	0.800	526,878	Therms	0.00550	2898	0.5%	6.4%	6.8743
Sewer/Water ³	\$4,710,101		12,572,119	kWh	0.00063	7944	5.5%	17.4%	1.6867
Anthropogenic			6,662,417	kWh	0.00063	4210			
Biogenic			5,909,702	kWh	0.00063	3734			
Liquid fuels ^{4,5}	\$479,197	147,717				1412	0.6%	3.1%	2.9466
Gasoline (US gal.) ⁹		88,654	88.65	1,000 gal	8.92	791			
Diesel (US gal.) ⁹		59,063	59.06	1,000 gal	10.51	621			
Solid waste management ⁷	\$523,533				2.1	550	0.6%	1.2%	1.0500
Subtotal Scope 1,2	\$8,171,645					24939		100.0%	3.0519
Other costs / Outside ICELI Scope:			Consumption Based / Supply Chain / Procurement GHG						
Personnel (FTE)	\$33,732,354	500		FTE	20	10000	39.6%	21.9%	0.2965
Professional Services	\$8,133,116	121		FTE	20	2411	9.5%	5.3%	0.2965
Communications Services	\$217,137			\$	0.35	38	0.3%	0.1%	0.1750
Materials	\$1,843,498			\$	0.75	691	2.2%	1.5%	0.3750
Goods / Services	\$4,130,918			\$	0.49	1012	4.8%	2.2%	0.2450
Equipment & Gov't CapX	\$14,985,889			\$	0.45	3372	17.6%	7.4%	0.2250
Enterprise CapX	\$14,000,000			\$	0.45	3150	16.4%	6.9%	0.2250
Subtotal Scope 3	\$77,042,912					20674			
Total	\$85,214,557					45613	100.0%		

- Notes:**
- 1 Average cost per kWh is from the city operations baseline assessment portion of the "Shorewood Renewable Energy Project, 2015." Data is for 2013. The source for the GHG emission rate is Xcel Energy for 2013.
 - 2 Source for cost per kWh: CenterPoint Energy. Downloaded from: Source for GHG emission factor: Table G.11, *International Local Government Greenhouse Gas Emissions Analysis Protocol*, Version 1.1, May 2010.
 - 3 Assumes 95% of costs are electricity based and 5% natural gas based per cities of Shorewood and Burnsville, 2013 (refer to Table 2).
 - 4 Source: Table G.12, *International Local Government Greenhouse Gas Emissions Analysis Protocol*.
 - 5 Transportation fuels sold in Minnesota have blends of ethanol that are higher than the national average, thus, per-gallon GHG emissions will be relatively lower. From 2001 to 2005, the state required 10% ethanol in gasoline. From 2006 to the present, the state added the requirement of 5% ethanol in diesel fuels.
 - 6 Assumes the share of total emissions associated with solid waste management in Edina are comparable to the share in the cities of Burnsville and Shorewood (refer to Table 2).
 - 7 Assumes contract service for normal public works responsibilities in Edina are comparable to the share in the cities of Burnsville and Shorewood (refer to Table 2).
 - 8 Refer to Table 2 for comparison figures for the cities of Shorewood and Burnsville.
 - 9 Source: City of Edina / <http://coolclimate.berkeley.edu/business-calculator> for Outside scope items.

Chart 1: City of Edina / Rough Greenhouse Gas Estimate By Major Category of Expense

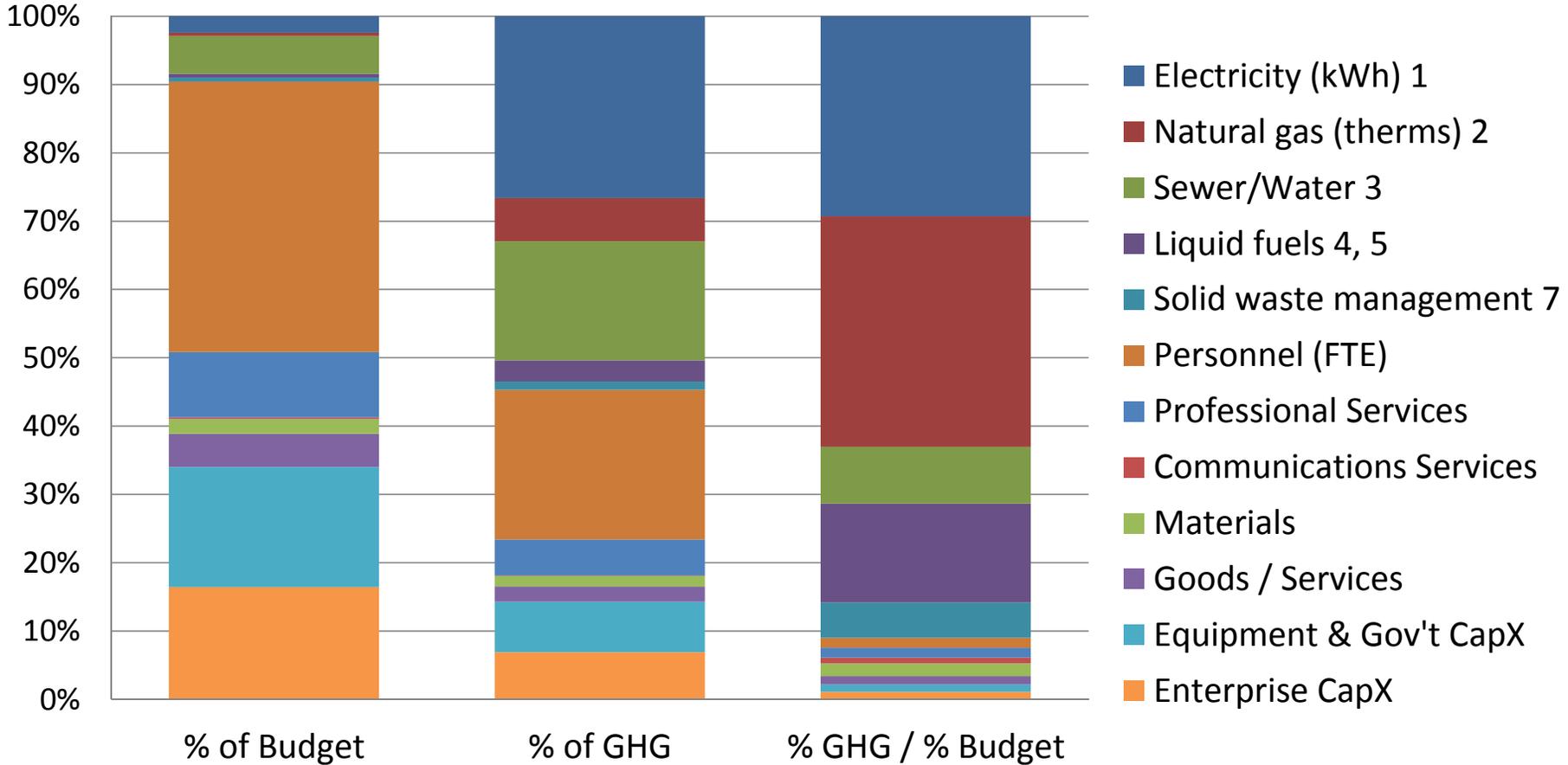


Table 2: Footprint, Indicators, Tools and Policies for Sustainability by Major Categories of Expense.

Major Categories	Notable Services	Notable Footprints	Indicators	Municipal Organization Policy / Tools	Citywide Policy /Tools
Direct Burn / Energy Conversions / Territorial GHG					
Electricity (kWh) 1	Utilities, Park Enterprises	GHG, Land	B3, Xcel	Comprehensive Plan	
Natural gas (therms) 2	Park and Government	GHG	B3, Centerpoint	Comprehensive Plan	
Sewer/Water 3	Sanitary Utility / MCES	Water, GHG	RII, B3	Comprehensive Plan	Comprehensive Plan
				CWRMP	
Liquid fuels 4, 5	Fleet, Transportation	GHG, Land	RII, City Fleet Report	Comprehensive Plan	
Solid waste management 7	Contracted recycling	Land			
	Solid Waste				
Consumption Based / Supply Chain / Procurement / Pathways					
Personnel (FTE)	Public Safety				
Professional Services					
Communications Services					
Materials	Transportation	GHG, Land		Procurement Policy	
Goods / Services				Procurement Policy	
Equipment & Gov't CapX	Park, Fleet		Envision Score	Envision, Living Streets	Envision, Living Streets
Enterprise CapX	Utilities, Transportation		LEED, Envision	LEED, Envision	LEED, Envision

Table 3: Conceptual Level / Greenhouse Gas Emission Reduction Options: City Operations

Major Categories	Potential GHG Reduction Strategies	Approximate One Time / Capital Cost	Approximate Annual Cost	Possible Reduction	Possible Reduction (Tonnes GHG)	Organization-Wide % Energy Use	10 year \$Cost or (\$savings) / Tonnes GHG Reduced	Notes
Direct Burn / Energy Conversions / Territorial GHG								
Building Electricity (kWh)	Energy conservation	\$50,000	-\$70,000	10%	704	1.5%	-92	
	Building continual recommissioning (electric)	\$250,000	-\$100,000	15%	1056	2.3%	-71	
	Building retrofit (Electric)	\$4,500,000	-\$300,000	30%	2112	4.6%	71	
Utility Electricity	Pump and lift optimization	\$900,000	-\$30,000	10%	510	1.1%	118	Capital intensive to cut long service life short.
	Negotiate renewable purchase	\$0	\$250,000	100%	12136	26.6%	21	Easy to do, adds variability in price
	Direct carbon market offset		\$200,000	100%	12136	26.6%	16	Potentially high variability in price, possible to increase scale
	Xcel Conservation Target	\$0	\$0	30%	3641	8.0%	0	Will happen based on Xcel plan.
Natural gas	Building continual recommissioning (Gas)	\$50,000	-\$45,000	15%	435	1.0%	-92	
	Building retrofit (Gas)	\$2,500,000	-\$100,000	30%	869	1.9%	173	
	Cogeneration	\$2,500,000	-\$200,000	50%	1449	3.2%	35	
Sewer/Water 3	Water Conservation	\$100,000	\$50,000	10%	794	1.7%	76	This option reduces Edina share of MCES load and GHG, but would not reduce electric load at treatment plant substantially because total waste determines energy demand.
	Negotiate pass through renewable (wastewater)	\$0	\$75,000	34%	2738	6.0%	27	Slightly more complex due to third party, but relatively easy
	Negotiate to fund biogenic efficiency project	\$1,000,000	\$150,000	15%	1192	2.6%	210	
Liquid fuels 4, 5	Fleet management / conservation	\$50,000	-\$30,000	10%	141	0.3%	-177	May conflict with service level demands
	Vehicle efficiency goal	\$50,000	-\$20,000	15%	212	0.5%	-71	
Solid waste management 7	Efficiency provisions in contract		\$25,000	10%	55	0.1%	455	Opportunity comes up at time of recycling contract
Subtotal Scope 1,2								
Consumption Based / Supply Chain / Procurement GHG								
Personnel (FTE)	N/A							No actionable practices suggested
Professional Services	N/A							No actionable practices suggested
Communications Services	N/A							Internal plug load of servers and communications in electric above.
Materials	Procurement Policy							GHG not quantified in policy
Goods / Services	Procurement Policy							GHG not quantified in policy
Equipment & Gov't CapX	LEED and Envision							Infrastructure that serves the community can effect community wide future demand.
Enterprise CapX	LEED and Envision							Projects with small one-time impact to GHG can determine future fuel inputs.

Table 4: Conceptual Level / Greenhouse Gas Emission Reduction Plan: City Operations						
Example Reductions		Recommended 2015-2025 Actions for 50% reduction				
Percent		Cumulative	% Reduction	Cumulative	Reduction	Strategy
	10%	4561	8.0%	8.0%	3641	3641 Xcel Conservation Target
	20%	9123	9.5%	1.5%	4345	704 Energy conservation
2025 Goal	30%	13684	11.8%	2.3%	5400	1056 Building continual recommissioning (electric)
	40%	18245	12.8%	1.0%	5835	435 Building continual recommissioning (Gas)
	50%	22807	39.4%	26.6%	17970	12136 Negotiate renewable purchase
	60%	27368	39.9%	0.5%	18182	212 Vehicle efficiency goal
	70%	31929	44.5%	4.6%	20294	2112 Building retrofit (Electric)
2050 Goal	80%	36491	50.5%	6.0%	23031	2738 Negotiate pass through renewable (wastewater)
	90%	41052	50.8%	0.3%	23173	141 Fleet management / conservation

