2015
Local Government Operations Energy Use and Emissions Inventory

Produced by the City of Bloomington
Department of Economic & Sustainable Development, November 2016

Contents

Introduction

This report is intended to track the City of Bloomington's efforts to reduce energy use and emissions in City government operations. Particularly, this report will analyze the progress the City has made on tracking energy use, prioritizing energy efficiency opportunities and reducing City greenhouse gas emissions. To that end, comparisons to 2010 and 2013 data and figures will be used to illustrate changes over the analysis period.

For continuity between the original 2010 report, the 2013 addendum, and the current report, all energy and emission units will remain the same. Table 1 below lists the government sectors that will be referenced throughout the report.

Table 1: Government Sectors

Buildings and Facilities
Streetlights and Traffic Signals
Water Delivery Facilities
Wastewater Facilities
Vehicle Fleet
Transit Fleet

Executive Summary

In 2015, the City of Bloomington consumed approximately 227,240 million BTUs (MMBTUs) of electricity, natural gas and vehicle fuels collectively, spending over $4.68 million for that energy. This energy consumption resulted in emissions of over 37,150 tons of carbon dioxide equivalent (CO_2e). On a per-employee basis, these emissions equate to approximately 57 tons of CO_2e per full-time City of Bloomington employee (based on 650 employees).

The 2013 addendum to the energy use inventory indicated that the City had decreased the overall consumption of energy from the 2010 baseline. However, energy consumption rose from 2013 to 2015. This could partially be associated with a decline in energy prices, but there might be other factors that need to be identified if we are to attempt any intervention.

In comparison to 2013 data, the 2015 results show an increase of 4.30 million BTUs (1.93%), a decrease of $0.62 million (-12.15%) in expenditures, and a 970 ton (2.70%) increase in CO2e emissions. Overall there is an increase in energy usage in almost all sectors, which has contributed to the rise in emissions. In contrast, costs have decreased, largely due to a decrease in fuel costs. Electricity costs have also declined in comparison to 2013.

The updated GHG Inventory illustrates that over the 2013-2015 analysis period, City Streetlights and Traffic Signals experienced the largest relative reduction in energy consumption and CO_2e emissions. In 2015, City streetlights and traffic signals consumed approximately 706 MMBTUs (8%) less than in 2013 and reduced annual CO_2e emissions by roughly 113 tons (6%). City of Bloomington Utilities (CBU) Water Delivery branch of service experienced the second-highest reduction in total City government energy use and CO_2e emissions. In 2015, Water Delivery services consumed roughly 906 MMBTUs (2%) less energy and reduced CO_2e emissions by roughly 101 tons (1%).

The remaining sectors have experienced an increase in energy consumption. Wastewater Facilities, Buildings and Facilities, Transit Fleet, and Vehicle Fleet have all experienced increases of energy consumption (in MMBTU) of 3%, 4%, 6% and 1% respectively. Costs have declined for all sectors except for Buildings and Facilities. The biggest decrease can be seen in the Vehicle Fleet (a 58% drop) and Transit Fleet (24% decline). Cost declines can be seen in other sectors as well, largely due to reductions in energy prices as explained above.

The 2015 update shows an overall rise in energy consumption when compared to 2013. Although there is an overall declining trend, more data will be necessary to understand the long-term implications. Costs declined significantly during the study period, and the reason for a rise in consumption could be, among other things, associated with this fact.

In order to continue our progress, we recommend enhancing data tracking capabilities (particularly by exploring utility management software), approaching improvements on a portfolio basis in order to combine slower-payback projects with projects that have a quicker return, exploring innovations in the city fleet to reduce waste, and implementing renewables in city facilities.

Government Operations Energy Use and Emissions Inventory Results

Local Government Energy Consumption, Costs, and Emissions by Sector

In comparison to findings in 2013, the City's Wastewater Facilities and Water Delivery continue to be the largest source of energy consumption in City operations. These two City operations collectively account for 46.8% of total energy consumption, 47.5% of energy expenditures and 60.4% of total CO_2e emissions. The City's Vehicle Fuel usage (including both Non-Transit and Transit vehicles) remains the second largest consumer of energy, accounting for 31.6% of total energy consumption, 27.4% of total energy expenditures and 16.8% of emissions. Since 2013, Buildings and Facilities have slightly increased from 17.47% of total energy consumption to 17.77%. Streetlights and Traffic Lights show an overall decline during this time period in all metrics: a decline of 6% in emissions, 8% in energy consumption, and an 8% decline in energy expenditures, all realized due to the recent availability of LED luminaries for use in Duke-owned streetlights.

When 2015 numbers are compared to 2010, there were declines in all sectors, except Wastewater Facilities and Transit Fleet. The largest decline in emissions was experienced by Building and Facilities and the largest decline in cost was seen in the Vehicle Fleet sector. Tables 2-4 and Figures 1-7 illustrate these changes.

Table 2: City Government Energy Consumption, Cost and Emissions by Government Sector

Sector	CO_2e (tons)	CO_2e (%)	Energy Use (MMBTUs)	Energy Use (%)	Cost ($)	Cost (%)
			2010			
Water Delivery Facilities	12,128.95	31.65%	56,363	24.22%	$ 1,099,092.24	23.56%
Wastewater Facilities	10,340.49	26.99%	51,259	22.03%	$ 866,123.18	18.56%
Buildings and Facilities	7,636.22	19.93%	44,547	19.15%	$ 795,387.86	17.05%
Vehicle Fleet	2,893.18	7.55%	33,737	14.50%	$ 781,146.00	16.74%
Transit Fleet	3,285.94	8.58%	37,584	16.15%	$ 685,300.00	14.69%
Streetlights and Traffic Signals	2,033.44	5.31%	9,182	3.95%	$ 438,456.00	9.40%
Total	**38,318**	**100%**	**232,672**	**100%**	**$ 4,665,505.28**	**100%**
			2013			
Wastewater Facilities	10,758.45	29.74%	53,618.89	24.05%	$ 1,164,217.40	21.84%
Water Delivery Facilities	11,267.63	31.14%	52,006.28	23.33%	$ 1,185,745.20	22.24%
Buildings and Facilities	6,123.82	16.93%	38,937.49	17.47%	$ 777,173.06	14.58%
Transit Fleet	3,317.11	9.17%	37,965.74	17.03%	$ 919,066.59	17.24%
Vehicle Fleet	2,681.05	7.41%	31,236.97	14.01%	$ 852,720.09	16.00%
Streetlights and Traffic Signals	2,032.31	5.62%	9,176.91	4.12%	$ 432,121.47	8.11%
Total	**36,180.37**	**100%**	**222,942.28**	**100%**	**$ 5,331,043.81**	**100%**
			2015			
Wastewater Facilities	11,269.99	30.34%	55,330.15	24.35%	$ 1,148,602.74	24.53%
Water Delivery Facilities	11,166.85	30.06%	51,099.45	22.49%	$ 1,079,511.86	23.05%
Buildings and Facilities	6,556.35	17.65%	40,382.45	17.77%	$ 778,061.30	16.61%

Transit Fleet	3,540.04	9.53%	40,540.31	17.84%	$ 738,611.79	15.77%
Vehicle Fleet	2,698.10	7.26%	31,417.22	13.83%	$ 538,102.12	11.49%
Streetlights and Traffic Signals	1,919.18	5.17%	8,470.62	3.73%	$ 400,472.36	8.55%
Total	**37,150.52**	**100%**	**227,240.19**	**100%**	**$ 4,683,362.17**	**100%**
2013-2015 Percent Change	**2.68%**	**-**	**1.93%**	**-**	**-12.15%**	**-**

Table 3: Percentage changes between sectors

2013-2015 percentage change	CO2e		MMBTU		Costs	
	%	Quantity (tons)	%	Quantity (tons)	%	Amount ($)
Wastewater Facilities	5%	511.54	3%	1,711.26	-1%	$ (15,615)
Water Delivery Facilities	-1%	(100.78)	-2%	(906.83)	-10%	$ (106,233)
Buildings and Facilities	7%	432.53	4%	1,444.96	0.11%	$ 888
Transit Fleet	6%	222.94	6%	2,574.56	-24%	$ (180,455)
Vehicle Fleet	1%	17.05	1%	180.25	-58%	$ (314,618)
Streetlights and Traffic Signals	-6%	(113.13)	-8%	(706.29)	-8%	$ (31,649)

Table 4: Percentage changes between sectors

2010-2015 percentage change	CO2e		MMBTU		Costs	
	%	Quantity (tons)	%	Quantity (tons)	%	Amount ($)
Wastewater Facilities	8%	929.50	7%	4,071.12	25%	$ 282,480
Water Delivery Facilities	-9%	(962.10)	-10%	(5,263.50)	-2%	$ (19,580)
Buildings and Facilities	-16%	(1,079.87)	-10%	(4,164.70)	-2.23%	$ (17,327)
Transit Fleet	7%	254.10	7%	2,956.54	7%	$ 53,312
Vehicle Fleet	-7%	(195.08)	-7%	(2,319.89)	-45%	$ (243,044)
Streetlights and Traffic Signals	-6%	(114.26)	-8%	(711.38)	-9%	$ (37,984)

Figure 1: Energy consumption trend and forecast

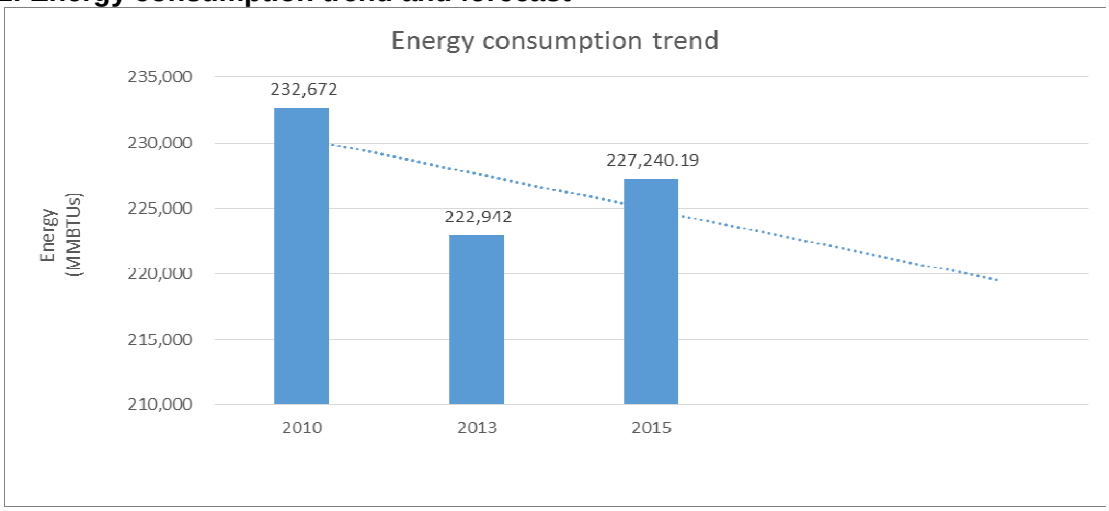


Figure 2: Energy Consumption by City Government Sector 2010-2015 Comparison

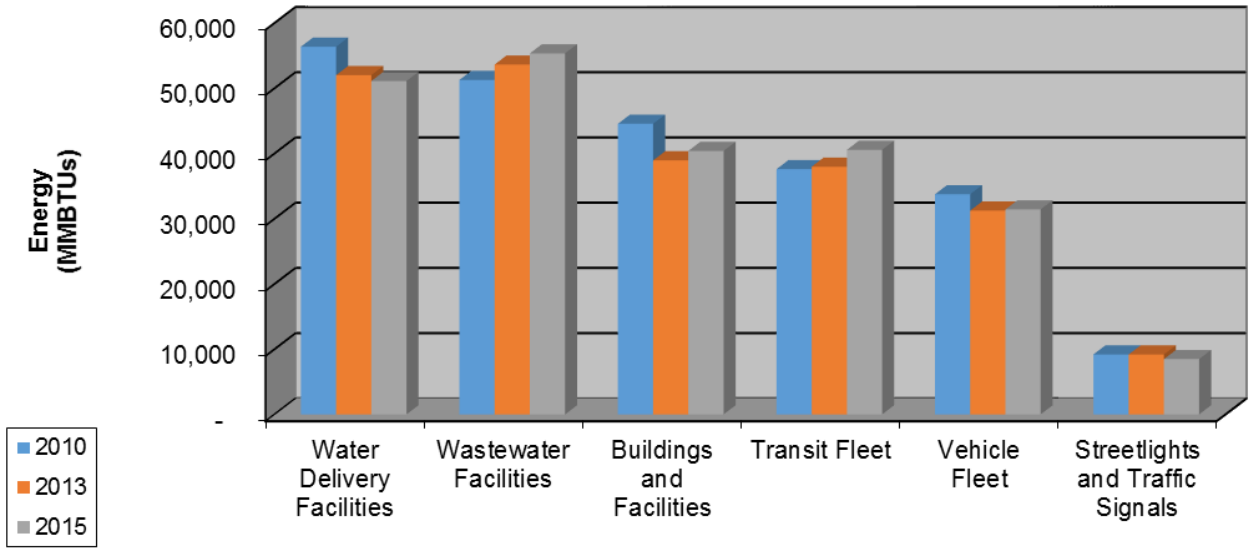


Figure 3: Energy Consumption by City Government Sector in MMBTUs (2015)

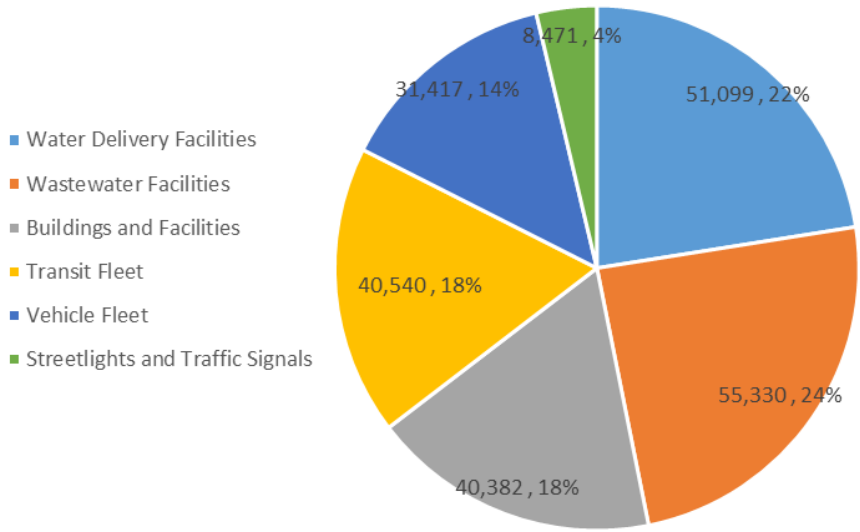


Figure 4: Cost of Energy by City Government Sector 2010-2015 Comparison

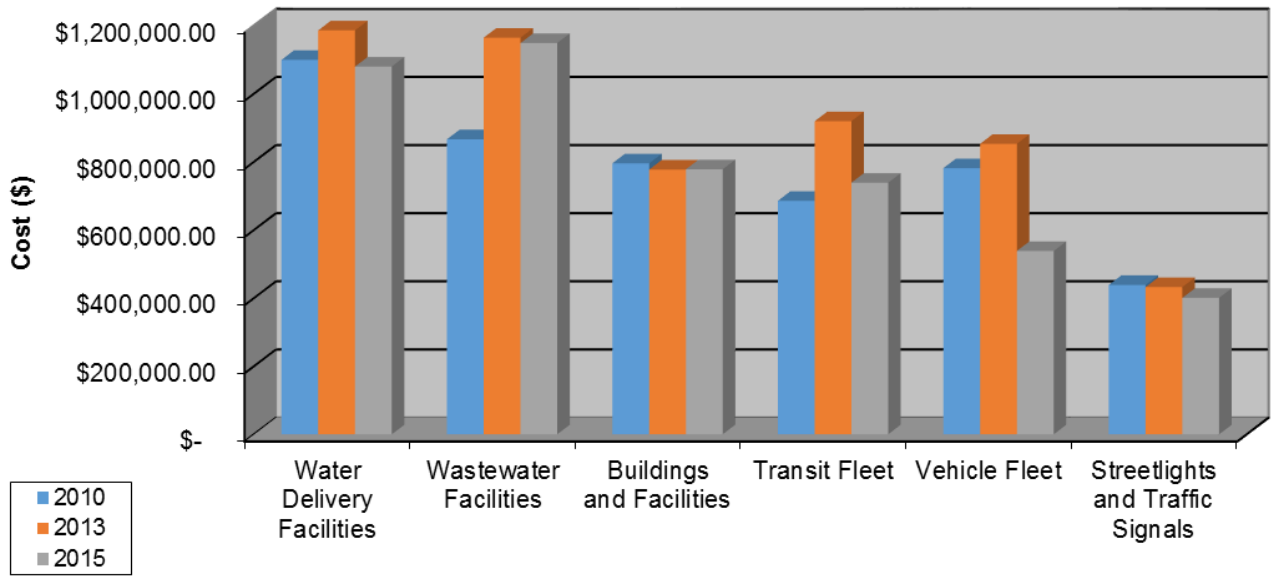


Figure 5: Cost of Energy by City Government Sector (2015)

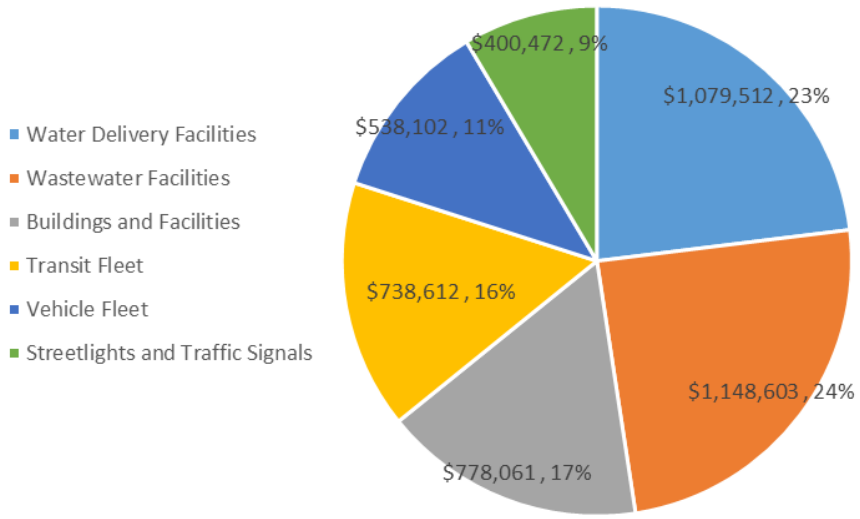


Figure 6: CO_2e Emissions by City Government Sector 2010-2015 Comparison

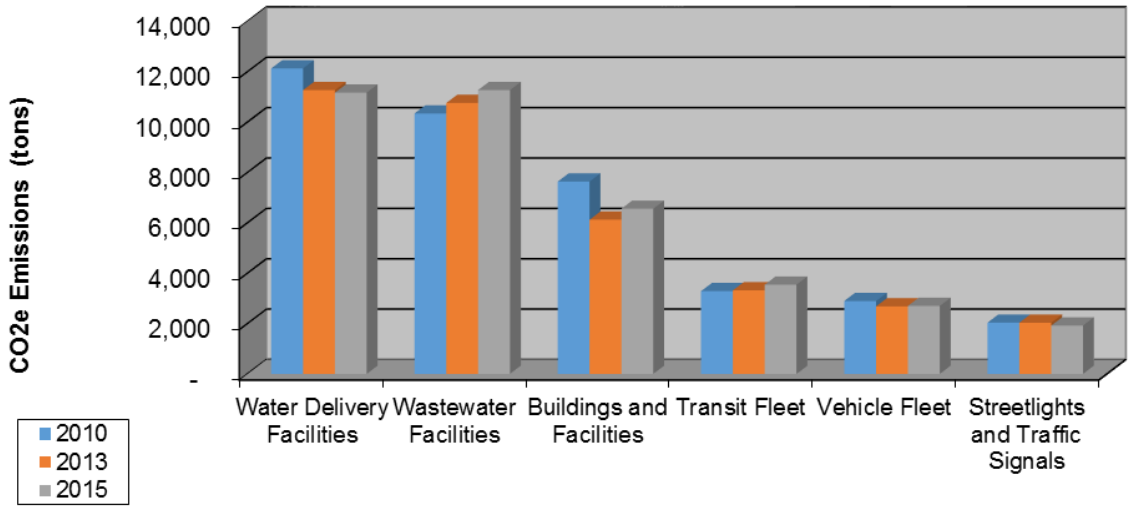
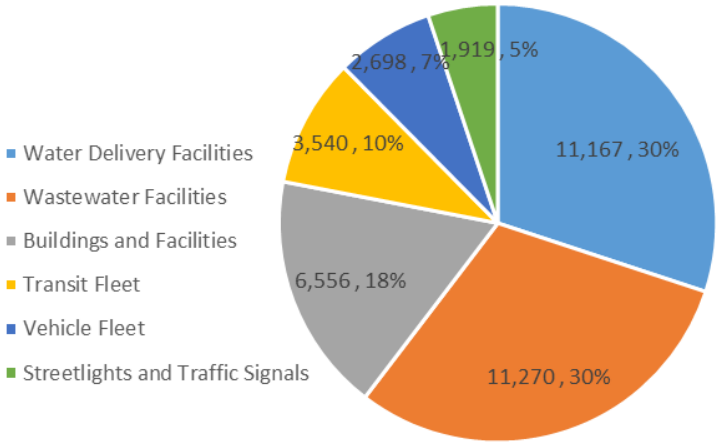


Figure 7: Emissions by City Government Sector (2015)



Local Government Energy Consumption, Cost, and Emissions by Source

City government energy consumption, cost, and emissions are dominated by purchased electricity, which is largely produced from coal in Bloomington and Indiana generally. Purchased electricity comprises 57% of the City's total energy consumption, 69% of total energy expenditures and 79% of total CO_2e emissions. Diesel fuel, natural gas, gasoline, and biodiesel and ethanol fuel additives collectively comprise the City's remaining 43% of energy consumption, 31% of total energy expenditures and 21% of CO_2e emissions. Electricity and natural gas have declined when compared to 2010, but they have increased when compared to 2013.

The increases since the 2013 report may be largely due to decreases in energy prices. Gasoline had an average price of $3.29 in 2013 and $2.06 in 2015; diesel had an average cost of $3.37

in 2013 and $2.01 in 2016. Electricity costs have also declined in comparison to 2013. This decrease was the result of an approximate 6% decline in Duke's fuel rider.[1]

Table 5 and Figures 8-13 illustrate this data and how the City's energy composition has changed since 2010.

Table 5: Energy Consumption, Cost and Emissions by Source

Energy Source	CO_2e (tons)	CO_2e (%)	Energy Use (MMBTUs)	Energy Use (%)	Cost ($)	Cost (%)
			2010			
Electricity	30,473.98	79.53%	137,605.31	59.14%	$ 3,006,520.09	64.44%
Diesel	4,112.79	10.73%	46,953.66	20.18%	$ 936,915.00	20.08%
Natural Gas	1,665.12	4.35%	23,745.82	10.21%	$ 192,539.19	4.13%
Gasoline	1,826.24	4.77%	21,605.50	9.29%	$ 477,110.00	10.23%
Other*	240.09	0.63%	2,761.72	1.19%	$ 52,421.00	1.12%
Total	**38,318**	**100%**	**232,672**	**100%**	**$ 4,665,505.28**	**100%**
			2013			
Electricity	28,793.21	79.58%	130,016	58.32%	$ 3,388,626.01	63.56%
Diesel	4,209.14	11.63%	48,054	21.55%	$ 1,182,737.44	22.19%
Natural Gas	1,389.00	3.84%	23,724	10.64%	$ 170,631.12	3.20%
Gasoline	1,719.44	4.75%	20,342	9.12%	$ 564,692.60	10.59%
Biodiesel	54.37	0.15%	624	0.28%	$ 17,490.94	0.33%
Ethanol	15.20	0.04%	183	0.08%	$ 6,865.70	0.13%
Total	**36,180.37**	**100%**	**222,942.28**	**100%**	**$ 5,331,043.81**	**100%**
			2015			
Electricity	29,422.75	79.16%	129,862	57.10%	$ 3,232,572.84	65.48%
Diesel	4,464.78	12.01%	50,972	22.41%	$ 900,144.32	18.23%
Natural Gas	1,490.63	4.01%	25,421	11.18%	$ 174,075.33	3.53%
Gasoline	1,713.29	4.61%	20,269	8.91%	$ 612,340.98	12.40%
Biodiesel	59.30	0.16%	681	0.30%	$ 11,596.58	0.23%
Ethanol	19.85	0.05%	239	0.11%	$ 5,880.25	0.12%
Total	**37,170.60**	**100%**	**227,443.73**	**100%**	**$ 4,936,610.30**	**100%**
2013-2015 Change	**2.74%**	**-**	**2.02%**	**-**	**-7.40%**	**-**

[1] A rate **rider** is a temporary, additional rate on a utility **bill**, separate from the basic monthly rates charged by the utility company for electric use. Rate **riders** are intended to recover costs or refund money for something that is temporary, or caused by factors outside of utility control. The decrease reflected here is expected to be temporary.

Figure 8: City Energy Use by Energy Source 2010-2015 Comparison

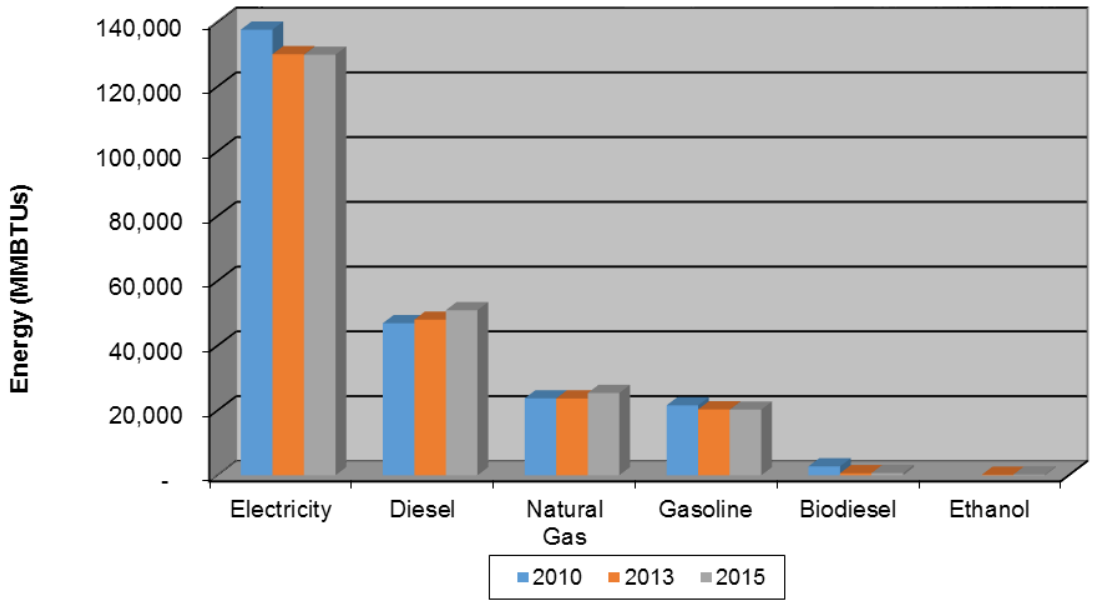


Figure 9: Energy Consumption by Energy Source for City Operations in MMBTUs (2015)

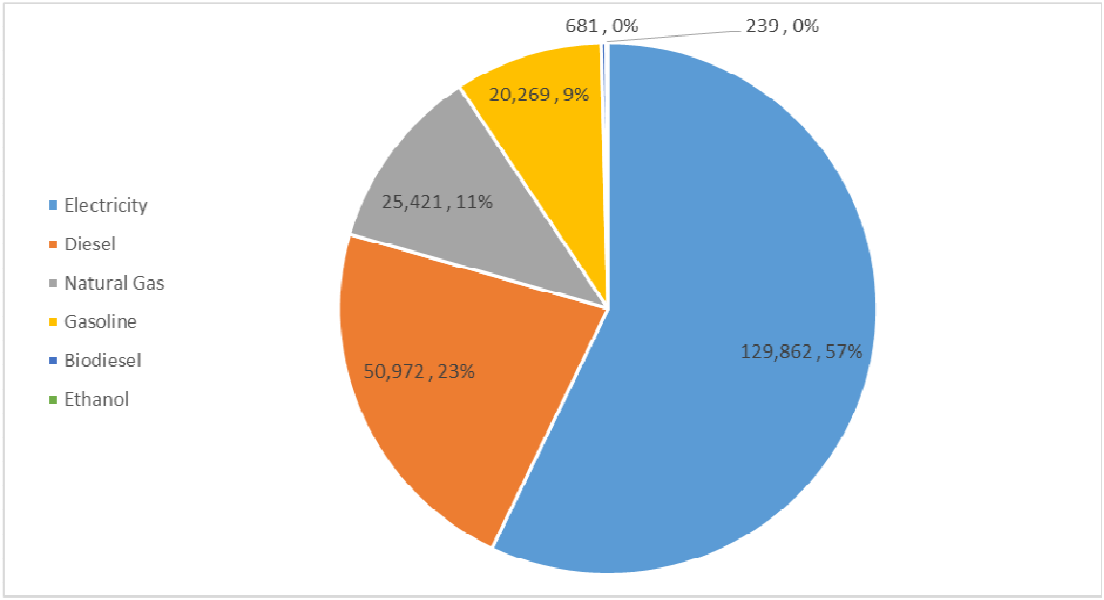


Figure 10: City Energy Expenditures by Energy Source 2010-2015 Comparison

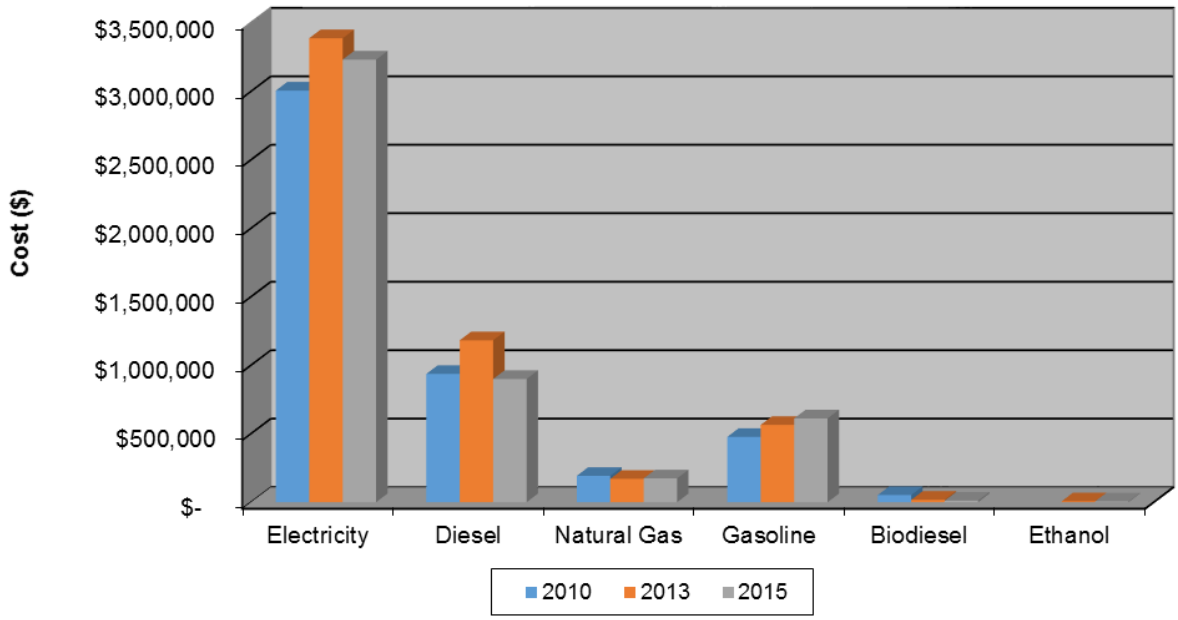


Figure 11: Energy Expenditures by Energy Source (2015)

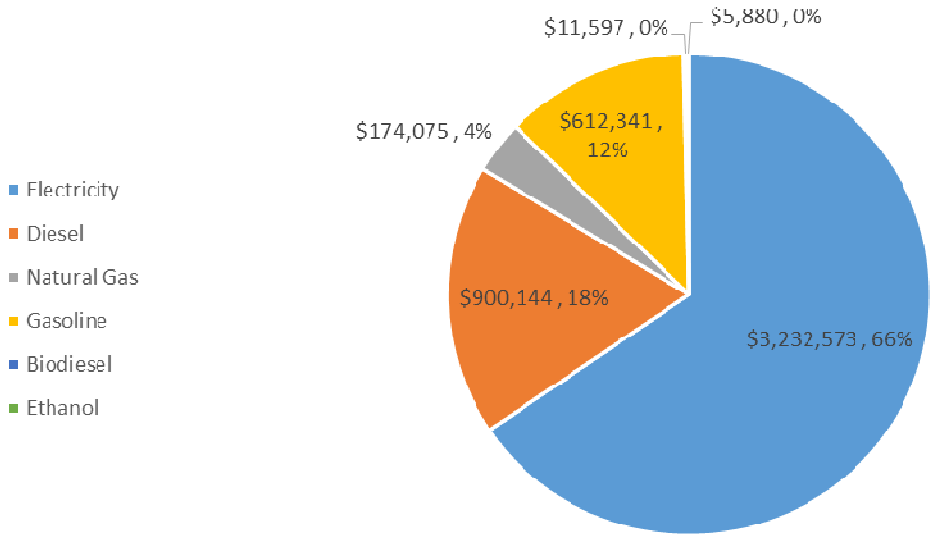


Figure 12: City CO_2e Emissions by Energy Source 2010-2015 Comparison

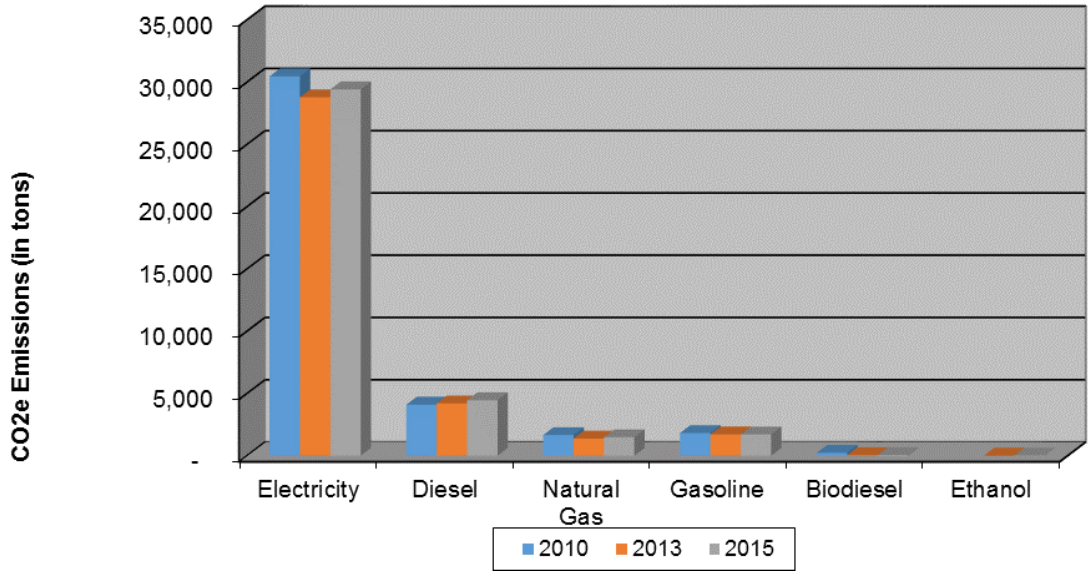
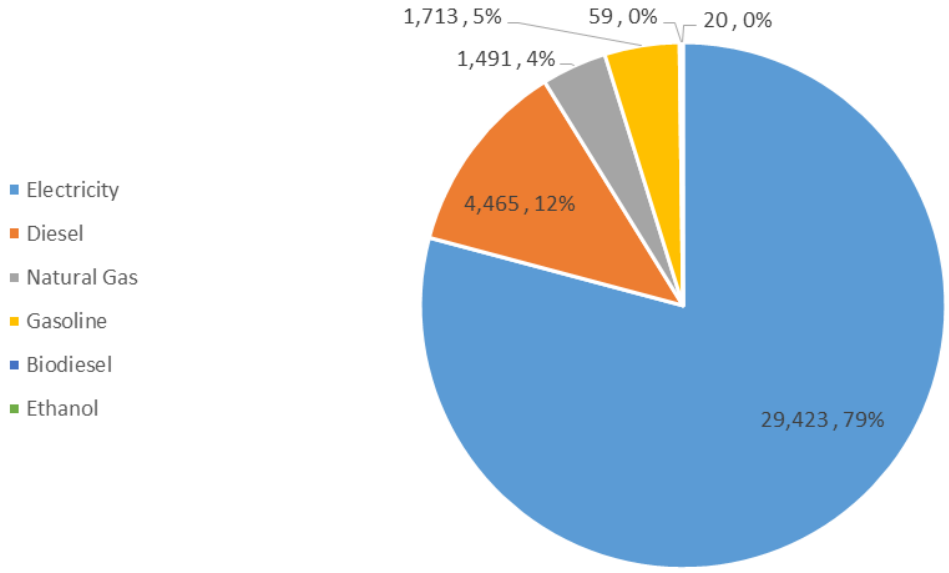


Figure 13: City CO_2e Emissions by Energy Source (2015)



Electricity Consumption Breakdown

For City government electricity consumption, City of Bloomington Utilities (CBU) continues to comprise the majority of consumption, just as in 2013 and 2010. CBU services collectively account for 74.2% of the City's total electricity consumption, 66.8% of total electricity expenditures and 74.2% of total CO_2e emissions. Water Delivery facilities have shown a continuous decline since 2010, while Wastewater Facilities have shown a gradual increase. Buildings & Facilities experienced a sharp decline in electricity consumption from 2010 to 2013, then ticked back up slightly in 2015. The City's remaining buildings, non-water delivery or treatment facilities, and streetlights and traffic signals account for 25.7% of total electricity consumption, 33% of total electricity expenditures and 25.7% of electricity CO_2e emissions. Table 6 and Figures 14-20 illustrate how electricity use was divided among sectors.

Table 6: Electricity Consumption by City Government Sector

Sector	CO2e (tons)	CO2e (%)	Energy Use (MMBTUs)	Energy Use (%)	Cost ($)	Cost (%)
			2010			
Water Delivery Facilities	12,002.04	39.38%	54,195.21	39.38%	$1,081,120	35.96%
Wastewater Facilities	9,977.03	32.74%	45,051.32	32.74%	$818,213	27.21%
Buildings & Facilities	6,461.47	21.20%	29,177	21.20%	$668,838	22.25%
Streetlights & Traffic Signals	2,033.44	6.67%	9,182	6.67%	$438,456	14.58%
Total	**30,473.98**	**100.00%**	**137,605.31**	**100.00%**	**$3,006,627**	**100.00%**
			2013			
Water Delivery Facilities	11,177.91	38.82%	50,473.89	38.82%	$1,173,863	34.64%
Wastewater Facilities	10,357.38	35.97%	46,768.75	35.97%	$1,116,167	32.94%
Buildings & Facilities	5,225.61	18.15%	23,596.25	18.15%	$666,474	19.67%
Streetlights & Traffic Signals	2,032.31	7.06%	9,176.91	7.06%	$432,121	12.75%
Total	**28,793.21**	**100.00%**	**130,015.80**	**100.00%**	**$3,388,626**	**100.00%**
			2015			
Water Delivery Facilities	11,023.44	37.47%	48,653.71	37.47%	$1,062,117	32.86%
Wastewater Facilities	10,828.23	36.80%	47,796.54	36.81%	$1,097,456	33.95%
Buildings & Facilities	5,650.90	19.21%	24,941.16	19.21%	$672,527	20.80%
Streetlights & Traffic Signals	1,919.18	6.52%	8,470.62	6.52%	$400,472	12.39%
Total	**29,421.75**	**100.00%**	**129,862.03**	**100.00%**	**$3,232,573**	**100.00%**
2013-2015 Percent Change	**2.18%**	**-**	**-0.12%**	**-**	**-4.61%**	**-**

Figure 14: Electricity Consumption by City Government Sector 2010-2015 Comparison

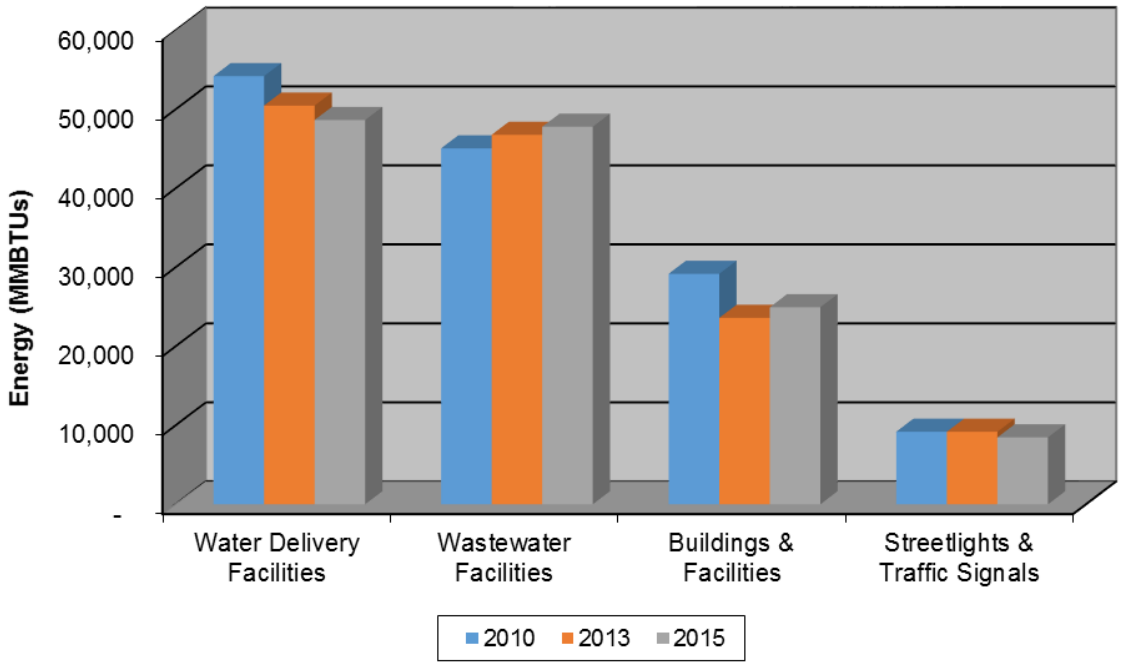


Figure 15: Electricity Consumption by City Government Sector in MMBTUs (2015)

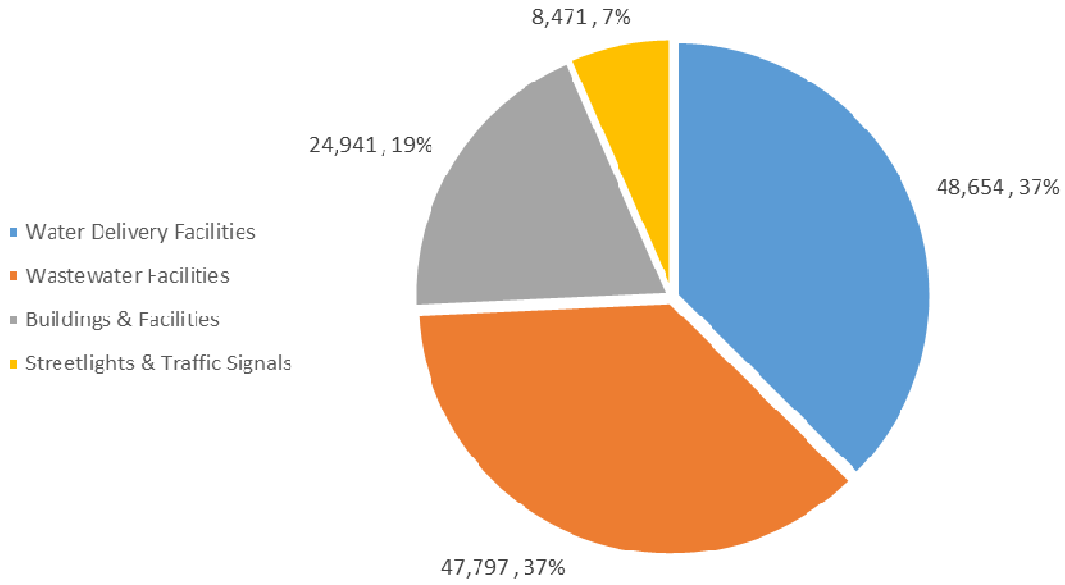


Figure 16: Electricity Expenditures by City Government Sector 2010-2015 Comparison

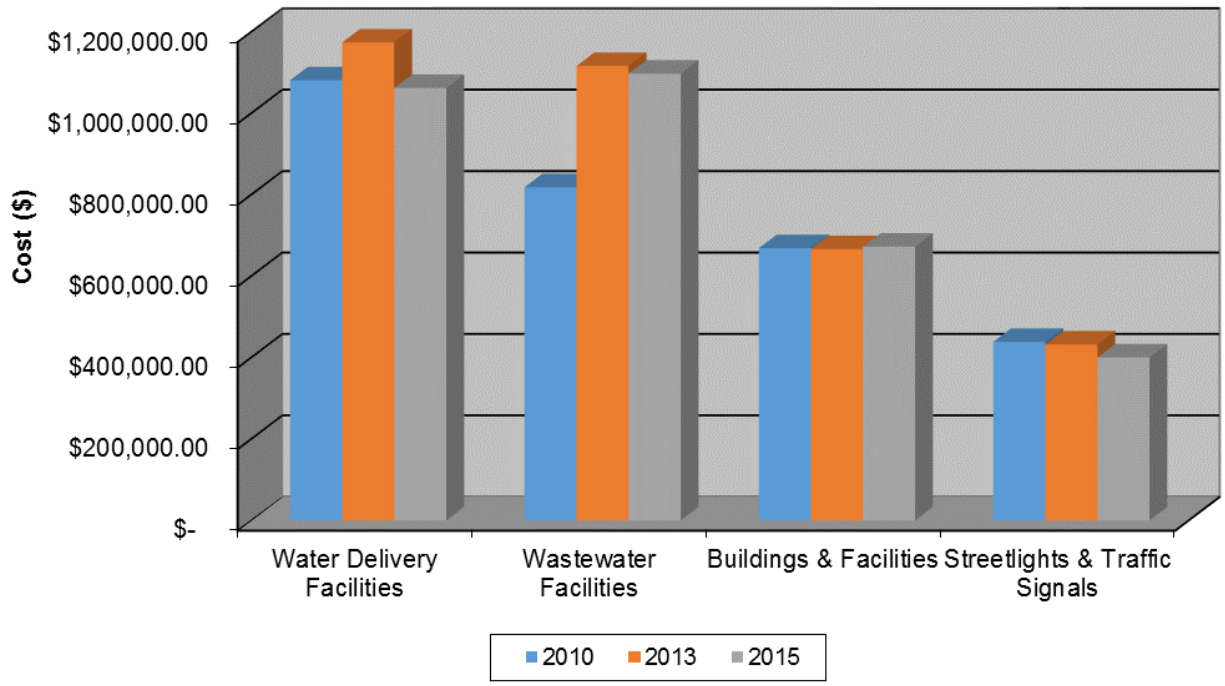


Figure 17: Electricity Expenditures by City Government Sector

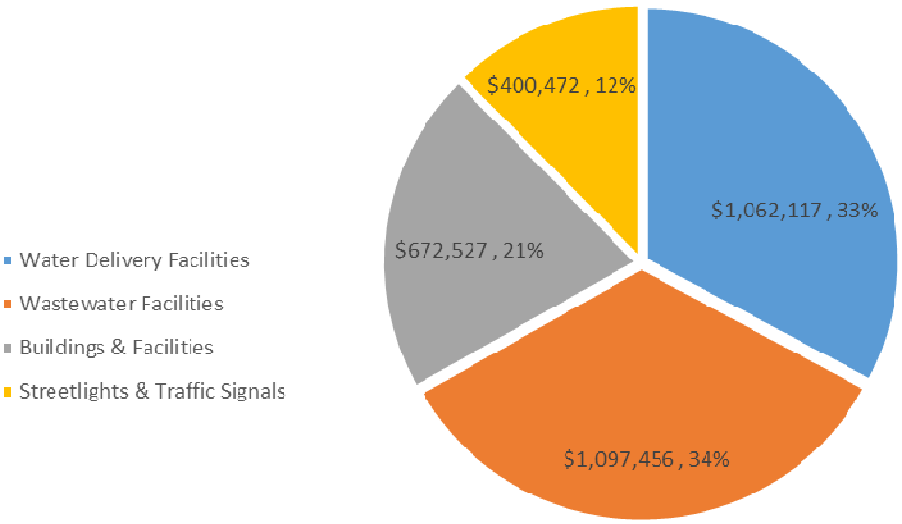


Figure 18: CO_2e Emissions from Electricity Consumption by City Government Sector 2010-2015 Comparison

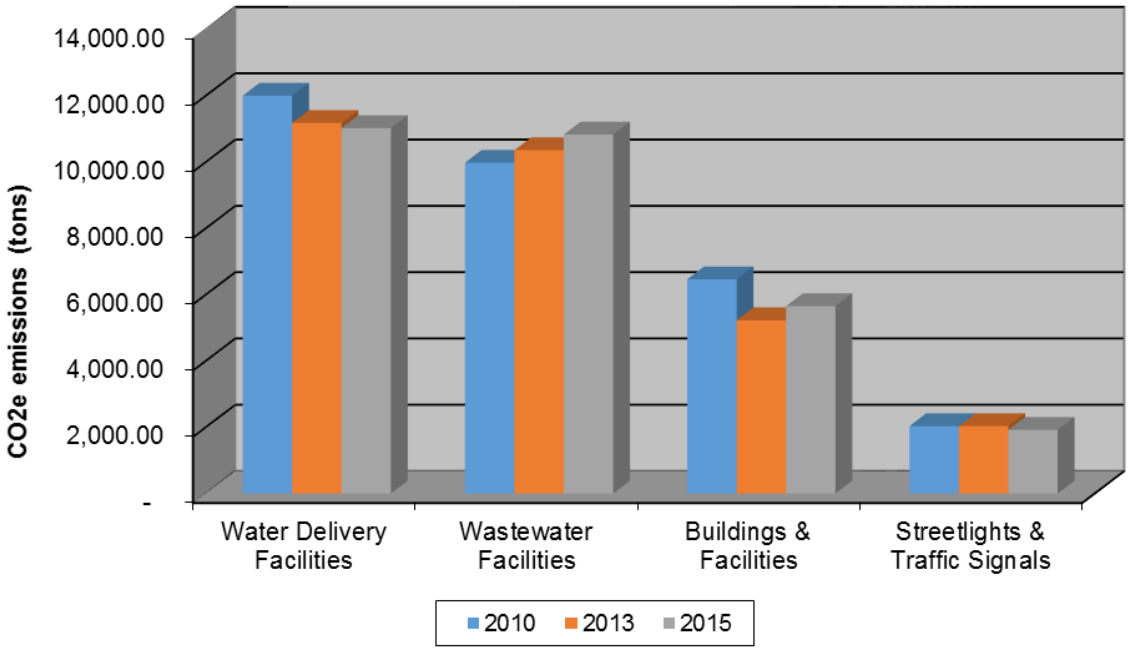


Figure 19: CO_2e Emissions from Electricity Consumption by City Government Sector (2015)

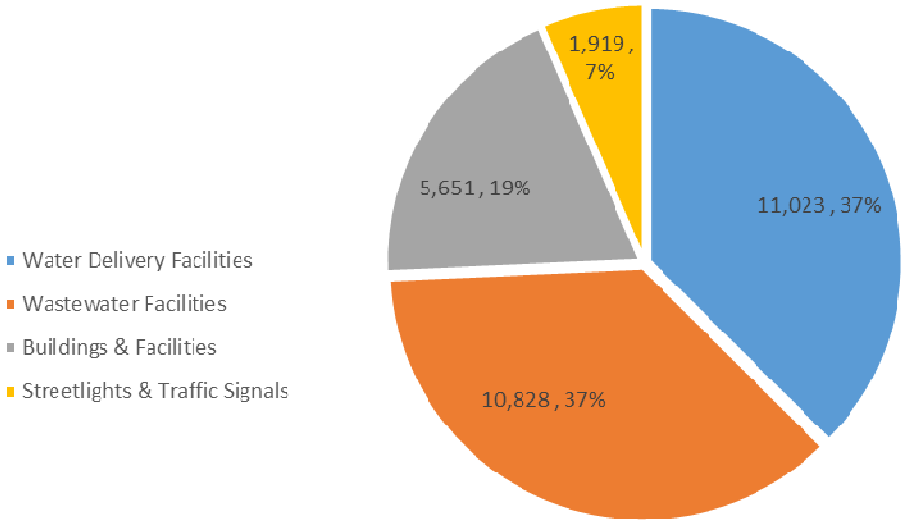
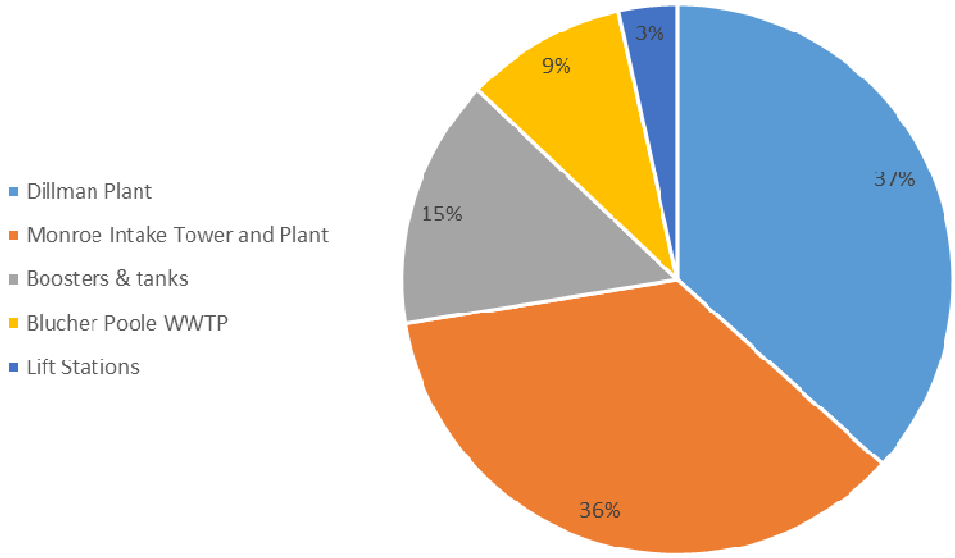


Figure 20: Top 5 largest electricity uses by CBU Water Delivery and Wastewater Facilities (2015)



Natural Gas Consumption Breakdown

Natural gas consumption has had a significant increase for City operations when compared to 2013. The City's largest consumer of natural gas remains Buildings and Facilities, as it was in 2013. Buildings and non-water-treatment Facilities account for 60% each of total City natural gas energy consumption, total expenditures and total CO_2e emissions. However, Buildings & Facilities experienced a decrease of 3.9% in natural gas consumption over this time period. Wastewater Facilities and Water Delivery Facilities, on the other hand, experienced an increase in consumption of 0.7% and 3.1%, respectively. When compared to 2010, all sectors experienced increases in usage.

Table 7 and Figures 21-26 illustrate this data and how natural gas consumption was divided among City sectors in 2013.

Table 7: Natural Gas Consumption by City Government Sector

Sector	CO2e (tons)	CO2e (%)	Energy Use (MMBTUs)	Energy Use (%)	Cost ($)	Cost (%)
2010						
Buildings & Facilities	1,174.75	70.55%	15,370.37	64.73%	$ 126,656.56	65.78%
Wastewater Facilities	363.46	21.83%	6,207.72	26.14%	$ 47,910.21	24.88%
Water Delivery Facilities	126.92	7.62%	2,167.74	9.13%	$ 17,972.42	9.33%
Total	**1,665.12**	**100.00%**	**23,745.82**	**100.00%**	**$ 192,539.19**	**100.00%**
2013						
Buildings & Facilities	898.21	64.67%	15,341.24	64.67%	$ 110,698.70	64.88%
Wastewater Facilities	401.07	28.87%	6,850.14	28.87%	$ 48,050.69	28.16%
Water Delivery Facilities	89.72	6.46%	1,532.39	6.46%	$ 11,881.73	6.96%
Total	**1,389.00**	**100.00%**	**23,723.77**	**100.00%**	**$ 170,631.12**	**100.00%**
2015						

Buildings & Facilities	905.45	60.74%	15,441.29	60.74%	$ 105,534.18	60.63%
Wastewater Facilities	441.76	29.64%	7,533.61	29.64%	$ 51,144.71	29.38%
Water Delivery Facilities	143.41	9.62%	2,445.74	9.62%	$ 17,394.41	9.99%
Total	**1,490.62**	**100.00%**	**25,420.64**	**100.00%**	**$ 174,073.30**	**100.00%**
2013-2015 Percent Change	**7.32%**	**-**	**7.15%**	**-**	**2.02%**	**-**

Figure 21: Natural Gas Consumption by City Government Sector 2010-2015 Comparison

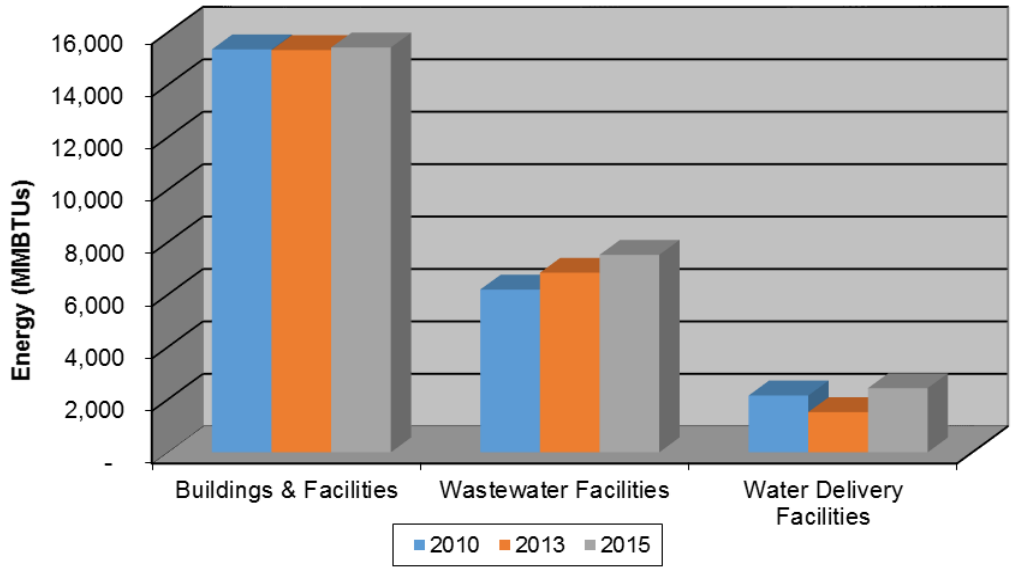


Figure 22: Natural Gas Consumption by City Government Sector (2015)

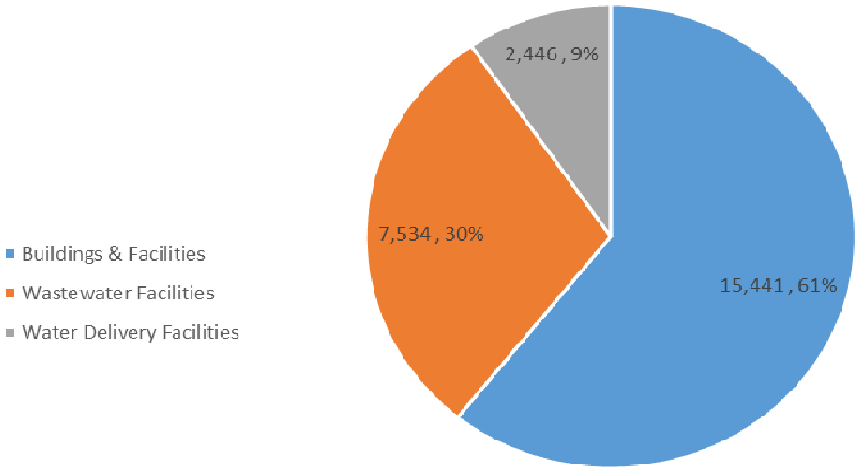


Figure 23: Natural Gas Expenditures by City Government Sector 2010-2015 Comparison

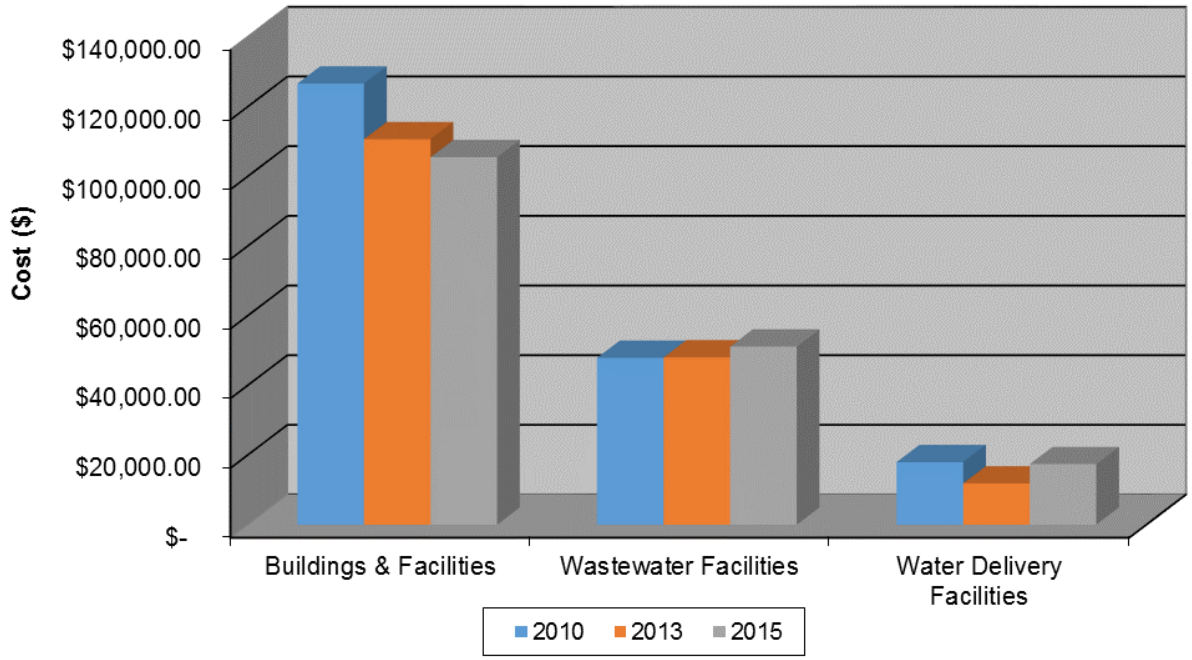


Figure 24: Natural Gas Expenditures by City Government Sector (2015)

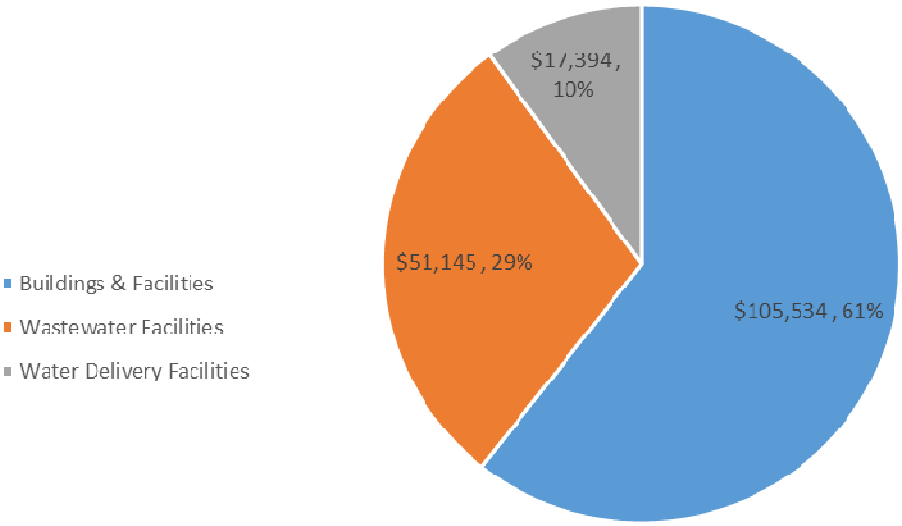


Figure 25: Natural Gas CO_2e Emissions by City Government Sector 2010-2013 Comparison

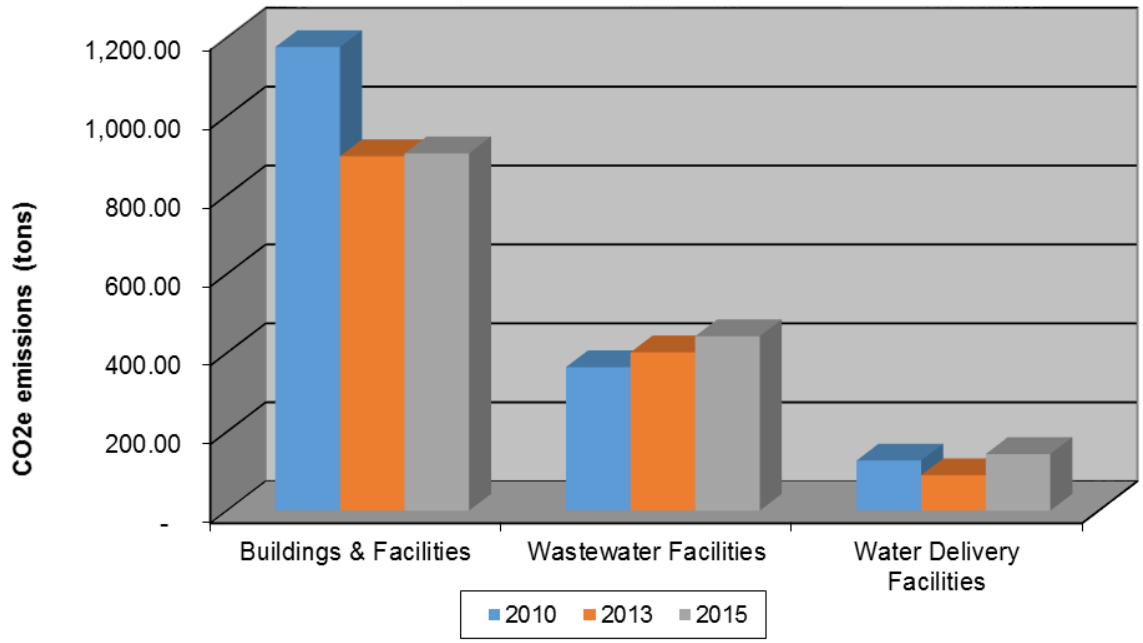
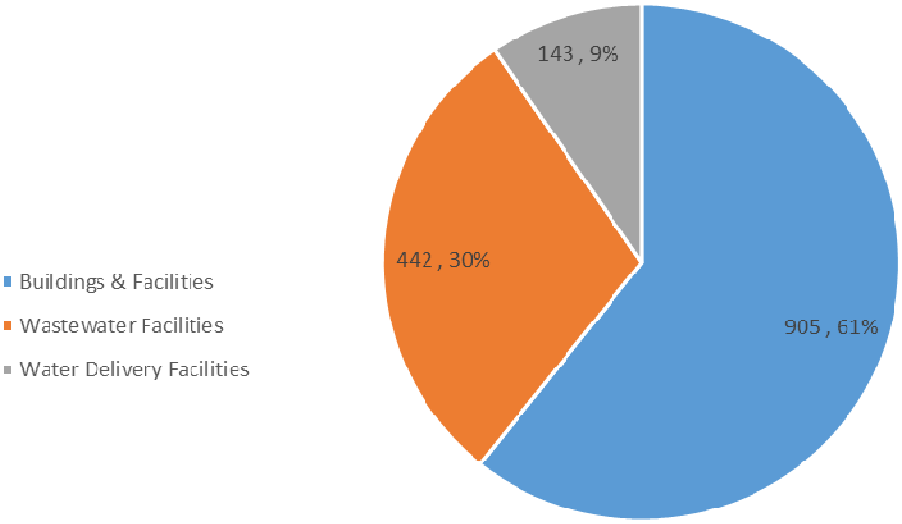


Figure 26: Natural Gas CO_2e Emissions by City Government Sector (2015)



Buildings and Non-Water Treatment Facilities Breakdown

When looking at non-water treatment facilities, we can see that they have experienced an increase of 4.49% in energy consumption. The CO2e emissions have also increased 8.19% when compared to 2013, and costs have risen by 1.48%. However, when comparing to base year 2010, there was a 13% decline in CO2e, 9.49% decline in energy consumption, and 0.85% decline in costs.

An analysis was conducted to determine if the increase in energy consumption from 2013 to 2015 was due to weather changes. Results showed no statistical significance in the difference between weather-normalized data and raw data. See Appendix A for trends in facilities' electricity and natural gas consumption and which specific facilities have seen increases in consumption.

Table 8 and Figures 27-32 illustrate this data and how electricity and natural gas consumption was divided among City departments in 2015.

Table 8: Energy Consumption, Costs and Emissions by City Department (Buildings and Non-Water Treatment Facilities Only)

Department	Utility	CO2e (tons)	CO2e (%)	Energy Use (MMBTUs)	Energy Use (%)	Cost ($)	Cost (%)
			2010				
Public Works	Electricity	3,010.12	88.91%	13,592	67.93%	$ 312,712.48	85.44%
	Natural Gas	375.63	11.09%	6,416	32.07%	$ 53,275.83	14.56%
Subtotal: Public Works		3,385.75	44.34%	20,007.91	44.91%	$ 365,988.31	46.01%
Parks & Recreation	Electricity	2,561.40	88.68%	11,566.00	67.44%	$ 271,014.00	85.13%
	Natural Gas	326.94	11.32%	5,584.00	32.56%	$ 47,349.00	14.87%
Subtotal: Parks & Rec.		2,888.34	37.82%	17,150.00	38.50%	$ 318,363.00	40.03%
Utilities	Electricity	543	84.63%	2,452	59.29%	$ 54,952.82	79.32%
	Natural Gas	99	15.37%	1,684	40.71%	$ 14,325.73	20.68%
Subtotal: Utilities		641.51	8.40%	4,135.25	9.28%	$ 69,278.55	8.71%
Transit	Electricity	347	48.16%	1,567	48.16%	$ 30,052.00	71.97%
	Natural Gas	374	51.84%	1,687	51.84%	$ 11,706.00	28.03%
Subtotal: Transit		720.63	9.44%	3,254.00	7.30%	$ 41,758.00	5.25%
Total		**7,636**	**100%**	**44,547**	**100%**	**$795,387.86**	**100%**
			2013				
Public Works	Electricity	2,590.88	87.42%	11,699.10	64.75%	$ 336,352.27	87.21%
	Natural Gas	372.83	12.58%	6,367.86	35.25%	$ 49,341.00	12.79%
Subtotal: Public Works		2,963.71	48.40%	18,066.96	46.40%	$ 385,693.27	49.63%
Parks & Recreation	Electricity	1,904.50	84.29%	8,599.79	58.65%	$ 265,103.76	85.45%
	Natural Gas	354.96	15.71%	6,062.54	41.35%	$ 45,139.48	14.55%
Subtotal: Parks & Rec.		2,259.46	36.90%	14,662.33	37.66%	$ 310,243.24	39.92%
Utilities	Electricity	400.44	83.53%	1,808.21	57.27%	$ 45,412.85	82.27%
	Natural Gas	78.99	16.47%	1,349.05	42.73%	$ 9,787.00	17.73%
Subtotal: Utilities		479.43	7.83%	3,157.26	8.11%	$ 55,199.85	7.10%
Transit	Electricity	329.79	78.29%	1,489.15	48.81%	$ 19,605.48	75.30%
	Natural Gas	91.44	21.71%	1,561.79	51.19%	$ 6,431.22	24.70%
Subtotal: Transit		421.23	6.88%	3,050.94	7.84%	$ 26,036.70	3.35%
Total		**6,123.82**	**100%**	**38,937.49**	**100%**	**$ 777,173.06**	**100%**
2010-2013 Percent Change		**-19.81%**	**-**	**-12.59%**	**-**	**-2.29%**	**-**
			2015				
Public Works	Electricity	2,885.56	89.44%	12,735.90	68.68%	$ 318,002.59	87.93%
	Natural Gas	340.60	10.56%	5,808.40	31.32%	$ 43,661.74	12.07%
Subtotal: Public Works		3,226.16	48.69%	18,544.30	45.58%	$ 361,664.33	45.86%
Parks & Recreation	Electricity	1,955.17	83.73%	8,629.45	57.12%	$ 268,999.00	84.89%
	Natural Gas	379.87	16.27%	6,478.00	42.88%	$ 47,886.10	15.11%

Subtotal: Parks & Rec.		2,335.04	35.24%	15,107.45	37.13%	$ 316,885.10	40.18%
Utilities	Electricity	391.81	80.71%	1,729.31	51.99%	$ 44,939.00	92.44%
	Natural Gas	93.62	19.29%	1,596.63	48.01%	$ 3,676.69	7.56%
Subtotal: Utilities		485.43	7.33%	3,325.94	8.17%	$ 48,615.69	6.16%
Transit	Electricity	487.51	84.22%	2,151.69	58.00%	$ 51,217.52	83.24%
	Natural Gas	91.36	15.78%	1,558.03	42.00%	$ 10,309.65	16.76%
Subtotal: Transit		578.87	8.74%	3,709.71	9.12%	$ 61,527.17	7.80%
Total		**6,625.50**	**100%**	**40,687.40**	**100%**	**$ 788,692.29**	**100%**
2013-2015 Percent Change		**8.19%**	-	**4.49%**	-	**1.48%**	-
2010-2015 Percent Change		**-13.24%**	-	**-9.49%**	-	**-0.85%**	-

Figure 27: Energy Consumption by City Government Department (Buildings and Non-Water Treatment Facilities only) 2010-2015 Comparison

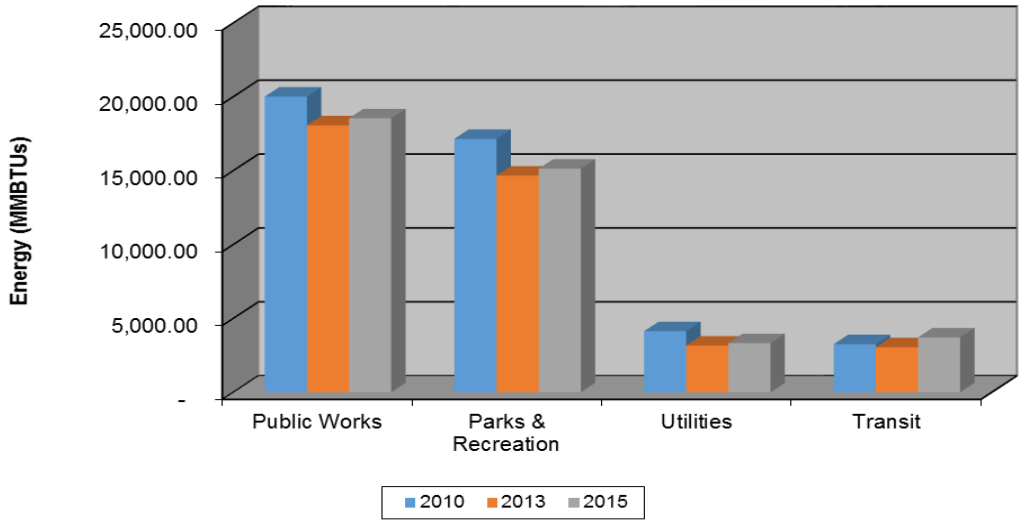


Figure 28: Energy Consumption by City Government Department in MMBTUs (Buildings and Non-Water Treatment Facilities only) (2015)

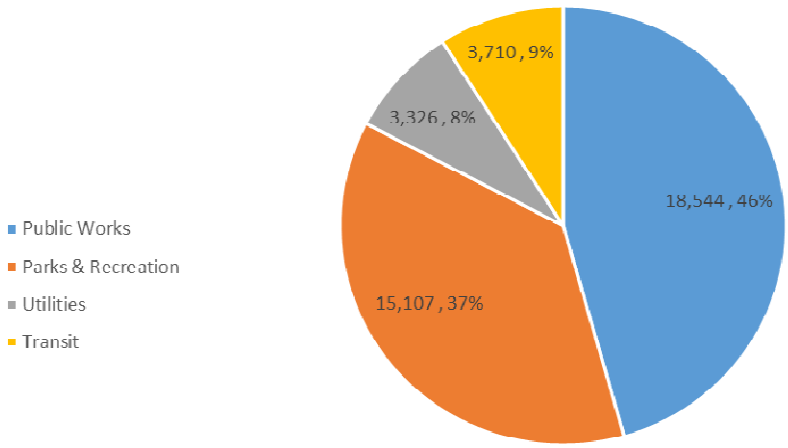


Figure 29: Energy Expenditures by City Government Department (Buildings and Non-Water Treatment Facilities only) 2010-2015 Comparison

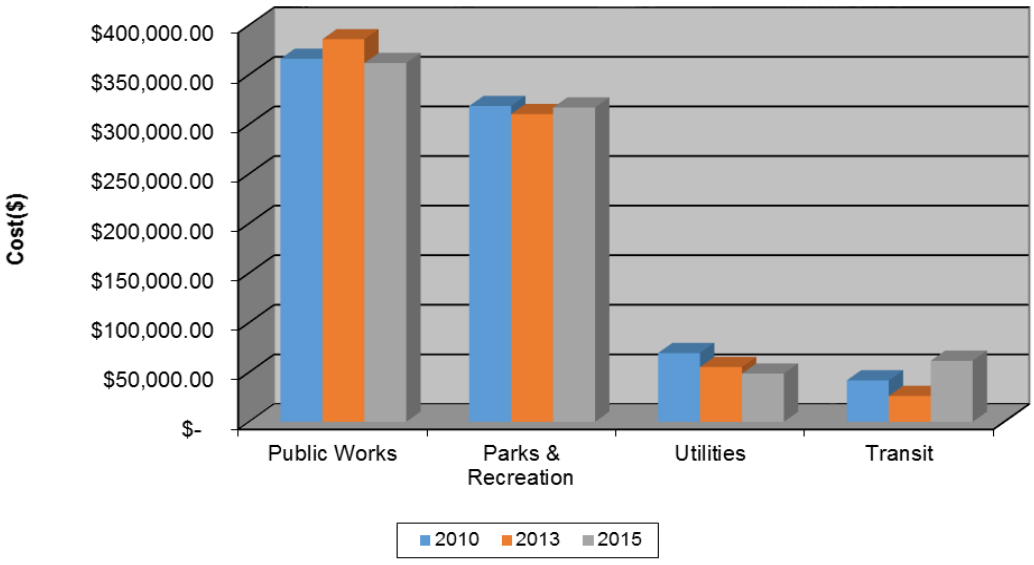


Figure 30: Energy Expenditures by City Government Department (Buildings and Non-Water Treatment Facilities only) (2015)

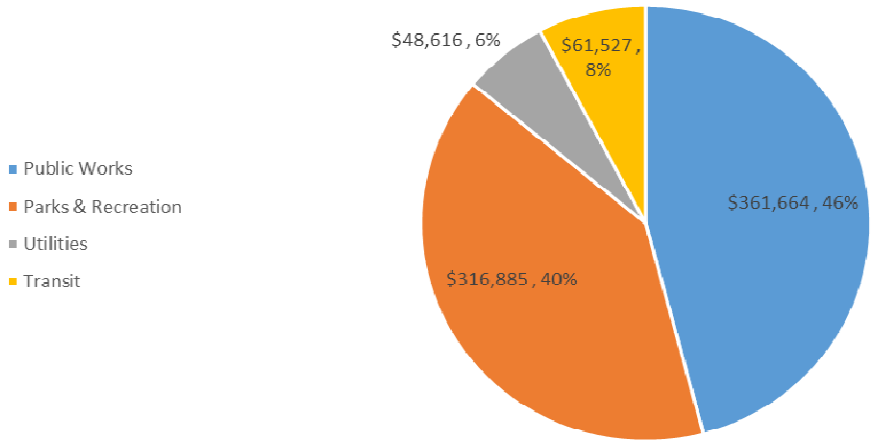


Figure 31: CO_2e Emissions by City Government Department (Buildings and Non-Water Treatment Facilities only) 2010-2013 Comparison

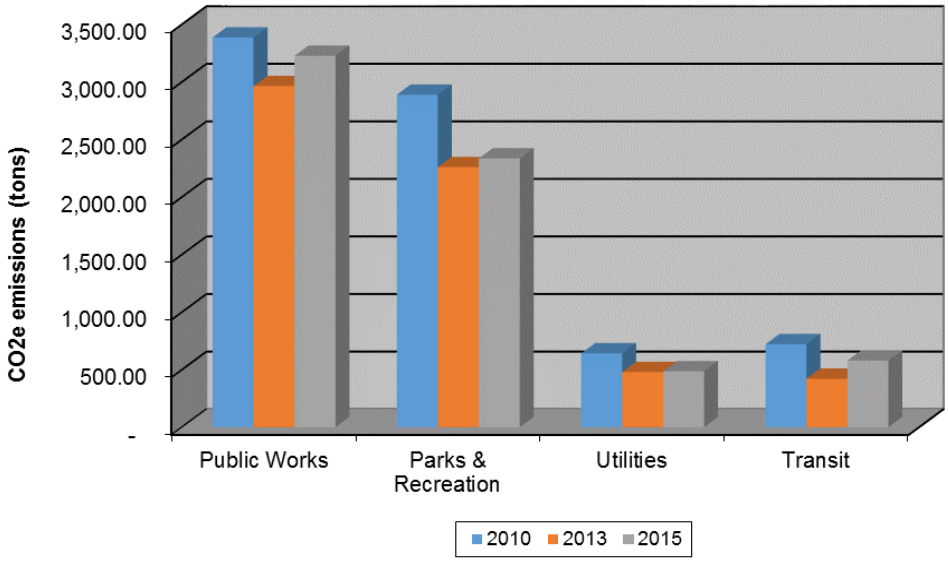
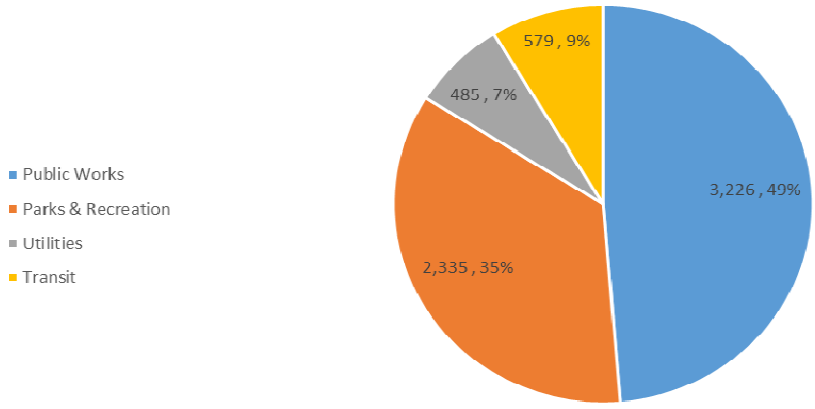


Figure 32: CO_2e Emissions by City Government Department (Buildings and Non-Water Treatment Facilities only) (2015)



As the above figures illustrate, the Public Works and Parks and Recreation Departments remain the City's dominant users of both electricity and natural gas for buildings and non-water treatment facilities.

Tables 9 and 10 below lend further insight into which buildings and facilities account for the largest share electricity and natural gas consumption.

Table 9: Top 10 Electricity Consuming City Government Facilities

Facility name	Annual kWh	Annual Cost	kWh/ft²	Cost/ft²
City Hall	1,105,578	$96,366.45	17.27	$1.51
Twin Lakes Recreation Center	969,943	$86,545.09	9.70	$0.87
Frank Southern Center	682,930	$52,259.92	21.34	$1.63
Police Headquarters	497,920	$38,776.43	45.27	$3.53
Utilities Service Center	486,240	$42,885.17	23.15	$2.04
GM/Morton St Garage	433,720	$29,397.85	2.41	$0.16
Grimes Transit Garage	417,510	$33,025.16	11.30	$0.89
Police-Dispatch	381,160	$32,017.44	71.15	$5.98
Walnut St Garage	246,000	$17,596.27	N/A	N/A
Downtown Transit Center	209,720	$17,728.05	N/A	N/A

Table 10: Top 10 Natural Gas Consuming City Government Facilities

Facility name	Annual Therms	Annual Cost	Therms/ft²	Cost/ft²
Frank Southern Center	25,823.03	$ 17,241.74	0.81	$ 0.54
Animal Shelter	18,587.99	$ 13,188.56	2.50	$ 1.77
Utilities Service Center	15,966.25	$ 3,676.69	0.76	$ 0.18
Grimes Transit Garage	14,430.69	$ 9,438.15	0.39	$ 0.26
Twin Lakes Recreation Center	10,757.09	$ 7,777.88	0.11	$ 0.08
Bryan Pool	6,773.85	$ 5,749.23	N/A	N/A
Fleet Building	5,665.55	$ 4,094.00	0.47	$ 0.34
Banneker Community Center	5,569.38	$ 4,111.08	0.86	$ 0.63
Maintenance Building 345	4,982.31	$ 3,425.06	1.92	$ 1.32
Fire station 4	4,551.60	$ 3,514.73	0.60	$ 0.46

Transit Fleet and Vehicle Fleet

The City Vehicle Fleet experienced an overall increase in consumption and emissions. When compared to 2013, this increase was 3.98% in energy usage and 4% in emissions. Costs have declined by 27.94%, as a result of a price decrease since 2013, as already explained. Approximately 98% of purchased diesel had a biodiesel content that ranged from B2-B20[2]. For calculation purposes, we had to "extract" the biodiesel content in order to calculate emissions, and we made the assumption that 5% of all purchased diesel is 100% biodiesel. Both the Transit and Vehicle Fleets have experienced a rise in emissions and energy usage when compared to 2010 as well. But costs have declined when comparing to 2010, same as with 2013.

Table 11 illustrates the total vehicle fuel data and how different City departments consumed vehicle fuels in 2015. Figures 33-38 illustrate the breakdown in vehicle fuel consumption, associated expenditures and total emissions per fuel type.

Table 11: Vehicle Fuel Consumption Breakdown

Department	Fuel Type	CO_2e (tons)	CO_2e (%)	Energy Use (MMBTUs)	Energy Use (%)	Cost ($)	Cost (%)
			2010[3]				
Transit Fleet	Diesel	3,122.96	95.04%	35,653.24	94.86%	$ 640,185.00	93.42%
	Ethanol	11.06	0.34%	133.13	0.35%	$ -	0.00%
	Gasoline	151.93	4.62%	1,797.40	4.78%	$ 45,115.00	6.58%
Transit Fleet Subtotals		3,285.94	53.18%	37,583.77	52.70%	$ 685,300.00	46.73%
Vehicle Fleet	Biodiesel	60.94	2.11%	696.45	2.06%	$ 17,457.55	2.23%
	Diesel	1,157.93	40.02%	13,232.56	39.22%	$ 331,693.45	42.46%
	Gasoline	1,674.31	57.87%	19,808.10	58.71%	$ 431,995.00	55.30%
Vehicle Fleet Subtotals		2,893.18	46.82%	33,737.10	47.30%	$ 781,146.00	53.27%
Total		**6,179.13**	**100%**	**71,320.87**	**100%**	**$1,466,446.00**	**100%**
			2013				
Transit Fleet	Diesel	3,092.96	93.24%	35,310.79	93.01%	$ 850,409.59	92.53%
	Ethanol	15.20	0.46%	183.09	0.48%	$ 6,865.70	0.75%
	Gasoline	208.94	6.30%	2,471.86	6.51%	$ 61,791.30	6.72%
Transit Fleet Subtotals		3,317.11	55.30%	37,965.74	54.86%	$ 919,066.59	51.87%
Vehicle Fleet	Biodiesel	54.37	2.03%	624.02	2.00%	$ 17,490.94	2.05%
	Diesel	1,116.18	41.63%	12,742.82	40.79%	$ 332,327.85	38.97%
	Gasoline	1,510.50	56.34%	17,870.12	57.21%	$ 502,901.30	58.98%
Vehicle Fleet Subtotals		2,681.05	44.70%	31,236.97	45.14%	$ 852,720.09	48.13%
Total		**5,998.16**	**100%**	**69,202.71**	**100%**	**$1,771,786.68**	**100%**
			2015				
Transit Fleet	Diesel	3,247.40	91.73%	37,073.99	91.45%	$ 679,809.27	92.04%
	Ethanol	19.85	0.56%	239.05	0.59%	$ 5,880.25	0.80%
	Gasoline	272.79	7.71%	3,227.27	7.96%	$ 52,922.27	7.17%
Transit Fleet Subtotals		3,540.04	56.58%	40,540.31	56.18%	$ 738,611.79	57.85%
Vehicle Fleet	Biodiesel	59.30	2.18%	680.60	2.15%	$ 11,596.58	2.16%

[2] B2 means that 2% of the diesel content is 100% biodiesel, B20 means 20% and so forth.

[3] Previous reports used a 20% assumption of purchased diesel was biodiesel in 2010. This assumption was altered to 5% to match this 5% assumption that was used in 2013 and 2015.

Diesel	1,217.38	44.80%	13,898.19	43.95%	$ 220,335.05	40.95%
Gasoline	1,440.50	53.01%	17,041.97	53.89%	$ 306,170.49	56.90%
Vehicle Fleet Subtotals	2,717.18	43.42%	31,620.76	43.82%	$ 538,102.12	42.15%
Total	**6,257.22**	**100%**	**72,161.07**	**100%**	**$1,276,713.91**	**100%**
2013-2015 Percent Change	**4.32%**		**4.27%**		**-27.94%**	**-**
2010-2015 Percent Change	**1.25%**		**1.16%**		**-14.86%**	**-**

Figure 33: Fuel Energy Consumption by Fuel Type 2010-2015 Comparison

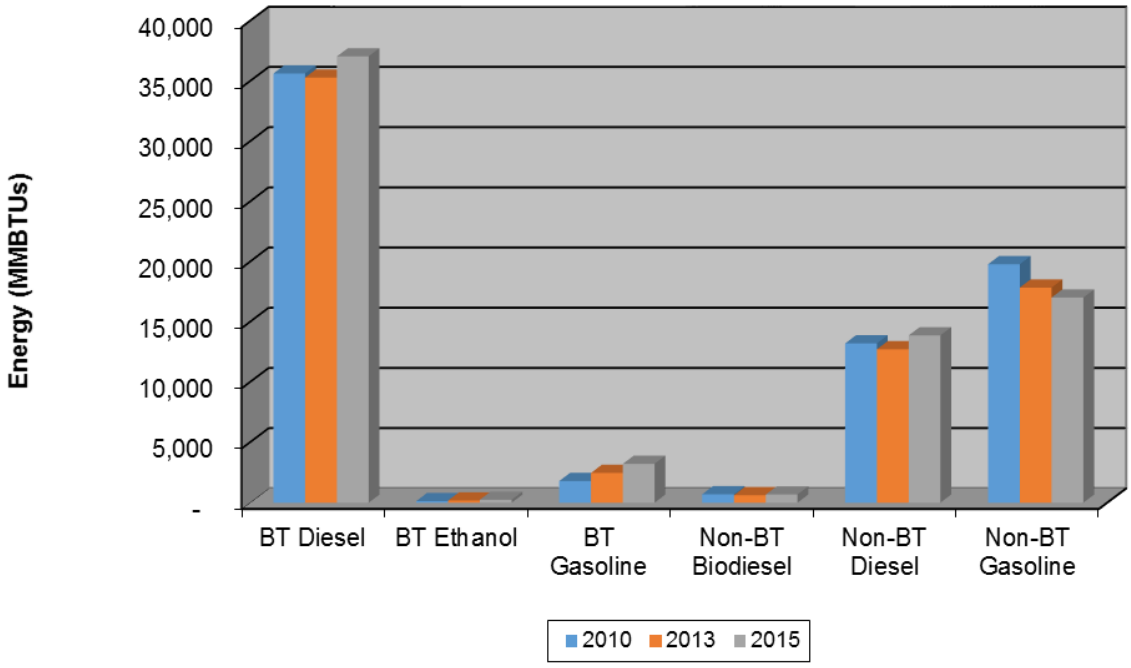


Figure 34: Vehicle Fuel Use by Fuel Type in MMBTUs (2015)

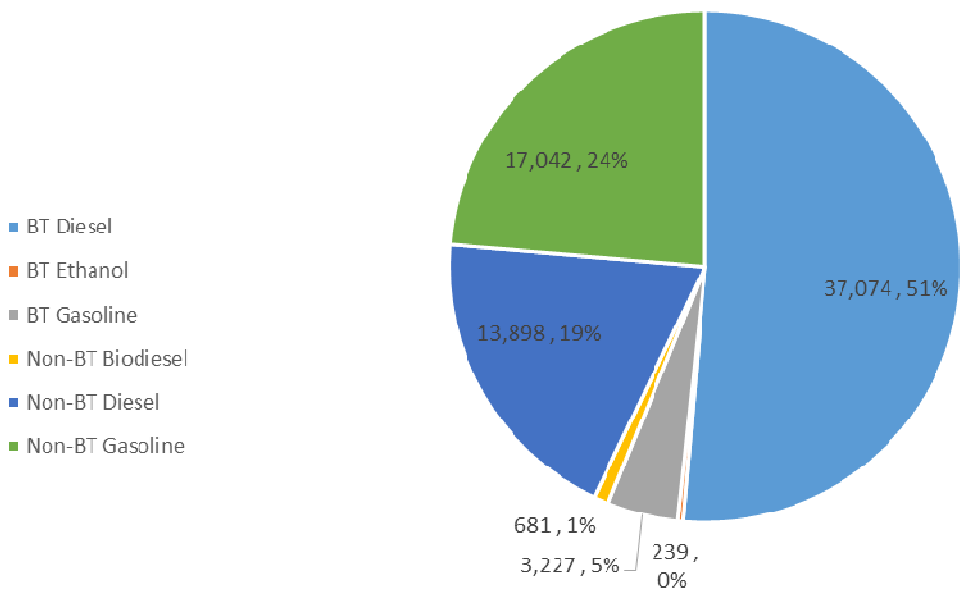
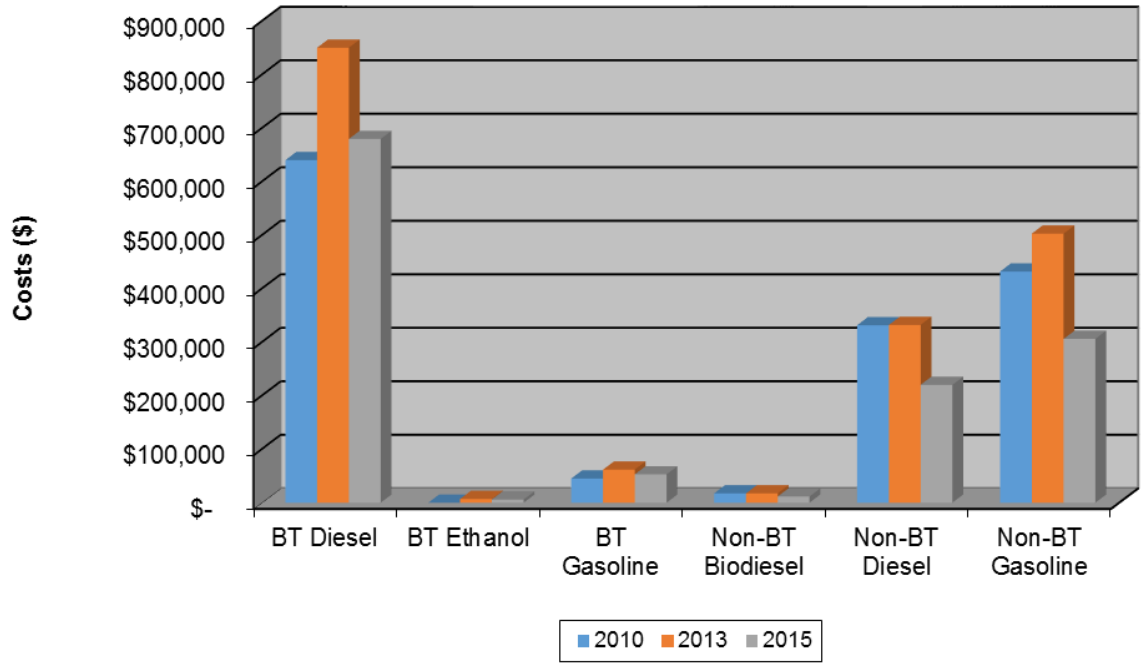


Figure 35: Fuel Expenditures by Fuel Type 2010-2015 Comparison



*BT = Bloomington Transit

Figure 36: Cost of Vehicle Fuel by Fuel Type (2015)

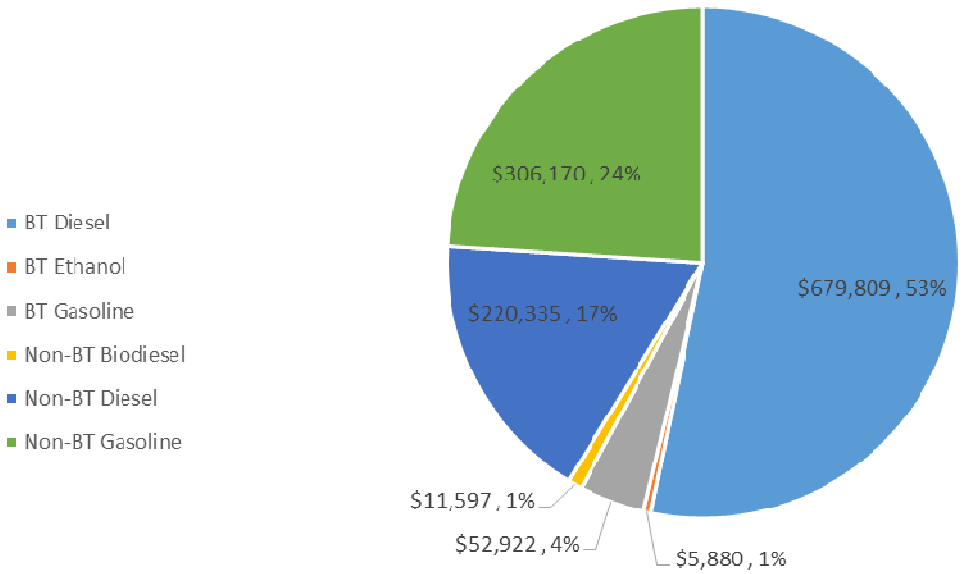
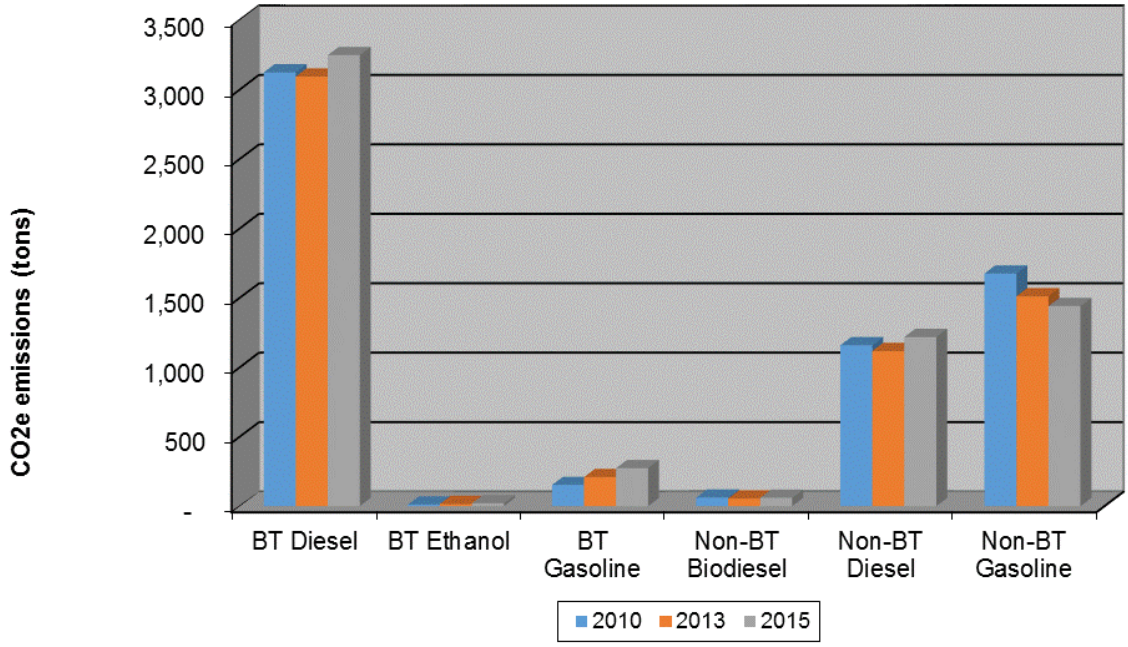
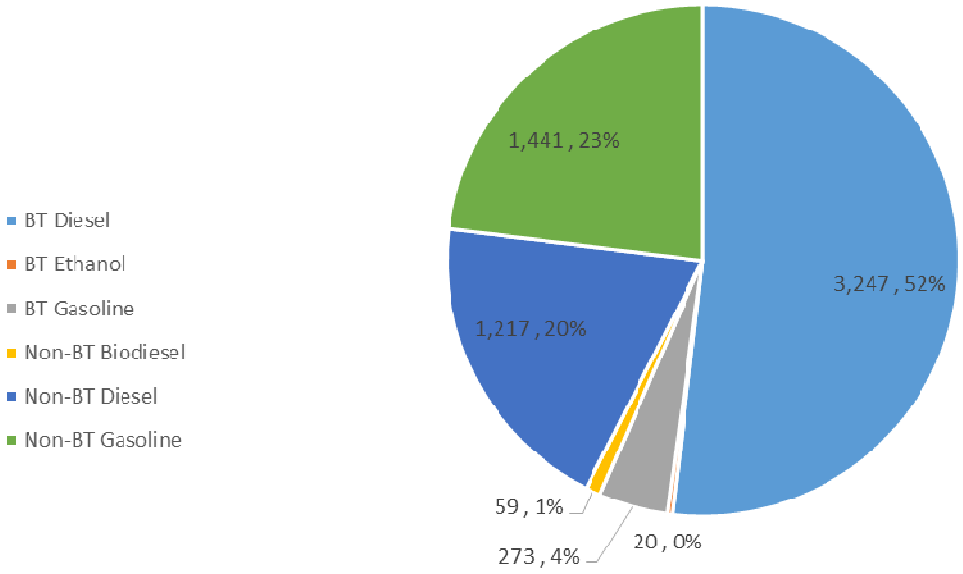


Figure 37: CO2e emissions by Fuel Type 2010-2015 Comparison



*BT = Bloomington Transit

Figure 38: CO2e Emissions associated with Vehicle Fuel (2015)



*BT = Bloomington Transit

As Figures 33-38 illustrate, Bloomington Transit (BT) is the single largest consumer of fuel in City operations and a majority of energy consumption (roughly 40,000 MMBTUs or 56%), associated costs (approximately $738,000, 57%) and CO2e emissions (about 3,500 tons, or 56%) originate from BT.

The following figures examine the division of energy consumption by City Non-Transit Departments.

Figure 39: Fuel Consumption by Non-Transit City Department in MMBTUs (2015)

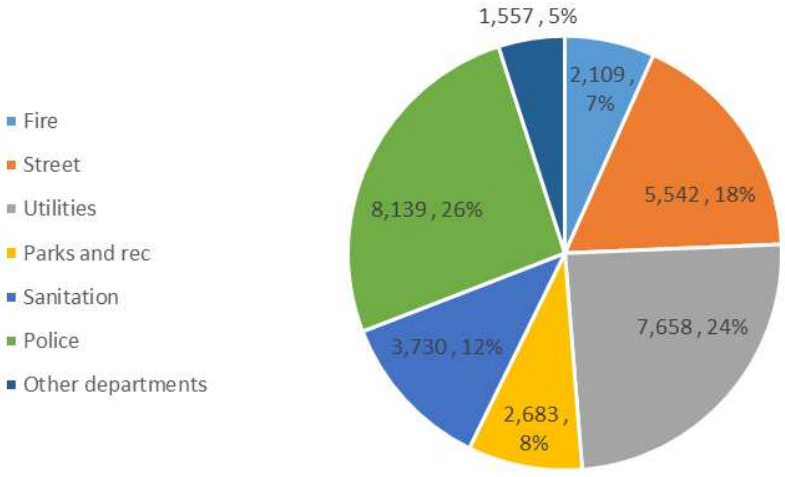


Figure 40: Unleaded Gasoline Consumption by Non-Transit City Department in MMBTUs (2015)

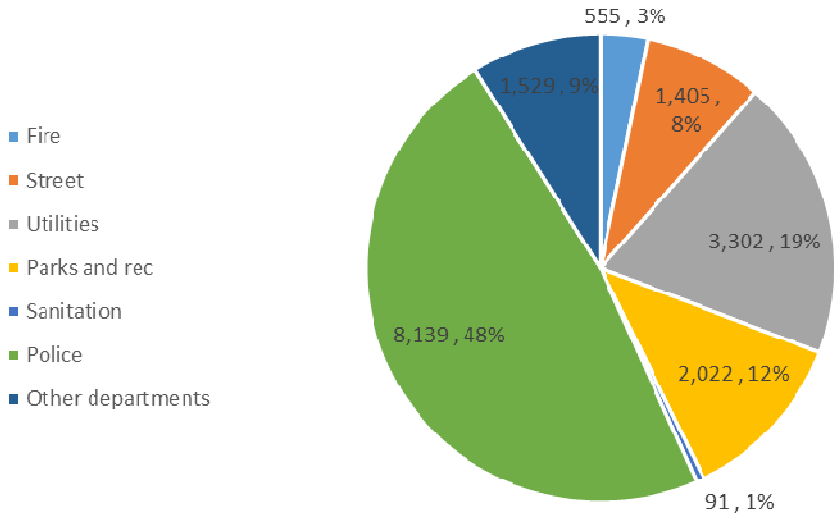
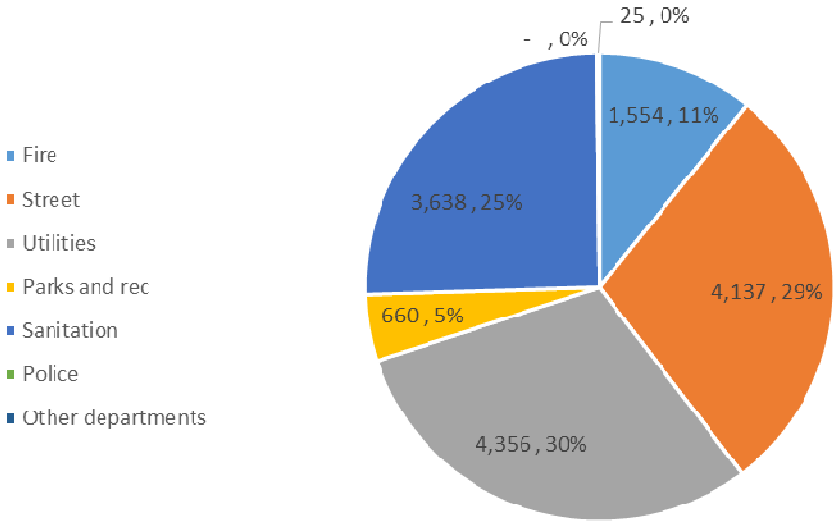


Figure 41: Diesel Consumption by Non-Transit City Department in MMBTUs (2015)



The police department (BPD) is the largest fuel user in the City fleet, representing 26% of fuel consumption. BPD only uses gasoline which makes them the largest gasoline user in the city fleet (48%). Police are then followed by Utilities with 24%, and Street with 18%.

Charts for biodiesel usage are not shown since usage is only estimated and not tracked in detail.

2015 Conclusions and Recommendations

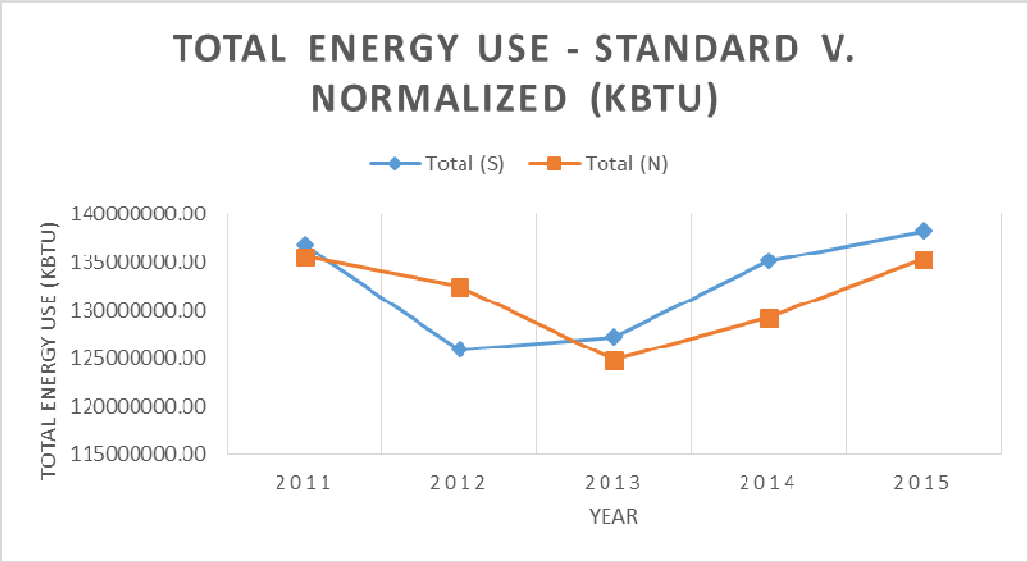
Although 2013 showed an overall decrease in energy usage when compared to 2010, this is not the case for 2015. This year has shown an overall increase in energy usage and emissions, although still lower than our baseline in 2010. One of the reasons for this might be the decrease in fuel and electricity prices that were present in 2015. Based on these results, we recommend:

- Developing a uniform and consistent way to assess energy usage throughout all departments to facilitate tracking and reporting. As part of this effort, we will explore utility management software that will standardize data collection and save the significant person-hours required to process bills each month for the City's 400+ utility accounts.
- Using collected data to understand trends and identify areas where energy usage can be reduced. This data, combined with energy dashboard data, has been critical in ongoing work with performance contracting firms to improve city facility efficiency. Based on this information, the City is planning to enter into a Guaranteed Energy Savings Contract in 2017.
- Implementing innovations in water and wastewater treatment since these sectors continue to be the primary energy users in city operations. The Guaranteed Energy Savings Contract will be important in continuing to make progress in this area as well.
- Taking advantage of opportunities for upgrades in the City fleet, where newer, more- efficient, right-sized, and/or hybrid vehicles could help reduce fuel demand. In addition, battery technologies and other innovations could reduce the need for vehicles to be left idling for significant periods of time to keep equipment running.
- Exploring the use of additional LEDs in street lighting.
- Continuing to explore the use of renewables in City facilities. Solar will be installed at City Hall and Police Headquarters in 2017, and additional opportunities may exist in other locations.

Appendix A: Parks and Public Works' Facilities – Electricity and Natural Gas 5-Year Usage

Energy Usage for Years 2011 through 2015[4]

The City's electricity and natural gas use increased in usage from 2012 to 2015 in its Parks and Public Works' facilities. The graph below shows standard energy use for these facilities, labeled Total (S), as well as weather-normalized energy use, labeled Total (N), for comparison.



To determine the causes of the increase in both electricity and natural gas usage, data from each of the 100 different unique accounts was compiled. The following page show the facilities with the highest usage, showing the percent change in usage from each year:

[4] 2010 data was omitted because only part of the year was recorded in an online database.

Facility	Account	Usage	2011-2012	2012-2013	2013-2014	2014-2015
Mills Pool	Parks	Gas	-32.87%	-21.03%	**3574.87%**	225.19%
Bryan Pool	Parks	Gas	-22.37%	-2.10%	**1485.66%**	141.83%
TLRC	Parks	Gas	-50.26%	73.08%	41.07%	-16.43%
Street Department	PW	Gas	-26.09%	56.45%	24.54%	-7.09%
Police Firing Range	PW	Gas	-28.32%	28.24%	30.02%	-24.79%
L. Ballfields	Parks	Electricity	-31.82%	55.17%	13.03%	-17.44%
Sanitation Building	PW	Gas	-32.77%	45.71%	13.83%	-29.29%
Jukebox	Parks	Gas	-17.73%	40.36%	12.26%	-4.69%
Fleet	PW	Gas	-23.73%	33.83%	16.23%	-18.60%
Banneker	Parks	Gas	-28.72%	31.70%	14.54%	-19.62%
Fire 4	PW	Gas	-24.29%	28.98%	16.87%	-7.64%
Winslow Tennis	Parks	Electricity	-24.67%	28.14%	19.79%	1.82%
Fire 5	PW	Gas	-39.82%	27.92%	10.84%	-3.67%
Golf Clubhouse	Parks	Gas	-13.22%	27.19%	20.66%	-10.52%
Rose Hill Office	Parks	Gas	-20.05%	26.80%	8.93%	-12.13%
Maintenance Building 346	Parks	Gas	-20.37%	22.03%	21.21%	-6.82%
Fire 1	PW	Gas	-23.45%	17.43%	23.44%	-12.26%
Fire 2 Fairfield	PW	Gas	-25.81%	17.20%	26.49%	15.57%
FSC Lights	Parks	Electricity	-1.14%	16.14%	22.92%	-24.62%
Animal Shelter	PW	Gas	-8.86%	13.70%	21.00%	-8.78%
Fire 3	PW	Gas	-16.56%	12.75%	27.84%	-8.30%
Rose Hill Office	Parks	Electricity	-40.58%	10.22%	29.32%	26.50%
Thompson	Parks	Electricity	-9.56%	8.01%	10.49%	-6.59%
Police Headquarters	PW	Gas	-0.89%	4.95%	15.91%	-6.14%
Traffic Department	PW	Gas	-24.25%	5.06%	42.79%	0.53%
Traffic Department	PW	Electricity	-11.39%	-36.89%	38.25%	-19.22%

Dark Red: More than 75% increase in usage, Red: 26-75% increase, Yellow: 0.01-25% increase

Main Takeaways:

- Of the 26 facilities, 20 usage increases are from natural gas; 5 from electricity, and 1 facility, Rose Hill Office, has increased in both types of energy.
- Most facilities have seen an increase beginning in 2012 and then a further increase in usage in 2013. However, in 2014, most facilities saw a decrease in usage. It should be noted that despite this drop in overall usage, the decrease in 2014 is still higher than the 2011-2012 usage (i.e. prior to the uptick in energy usage)
- Mills Pool and Bryan Pool have seen the highest increase in natural gas usage, with 3,574.87% and 1,485.66% increase, respectively, in 2013-2014
- Rose Hill Office is the only facility with increases in both electricity and natural gas; its electricity usage has continued to increase into 2015, compared to most other facilities that saw a decrease in usage between 2014 and 2015

Please note that some of the increases may be due to other reasons beyond simply increase in normal usage, such as the new pool heaters for Mills and Bryan Pools.