The Energy Demand and Greenhouse Gas Emissions of the Facilities and Operations of the City of Montpelier, Vermont FY 2011-2016

- Towards A Net Zero Montpelier 2030 -

Working Paper

For Discussion

1.0 Purpose

This analysis of energy demand and GHG emissions of Montpelier's municipal operations and facilities is to:

- Verify and monitor the progress of Montpelier's official priority[1] to transform to a "Net Zero" energy community by 2030.
- Create a distinction between "Municipal Operations and Facilities" and the inherently less precise "Community" energy and GHG inventories.

> **Net-Zero Energy Community:** "one that has greatly reduced energy needs though efficiency gains such that the balance of energy for vehicles, thermal, and electrical energy within the community is met by renewable energy."
>
> *- NREL, 2009; Definition of a Zero Net Energy Community*

Hierarchy of options to move to zero-energy communities (NREL, 2009)

Option Number	Option Name
0	Energy Efficiency and Energy Demand Reduction
1	Use Renewable Energy in the Built Environment & on Unusable Brownfield Sites
2a	Use Renewable Energy on Community Greenfield Sites (A Greenfield site is a site that has not been previously developed or built on, and which could support open space, habitat or agriculture)
2b	Use Renewable Energy Generated Off-site, On-site
3	Purchase New Off-site RECs

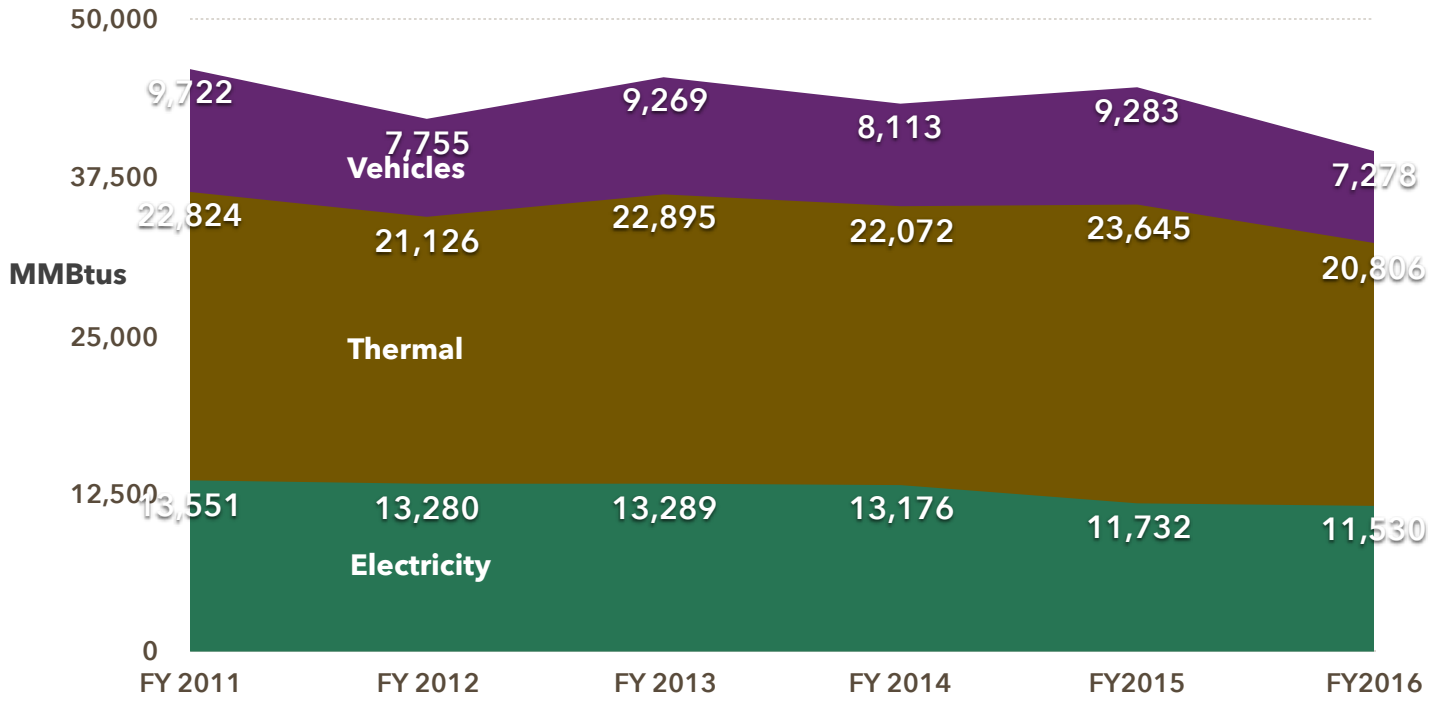
[1] The Montpelier City Council endorsed the priority of transitioning to a Net Zero energy community by 2030 on Feb. 12, 2014.

2.0 High Level Summaries

2.1 Municipal Energy Demand[2]

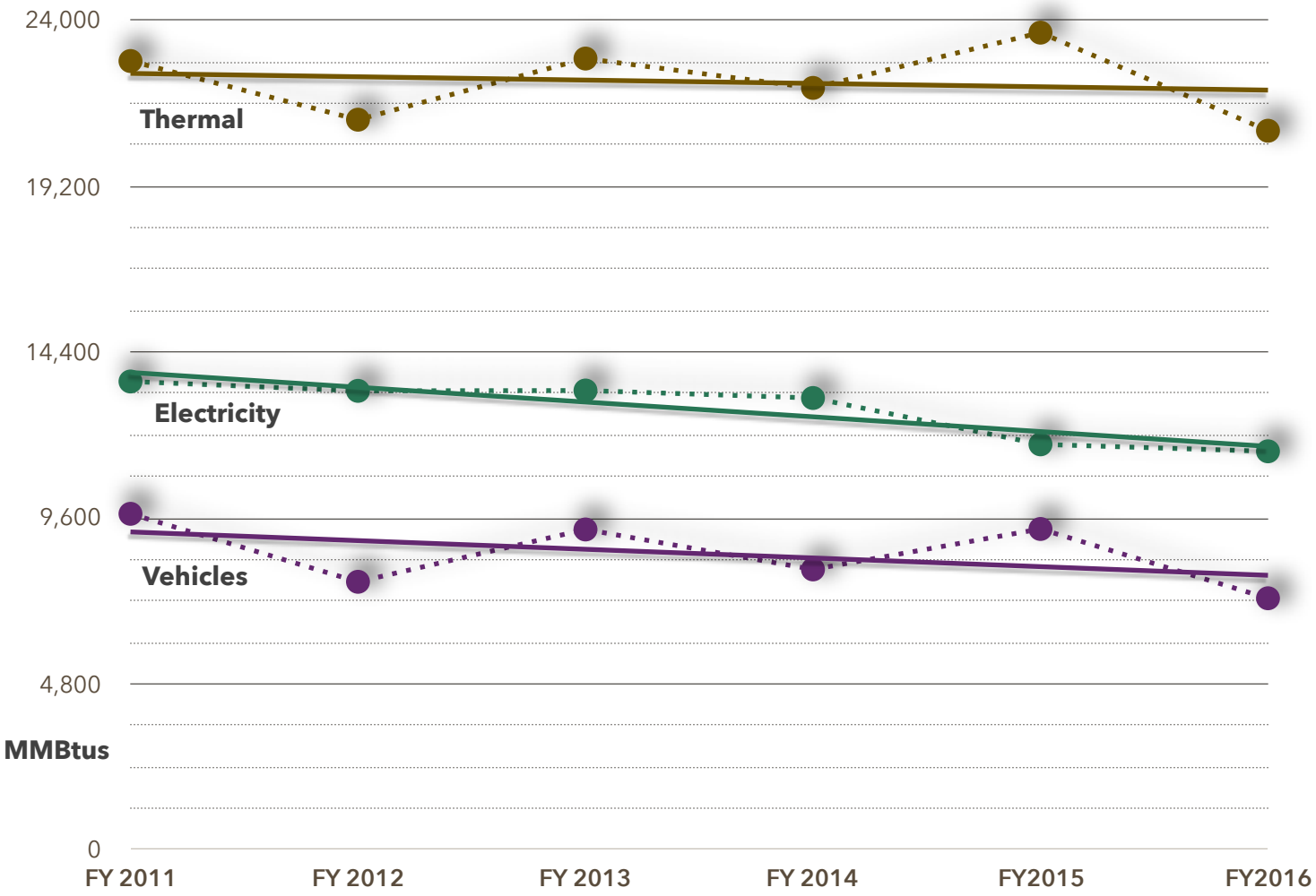
MUNICIPAL ENERGY DEMAND SUMMARY

	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Electricity	13,551	13,280	13,289	13,176	11,732	11,682
Thermal	22,824	21,126	22,895	22,072	23,645	20,806
Vehicles	9,722	7,755	9,269	8,113	9,283	7,278
Totals (MMBtus)	**46,096**	**42,160**	**45,453**	**43,361**	**44,660**	**39,766**

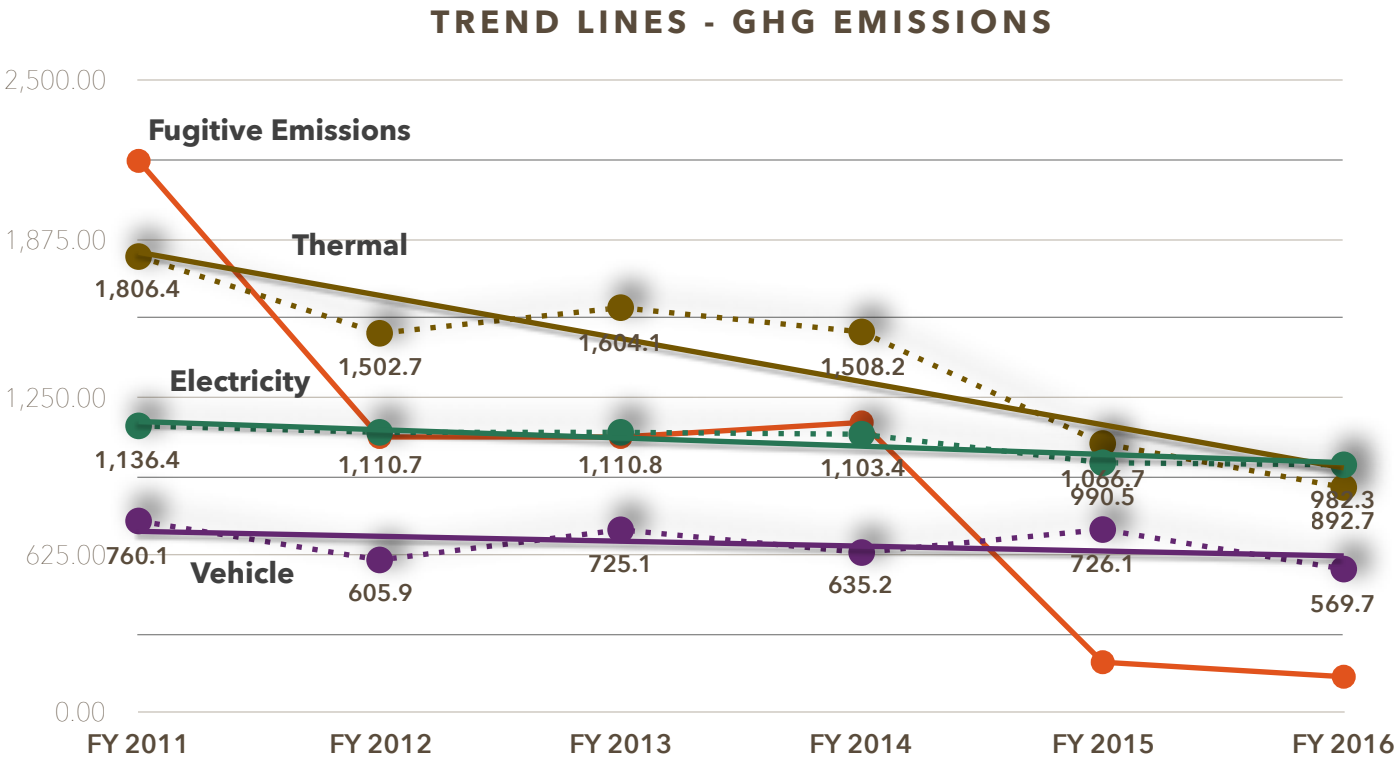


[2] *Total annual energy demand of all Montpelier's municipal facilities and operations, including elementary, middle and high schools. Does not include school busses, nor recreation department. It does not encompass trash collection, nor residential, commercial or industrial energy use.*

TREND LINES - MUNICIPAL ENERGY DEMAND



2.2 Municipal GHG Emissions[3]

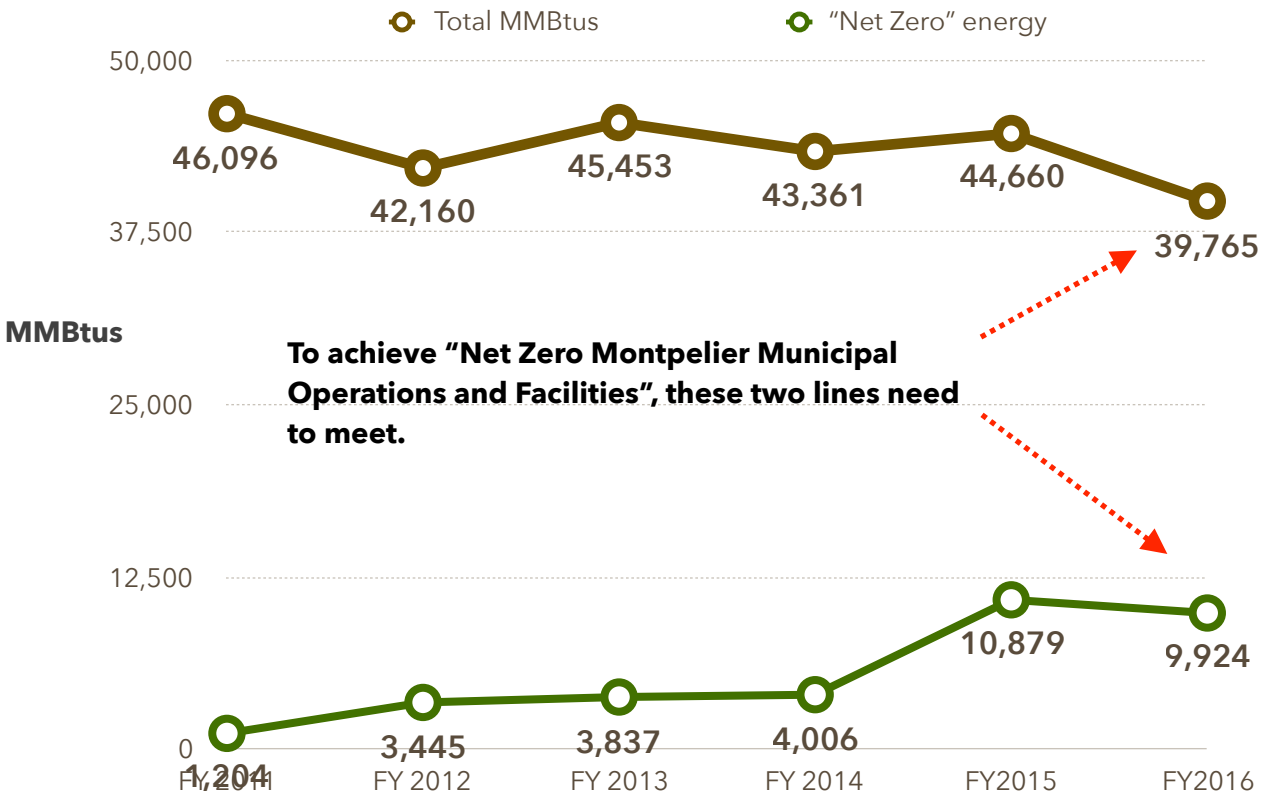


MONTPELIER MUNICIPAL GHG EMISSIONS

	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Electricity	1,136.41	1,110.73	1,110.84	1,103.37	990.45	982.26
Vehicles	760.06	605.87	725.14	635.19	726.13	569.70
Thermal	1,806.40	1,502.74	1,604.13	1,508.19	1,066.65	892.70
Fugitive Emissions WWTF	2,185.00	1,092.50	1,092.50	1,150.00	201.25	143.75
Totals (tCO_2e)	**5,887.87**	**4,311.84**	**4,532.61**	**4,396.75**	**2,984.48**	**2,588.41**

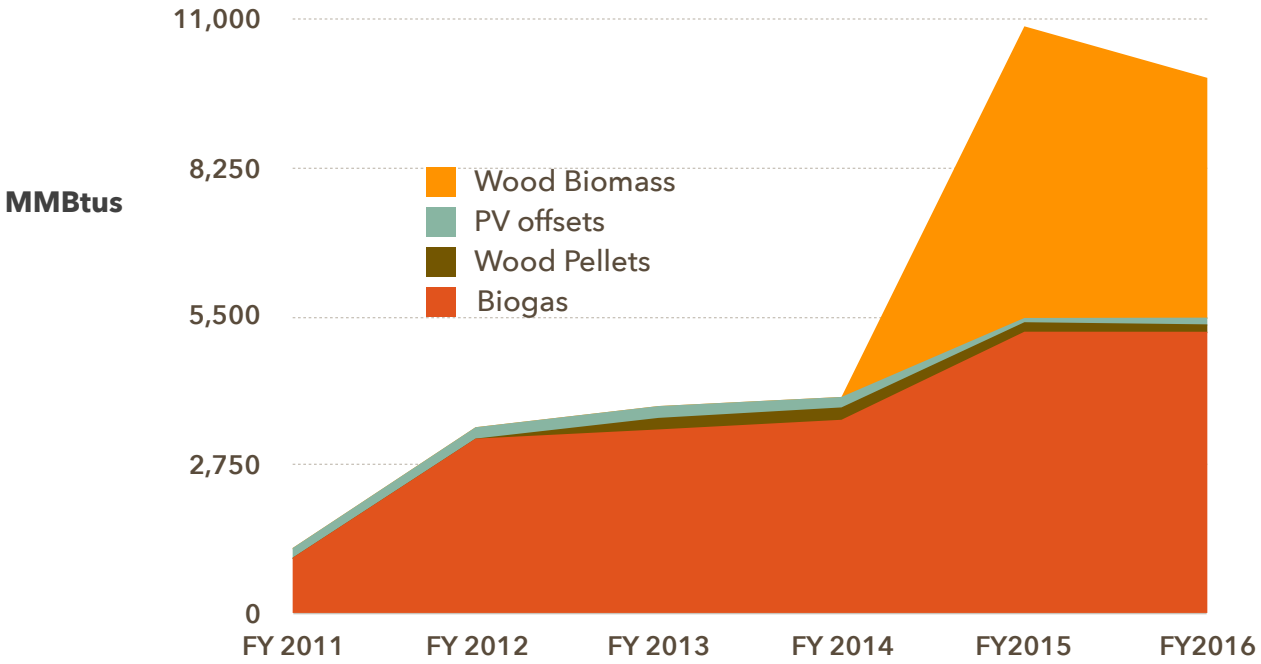
[3] Total annual emissions (metric tonnes) of GHG of all Montpelier's municipal facilities and operations, including elementary, middle and high schools. Includes estimates of "fugitive emissions" (leaks) from waste water treatment digester. Does not include school busses, nor recreation department. It does not encompass trash collection, nor landfill emissions nor residential, commercial or industrial energy use.

2.3 "Net Zero Factor" = Energy Demand Met by Renewables and Offsets



NET ZERO FACTOR= % OF ENERGY MET BY TOTAL RENEWABLES + OFFSETS

	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Biogas	1,024	3,233	3,403	3,583	5,216	5,215
Wood Pellets			214	220	176	137
Wood Biomass					5,409	4,447
PV offsets	180	211	220	194	79	125
Total Renewables + offsets (MMBtus)	1,204	3,444	3,837	3,997	10,880	9,924
Total Municipal Energy Demand (MMBtus)	46,096	42,160	45,453	43,361	44,660	39,765
"Net Zero Factor"	**2.6%**	**8.2%**	**8.4%**	**9.3%**	**24.4%**	**25.0%**



3.0 Conclusion

With the commitment to NZM in 2014, Montpelier has made significant progress to reducing both energy consumption and GHG emissions.

Since 2011, the city has reduced energy demand of municipal facilities and operations by 14% and GHG emissions by an impressive 56%.

NZM 2030 Municipal Facilities and Operations Baseline:

- FY2011 Energy Demand = 46,096 MMBtus
- FY2011 Energy Demand met by renewables and offsets[4] = 2.6%
- FY2011 GHG Emissions = 6,062 tCO_2e

- FY2016 Energy Demand = 39,765 MMBtus
- FY2016 Energy Demand met by renewables and offsets = 25.0%
- FY2016 GHG Emissions = 2,588tCO_2e

[4] *Assuming the RECs have not been sold.*