

Municipal Energy Tracking

Skyler Brown, Christina Chen, and Evelyn Lane
Sam Lash, CVRPC
Maddison Shropshire, ACRPC
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Howard E. Woodin Colloquium



90%

Renewable Energy

By 2050

Vermont State Energy Goals
(2016 Comprehensive Energy Plan)

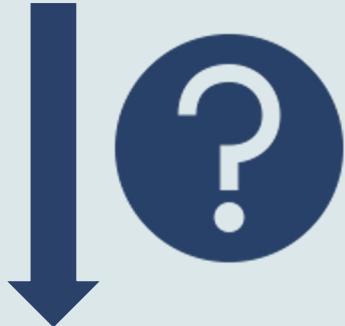
20%

Renewable Energy

Current Energy Consumption
Energy Action Network
(2022 Annual Report)

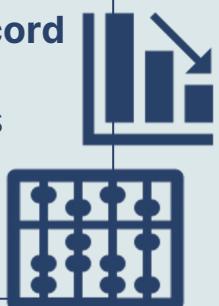
Raw Data

- Gas receipts
- Electric bills
- Gallons of propane burned
- Etc.



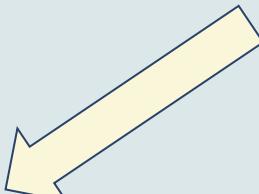
Organized & Comprehensive Record of Energy Use

- Including all municipal assets
- Multiple years
- Amount, cost, & pollution
- Encourages efficiency



Municipal Energy Use Tracking & Baseline Template

- Accessible spreadsheet
- Streamlined data entry
- Automatic conversions and calculations
- Establish energy use baseline
- Analyze change over time



Municipal Energy Use Tracking & Baseline Template

Introduction: This is the introductory page. Please start here for instructions on how to use this template. On every sheet there will be a gray box like this one that says what the sheet is.

Municipal Energy Tracking and Baseline Template

What this Energy Tracking Template Does	What this Energy Tracking Template Doesn't Do	How to Use this Energy Tracking Template
This template tracks the annual energy use of municipal assets including fuel, transportation, and electric energy use. Throughout the year, enter raw data into corresponding sector sheet. The sheet will automatically convert and summarize information to provide annual summaries. Please keep up-to-date with the template in order to keep up with annual energy use. At the end of each calendar year, please share a copy with Sam Lash at the CVRPC.	This template is not a Green House Gas Inventory (GHGI) . While some components (such as the MMBTUS and pounds of CO2 generated) will be entered into your municipality's GHGI, this template looks exclusively at energy. Thus, this is one of the first steps of creating a GHGI .	Each sheet in this template has its own set of instructions included on the sheet . The template uses a color key (below) to highlight where and how to enter data. This Municipal Energy Tracking and Baseline Template is compatible with Microsoft Excel 2007 or higher as well as Google Slides. Please download two copies of this template. Enter town data into the first file. The second should remain as a blank template to be duplicated/referred back to.

Introduction: This sheet presents the annual summaries across all sectors. **Can be ignored until reviewing end-of-year summary.**

Nothing to be done in this sheet. This sheet will automatically populate. Data should be entered on other sheets.

Totals calculated from columns on the left

Municipal Total

Annual summaries across sectors	Year	MMBTU	lbs CO2	Cost (\$)
	2021	1,185.21	34,748.21	546578
	2022	42,562.00	41,562.00	6754322
	2023	355,801.00	2,321.30	43567

Cell Color Key

Title/Introductory Page Description

Label

Instruction

Automatically Populated Data

Manually Input Information

Missing Information

Municipal Energy Use Tracking & Baseline Template:

Fuel

Maintenance Costs						
Building/Infrastructure	Work Done	\$ Cost	Date	Month	Year	
Town Hall	Repair	1000	5/19/2020	5	2020	
Street Lights	Repair	0	5/20/2020	5	2020	
Clerk's Office	Repair	0	5/21/2020	5	2020	
Police Station	Repair	0	5/22/2020	5	2020	
Town Offices	Labor	0	5/23/2020	5	2020	

Bills

1/5/2020	1/6/2020	2020	63.8	4.2	/	/
1/6/2020	1/7/2020	2020	60.6	4.2	6	6
					2020	

Fuel Summary

Building/Infrastructure Name	Fuel Type	Account No	Gallons	\$ Spent	\$ Adjusted for Maintenance	% Annual Total Cost	MMBTUs	Pounds CO2
Total	n/a	n/a	415281	41,562.00	42,562.00	100.00%	49,646.96	7,977,295.56
Town Hall	Gas	439032	403730	15,000.00	16,000.00	37.59%	48,543.74	7,820,258.83
Street Lights	Propane	340325	347	4,586.00	4,586.00	10.77%	31.73	4,399.96
Clerk's Office	Oil	540410	354	864.00	864.00	2.03%	48.63	7,947.30
Police Station	Gas	314054	987	8,744.00	8,744.00	20.54%	118.67	19,118.19
Town Offices	Propane	54932	9787	5,424.00	5,424.00	12.74%	895.04	124,099.16
Fire Station	Gas	90210	76	6,944.00	6,944.00	16.32%	9.14	1,472.12
Utilities	Natural Gas	9877622						

Municipal Energy Use Tracking & Baseline Template:

Electric

Non-renewable
energy only



Summary Department	Building	Meter Number	January		February		
			Electricity Consumption (kWh)	Electric Bill (\$)	Electricity Consumption (kWh)	Electric Bill (\$)	
Department #1	Community Hall	91181200006	67	32.66	65	32.27	
	Roxbury Free Lib	61181200009	173	52.84	161	50.56	
	Building #3						
	Building #4						
			Total Electricity consumption (kWh) and its Total Cost (\$) by Department#1 by Month	240.00	\$85.50	226.00	\$82.83

Municipal Energy Use Tracking & Baseline Template:

Electric cont.



Solar Production	Solar Panel	January		
Meter Number			Electricity generated (kWh)	Save (\$)
Department #1	Building #1	E14829089		
	Building #2			
	Building #3			
	Building #4			
			Total Electricity generated (kWh) and its total save (\$) by Month	0%

		2022				
Municipal Building	Account Number	Total Electricity Consumed - Municipality (kWh)	Total Renewable Electricity Generated - Municipality (kWh)	Annual Total Cost (\$)	Annual Total Save (\$)	MMBTUs
Community Hall	91181200006	2225.00	0%	354.48		
Roxbury Free Library	61181200009	1673.00	0	565.5		
Town of Roxbury	95912200003	3455.00	0	899.71		

Municipal Energy Use Tracking & Baseline Template: *Transportation*

	Refill #1 Date	
	Refill #1 Cost	
	Refill # 1 Gallons	
	Refill #2 Date	
	Refill #2 Cost	50
	Refill #2 Gallons	10
	Refill #3 Date	
	Refill #3 Cost	
	Refill #3 Gallons	
Information from gas station bill	End-of-January Mileage	20700
If you only refilled tank once, leave additional refill cells blank. If you refilled tank more than 3x create additional rows. Right-click on "Refill #3 Gallons" row and insert 3 rows below. Copy and paste rows 13-15 into new rows.	January Mileage	700
Odometer reading at the end of the month	January Fuel Cost	
	Total	140
	January Total Gallons	30
If you added more refill rows, edit formula in cells to add the additional refill cost and gallons	January Total Gallons (Calculated Estimate)	35
Estimate based on vehicle miles/gallon in case each refill is not recorded		

Info from gas receipts

Pounds of
CO₂ created
by vehicle

Pounds of
CO₂ created
by EV driving
same miles

Odometer reading on Dec 31	End-of-Year Mileage	20700
	Year Mileage	700
	Year Fuel Cost Total	140
	Year Total Gallons	30
Estimate based on vehicle miles/gallon in case each refill is not recorded	Year Total Gallons (Calculated Estimate)	35
Replace formula in cell with 0 if vehicle uses diesel fuel.		
D184 with D185 in cell formulas to correspond to calculated gallons.	Year Pounds of CO2 (if vehicle uses motor gasoline)	581.1
Replace formula in cell with 0 if vehicle uses diesel fuel.		
Based on total entered gallons. If not every bill was entered, replace D184 with D185 in cell formulas to correspond to calculated gallons.	Year MMBU (if vehicle uses motor gasoline)	3.60714
Replace formula in cell with 0 if vehicle uses motor gasoline.	Year Pounds of CO2 (if vehicle uses diesel fuel)	673.5
Based on total entered gallons. If not every bill was entered, replace D184 with D185 in cell formulas to correspond to calculated gallons.	Year MMBU (if vehicle uses diesel fuel)	4.12143
Replace formula in cell with 0 if vehicle uses motor gasoline.	If Replaced – Pounds of CO2	420
Based on total entered gallons. If not every bill was entered, replace D184 with D185 in cell formulas to correspond to calculated gallons.		
Amount of CO2 that would have been emitted if vehicle was replaced by EV at the beginning of the year		

Interactive graphs for visualization – Shiny App

Municipal Energy Consumption Tracking in Roxbury, VT

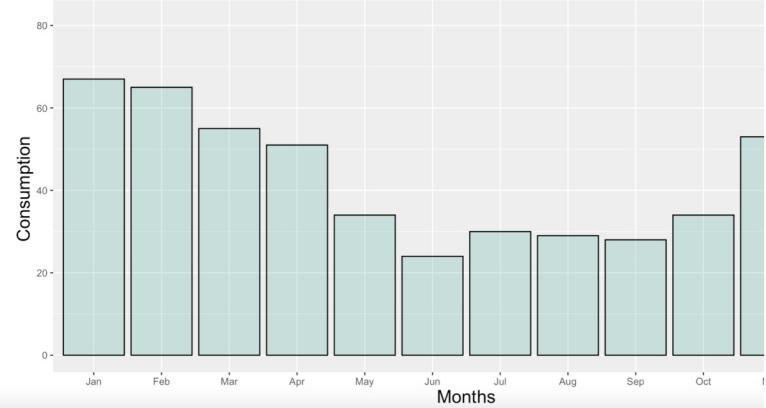
Pick a sector among Electricity, Fuel, and Transportation that you would like to view

- Electricity
- Fuel
- Transportation

Choose a Building that you would like to view

Community Hall

Electricity Consumption For Community Hall



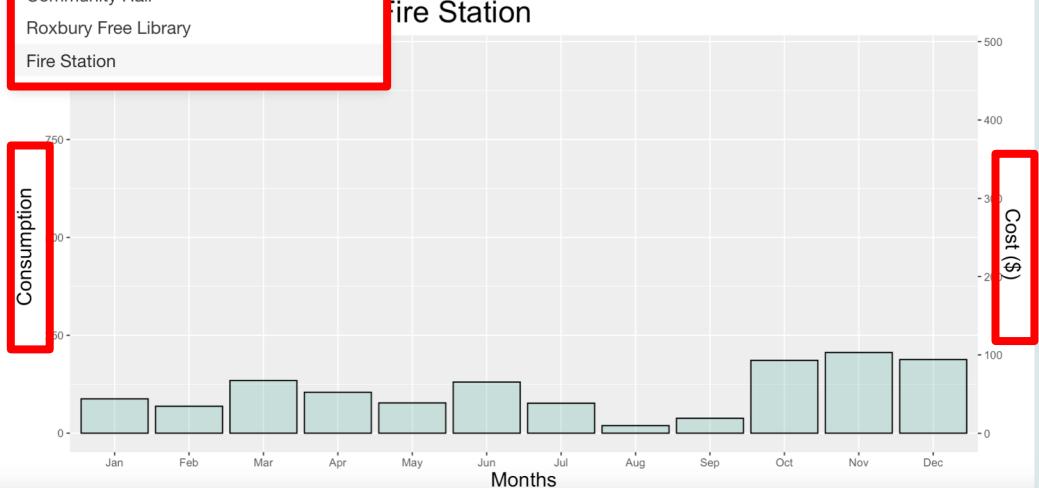
Pick a sector among Electricity, Fuel, and Transportation that you would like to view

- Electricity
- Fuel
- Transportation

Choose a Building that you would like to view

Fire Station

Fire Station

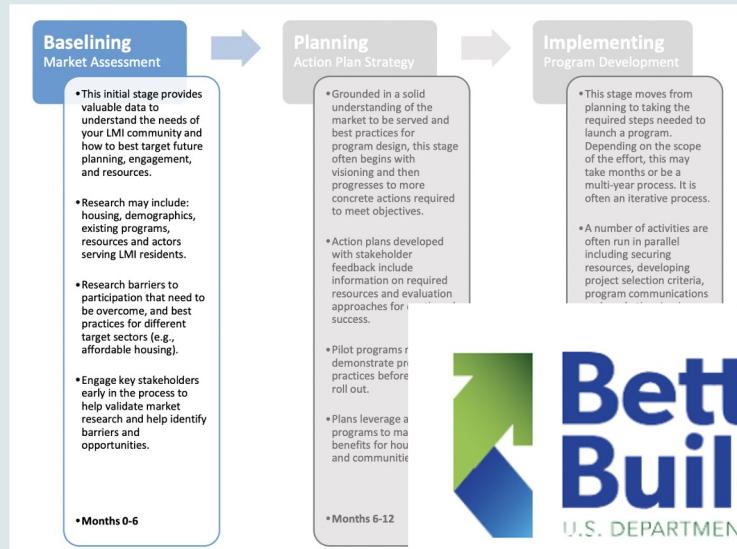


Purpose & Applications

Duxbury, VT Town Gravel Pit Solar Development Project



Building Communities GRANTS PROGRAM



Town Hall (439032) - Gas								
Statement Date	Date Paid	Year	Gallons	Rate	\$ Billed	\$ Paid	Notes	
12/22/2019	12/23/2019	2019	3	45				
12/23/2019	12/23/2019	2019	12	45				
12/24/2019								
12/25/2019								
12/26/2019								
12/27/2019								
12/28/2019								
12/29/2019								
12/30/2019								
12/31/2019								

Maintenance Costs								
Building/Infrastructure		Fuel Type	Account No.	Gallons	\$ Spent	\$ Adjusted for Maintenance	% Annual Total Cost	MMBTUs
Building/Infra	Total	Fire Station	n/a	Fire Dept.	1	0430000627GMP	E15209135	19.03
Building/Infra	Fire Station	Gas	439032	938.8	1,696.00	1,699.00	100.00%	0.00
Building/Infra	Garage	Town Hall						0.00
Building/Infra	Police	Street Light						
Building/Infra	Clerk's Office	Police Station						
Building/Infra	Police Office	Police Dept.						
Building/Infra	Senior Center	Police Dept.						
Building/Infra	Office	Police Office						
Building/Infra	Office	Senior Center						
Building/Infra	Unspecified	Parks Dept						
Building/Infra	Office							
Building/Infra	Office							
Building/Infra	Library Furn.							
Building/Infra	Green Mount							
Building/Infra	Unspecified							
Building/Infra	Office							

Summary Department								
Public Works		Traffic	PREMISE ID	Meter Number	January	February	March	April
Electricity - MMBTUs								
Total Electricity - City								
Renewable Electricity - City								
Total School Electricity								
Renewable Electricity - School								
TOTAL ELECTRICITY								
Solar Production								
TOTAL SOLAR PRODUCTION								
High School (MHS)	UES		5050000045GMP					
Solar Panels	MSMS		2643000105GMP					
MHS	Refill #1 Date							
	Refill #1 Cost							
	End-of-Year Mileage		20700		90			
	2019 Mileage		700		20			
	Total School Electricity by Month (kWh)							
	Fleet Summary							
	2019 Fuel Cost Total							
	2019 Total Gallons							
	Gallons							
	MMBTU							
	KWH							
	0							
	0							
	0							
	#DIV/0!							
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Reaching Vermont Energy Goals

The background of the slide features a photograph of a solar farm. In the foreground, several rows of blue solar panels are visible, angled towards the sun. Above them, the sky is a vibrant blue, dotted with various types of white clouds, from wispy cirrus to puffy cumulus.

Acknowledgements

Sam Lash

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Roxbury Town

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Prof. Diane Munroe

Our wonderful classmates in ES401

**Up Next: Weatherization
and Tenant Protection**