

# GREATER SUDBURY COMMUNITY ENERGY AND EMISSIONS PLAN

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**GREATER SUDBURY**

Our energy future.   

## ***EXECUTIVE SUMMARY***

**DECEMBER, 2019**

# Acknowledgements

Greater Sudbury's Community Energy and Emissions Plan (CEEP) development took place over almost two years. We thankfully acknowledge the following individuals and organizations in the CEEP's preparation.

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## Stakeholder Working Group Invitees

Greater Sudbury Utilities	Atikameksheng Anishnawbek First Nation
Union Gas	Conseil scolaire public du Grand Nord de l'Ontario
NORCAT	Conseil scolaire catholique du Nouvel-Ontario
Vale	Sudbury Catholic District School Board
United Way Centraide North East Ontario	Greater Sudbury Housing Corporation
reThink Green/Green Economy North	CGS Economic Development Division
Laurentian University	City of Greater Sudbury - Water/Wastewater Division
Cambrian College	Dalron/Sudbury and District Home Builders Association
College Boreal	Ontario Ministry of Natural Resources and Forestry
Wahnapiitae First Nation	New Sudbury Centre
Glencore	
Hydro One	
Greater Sudbury Chamber of Commerce	
Electric Vehicle Society – Greater Sudbury	
Rainbow District School Board	

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**CEEP Preparation**



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# Greater Sudbury by the Numbers

		% change over 2016
Population, 2016 (Adjusted for student population)	176,435	
Population, 2050 (Adjusted for expected student population)	184,080	+4.3%
New dwellings, 2016-2050	5,153	+7.4%
New non-residential floor space, 2016-2050	379,118 m <sup>2</sup>	+9.5%
2016 total GHG emissions	1,303,900 tCO <sub>2</sub> e	
2050 total GHG emissions under current trajectory	1,163,000 tCO <sub>2</sub> e	-11%
2050 total GHG emissions under CEEP implementation	0 tCO <sub>2</sub> e	-100%
2016 per capita GHG emissions	7.4 tCO <sub>2</sub> e	
2016 per capita net emissions under current trajectory	6.2 tCO <sub>2</sub> e	-14%
2050 per capita net emissions under CEEP implementation	0 tCO <sub>2</sub> e	-100%
2016 total energy consumption	26.9 million GJ	
2050 total energy consumption under current trajectory	24.6 million GJ	-9%
2050 total energy consumption under CEEP implementation	10.6 million GJ	-61%
2016 total energy costs	\$776M	
2050 total energy costs under current trajectory	\$901M	+17%
2050 total energy costs under CEEP implementation	\$393M	-49%
Person years employment generated by the CEEP, 2020-2050	40,000	

# Executive Summary

Greater Sudbury's Community Energy and Emissions Plan (CEEP) follows from decades of energy and emissions reduction initiatives in the community and responds to City Council's May 28, 2019 Climate Emergency declaration. A climate change mitigation plan, it parallels the City's climate change adaptation planning efforts. The CEEP uses energy, emissions, land-use, and financial modelling to determine the community-wide efforts required to meet a 2050 net-zero emissions target. This target requires the reduction of 1.2 million tonnes of emissions in the target year of 2050. The Plan also describes the efforts required to meet an 80% of 2016 emissions levels reduction target by 2050 for comparison.

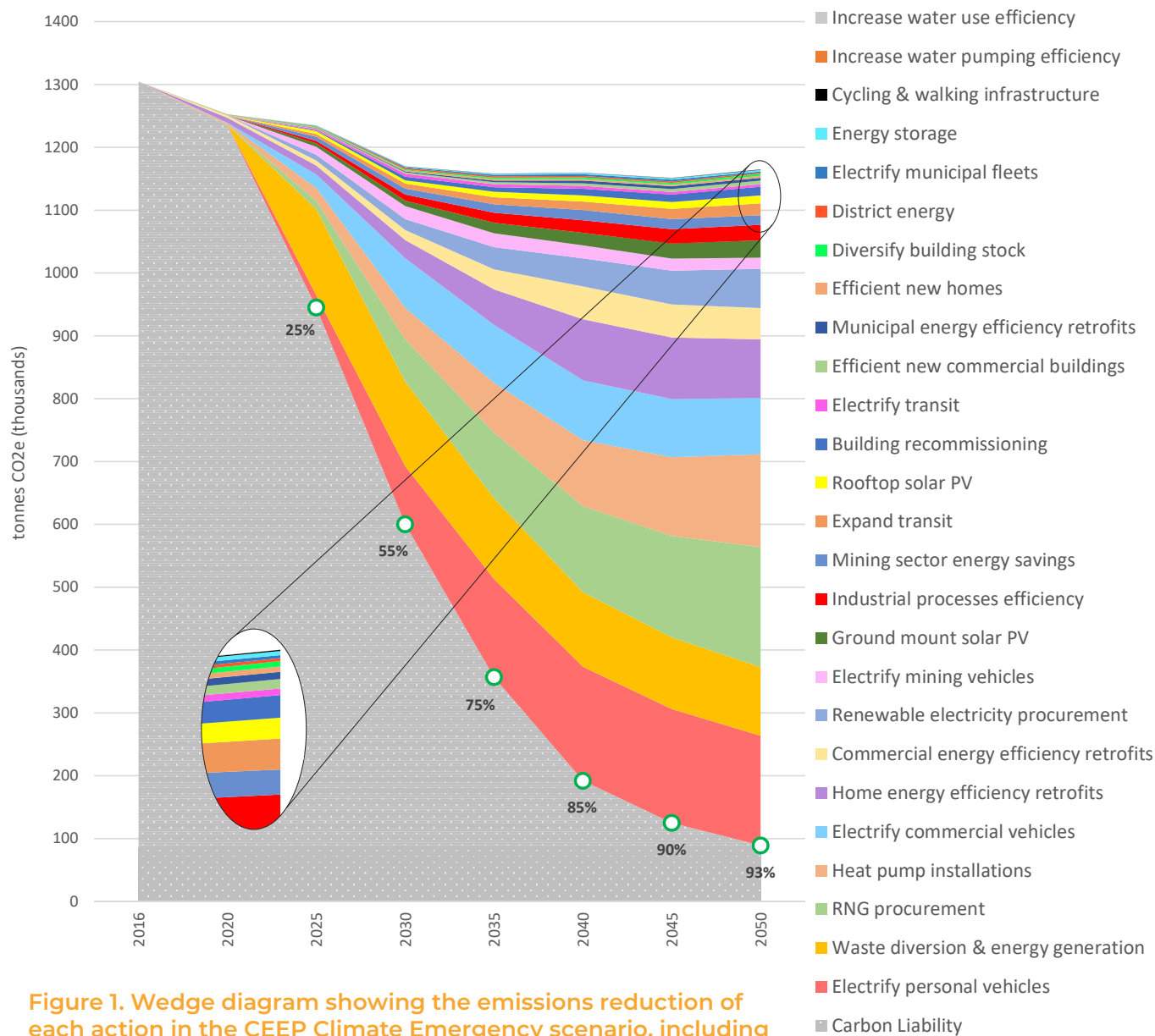
The CEEP employs three key concepts in determining its recommended actions:

1. The Reduce-Improve-Switch paradigm (reduce energy use, improve efficiency, and switch to low-carbon energy sources);
2. Community energy planning prioritization; and
3. Infrastructure, mechanical, and energy systems turnover.

These concepts are applied to energy and emissions actions in 8 strategy sectors, in which there are 18 CEEP goals:

STRATEGY SECTOR		GOAL
1.	COMPACT, COMPLETE COMMUNITIES	Goal 1: Achieve energy efficiency and emissions reductions by creating compact, complete communities through infill developments, decreasing dwelling size through an increase in multi-family buildings, and increasing building type mix.
2.	EFFICIENT BUILDINGS	Goal 2: Periodically increase the energy efficiency of new buildings until all new buildings in 2030 onward are Passive House energy efficiency compliant.  Goal 3: The existing building stock is retrofit for 50% increased energy efficiency by 2040 and large buildings are routinely recommissioned  Goal 4: Achieve net-zero emissions in City buildings by 2040.

STRATEGY SECTOR		GOAL
3.	<b>WATER, WASTEWATER, AND SOLID WASTE</b>	<p>Goal 5: Decrease energy use in the potable water treatment and distribution system by up to 60% by 2050.</p> <p>Goal 6: Achieve 90% solid waste diversion by 2050. An organics and biosolids anaerobic digestion facility is operational by 2030.</p>
4.	<b>LOW-CARBON TRANSPORTATION</b>	<p>Goal 7: Enhance transit service to increase transit mode share to 25% by 2050.</p> <p>Goal 8: Achieve 35% active mobility transportation mode share by 2050.</p> <p>Goal 9: Electrify 100% of transit and City fleet by 2035.</p> <p>Goal 10: 100% of new vehicle sales are electric by 2030.</p>
5.	<b>INDUSTRIAL EFFICIENCY</b>	<p>Goal 11: Increase industrial energy efficiency 50% by 2040.</p>
6.	<b>LOCAL CLEAN ENERGY GENERATION</b>	<p>Goal 12: Establish a renewable energy cooperative (REC) to advance solar energy systems and other renewable energy efforts of the CEEP.</p> <p>Goal 13: Install 10 MW of ground mount solar PV each year, starting in 2022.</p> <p>Goal 14: Install net metered solar photovoltaic (PV) systems on 90% of new buildings and 80% of existing buildings, supplying 50% of their electric load.</p> <p>Goal 15: Expand the downtown district energy system to 23 MW capacity.</p> <p>Goal 16: Install 50 MW of renewable energy storage.</p>
7.	<b>LOW-CARBON ENERGY PROCUREMENT</b>	<p>Goal 17: Procure 100% of community-wide grid electricity and 75% of natural gas demand from renewable sources by 2050.</p>
8.	<b>CARBON SEQUESTRATION</b>	<p>Goal 18: Increase the reforestation efforts of the Regreening Program.</p>



**Figure 1. Wedge diagram showing the emissions reduction of each action in the CEEP Climate Emergency scenario, including emissions reduction percentage targets (of 2016 emissions levels). Note that although water use efficiency and water pumping efficiency actions save energy, their emissions saving is negligible and does not display on this graph.**

Figure 1 shows the emissions reductions effects of the best action options to achieve the 18 goals, and thus the 2050 net-zero emissions target. The top line of the graph indicates emissions under a business as usual scenario (i.e. accounting for current trends and plans). Energy efficiency, energy generation, and vehicle electrification actions will achieve the majority of emissions reductions. A variety of smaller actions are critical for achieving the remainder of reductions. These actions reduce 93% of 2016 emissions levels in the year 2050 (1.1 million tonnes CO<sub>2</sub>e), leaving 100,000 tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e) present in that year.

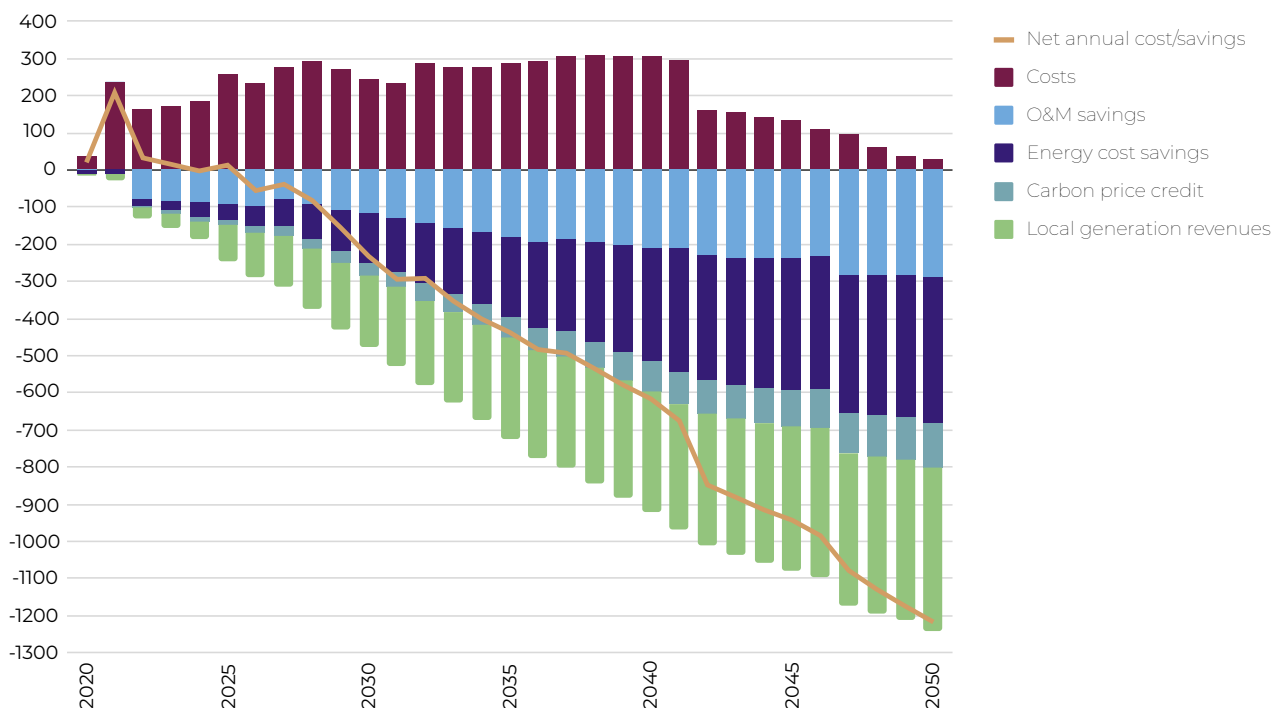


The final 100,000 tCO<sub>2</sub>e in 2050 could be completely reduced to meet the net-zero goal through some combination of approaches including:

- Increasing RNG use from the current goal of 75% natural gas replacement to 100% replacement, including in district energy systems;
- Operating all industrial activities on biofuels or renewable electricity;
- Expanding gas capture to all landfill and wastewater operations; and
- Carbon sequestration.

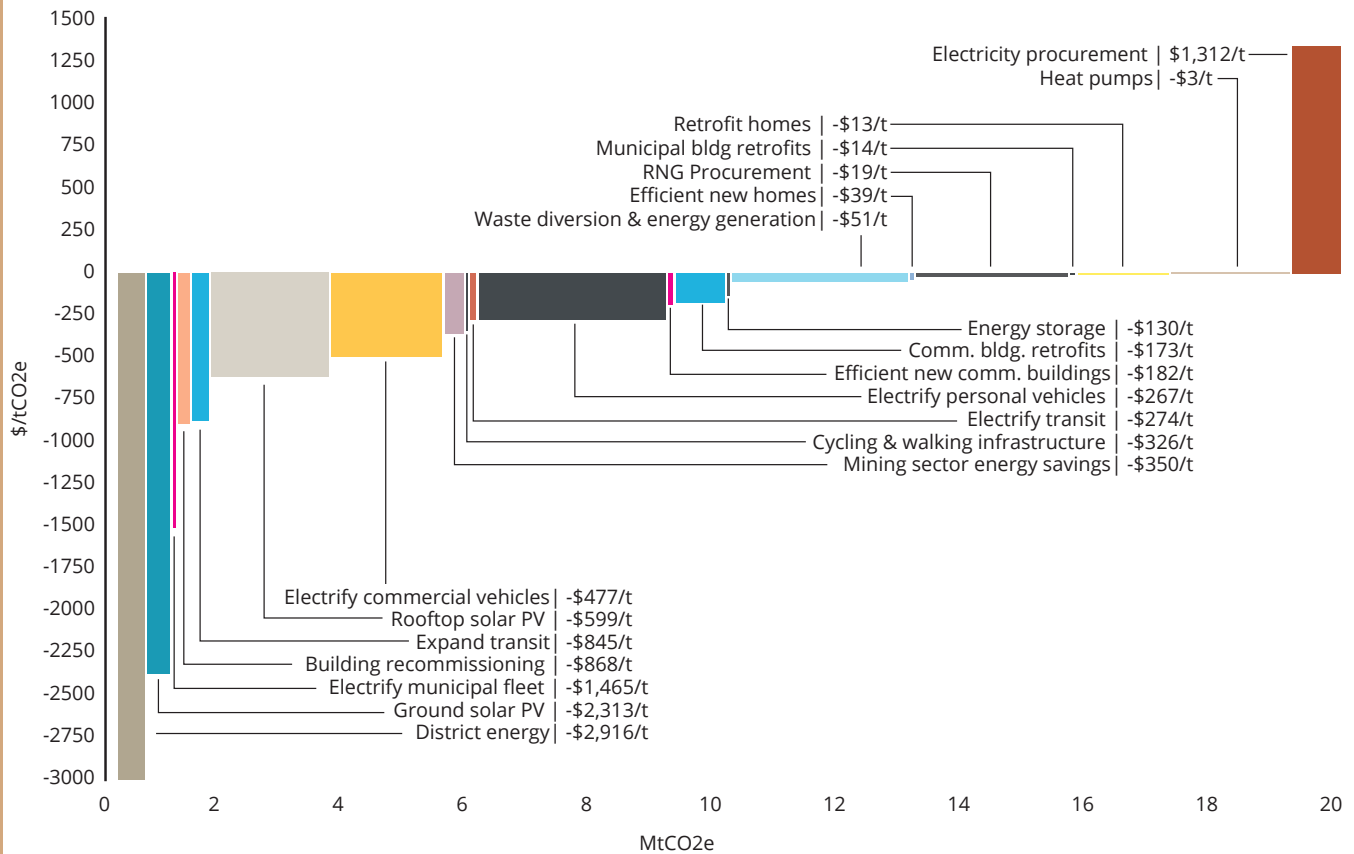
Carbon sequestration is a promising option, as Greater Sudbury's Regreening Program has already proven to be a successful reforestation effort with sizeable sequestration results.

Financial modelling of CEEP actions determined their high-level costs and savings between 2020 and 2050 (Figure 2) as compared to expected costs and savings under a business as usual scenario. The costs and savings will be community-wide (i.e. not solely incurred by the City). Costs are incurred by energy generation infrastructure provision, transition to electric vehicles, building energy efficiency retrofits, etc. Savings are made through reduced vehicle and equipment operations and maintenance, avoided carbon tax payments, energy use cost savings, and revenues from local energy generation. By 2050 cumulative CEEP implementation costs total \$6.5B with a present value of \$4.3B (at a discount rate of 3%). Total net savings reach \$14.6B. Financial modelling also estimates that 40,000 person years of employment will be generated by CEEP actions between 2020 and 2050.



**Figure 2. Summary of annual CEEP costs (above x-axis) and savings (below x-axis) relative to the BAU scenario.**

Combining the energy and emissions actions analysis with the financial analysis yields the Marginal Abatement Cost (MAC) curve (Figure 3). The MAC curve provides an at-a-glance summary of the financial cost or savings per tonne of emissions reduced for each action. All CEEP actions except electricity procurement generate savings for every tonne of emissions reduced.



**Figure 3. CEEP marginal abatement cost (MAC) curve, showing the cost/savings per tonne of emissions reduced by action. Horizontal axis: megatonnes CO<sub>2</sub>e reduced by the action (wider bars = greater reductions). Vertical axis: net financial cost/savings of the action (taller bars = greater cost/savings). Positive numbers are costs, negative numbers are savings.**

The CEEP illustrates what is required to achieve a 2050 net-zero emissions target in Greater Sudbury. Although substantial effort is required to reduce energy use and transition from fossil fuel supplied energy, the environmental, financial, and community benefits indicate that the endeavour is worthwhile.