GREATER SUDBURY

COMMUNITY ENERGY AND EMISSIONS PLAN

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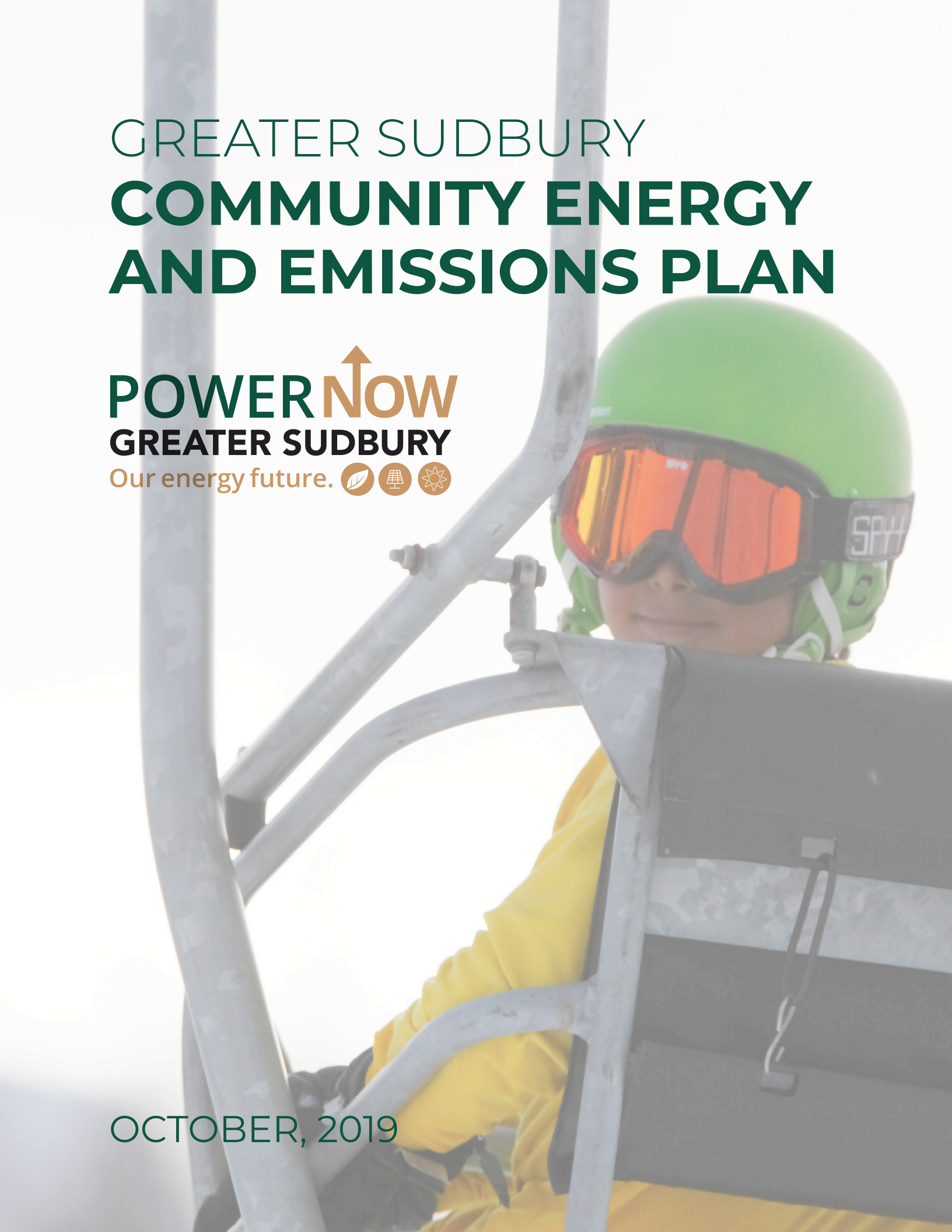
Our energy future.



OCTOBER, 2019

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

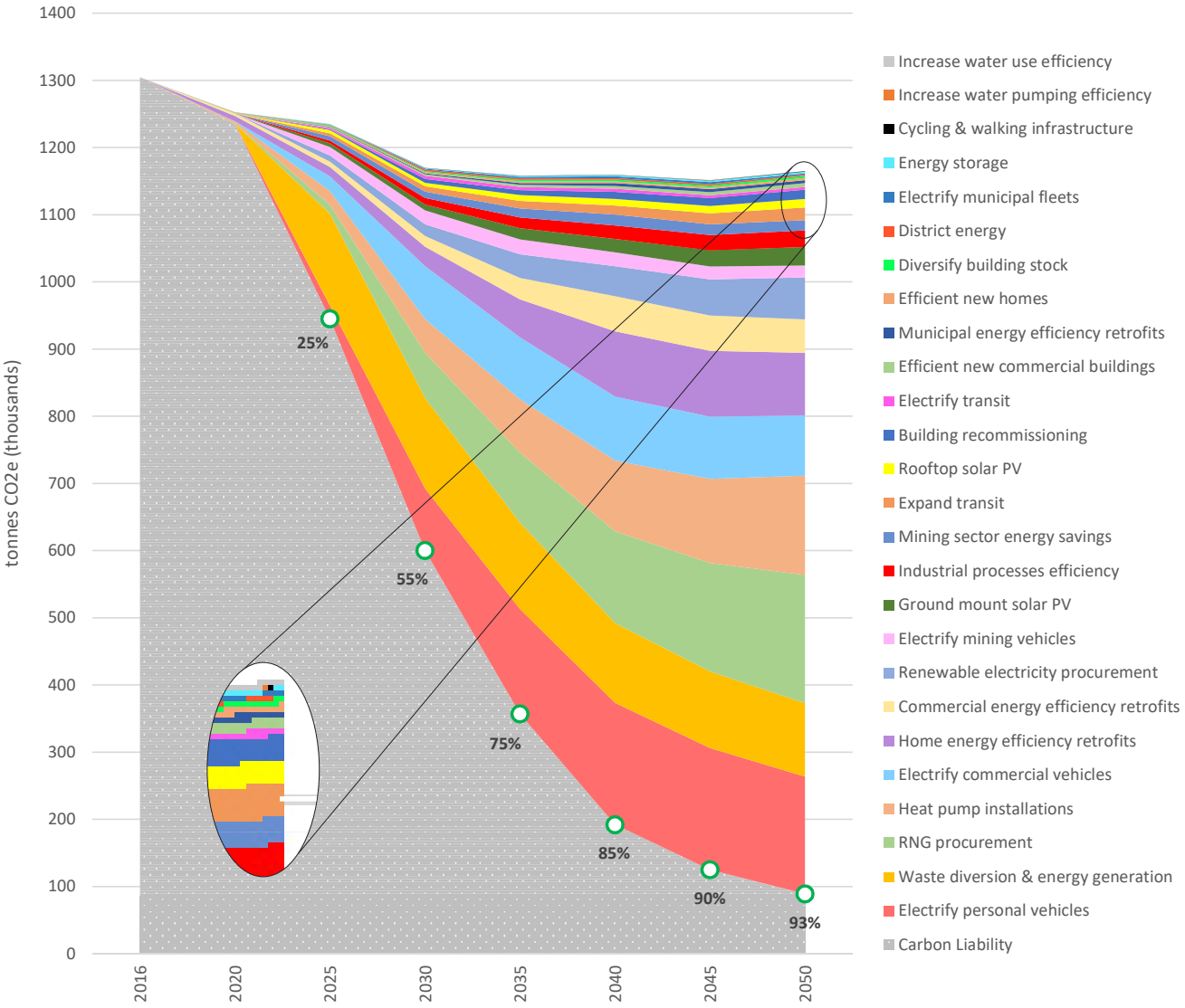


Figure 1. Wedge diagram showing the emissions reduction of each action in the CEEP Climate Emergency scenario, including emissions reduction percentage targets (of 2016 emissions levels). Note that although water use efficiency and water pumping efficiency actions save energy, their emissions saving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

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 by 2050, leaving 100,000 tonnes of carbon dioxide equivalent (tCO_2e) present in that year.

The final 100,000 tCO_2e 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 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.

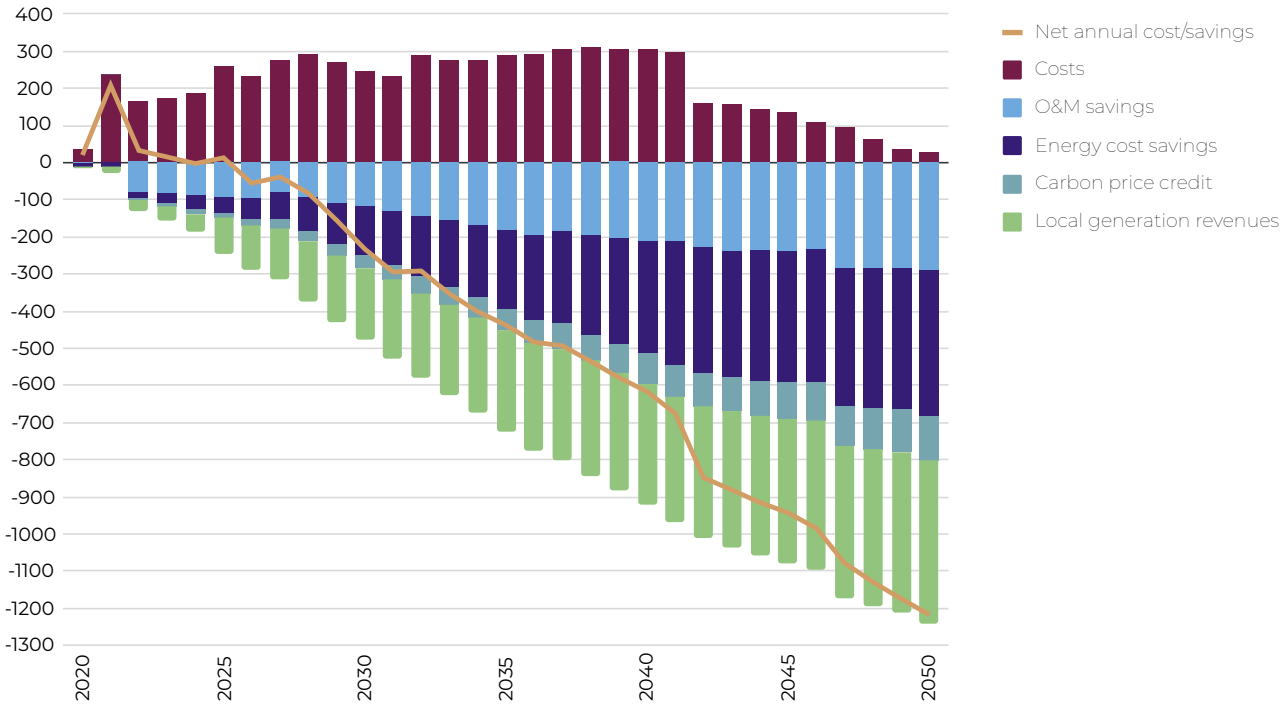
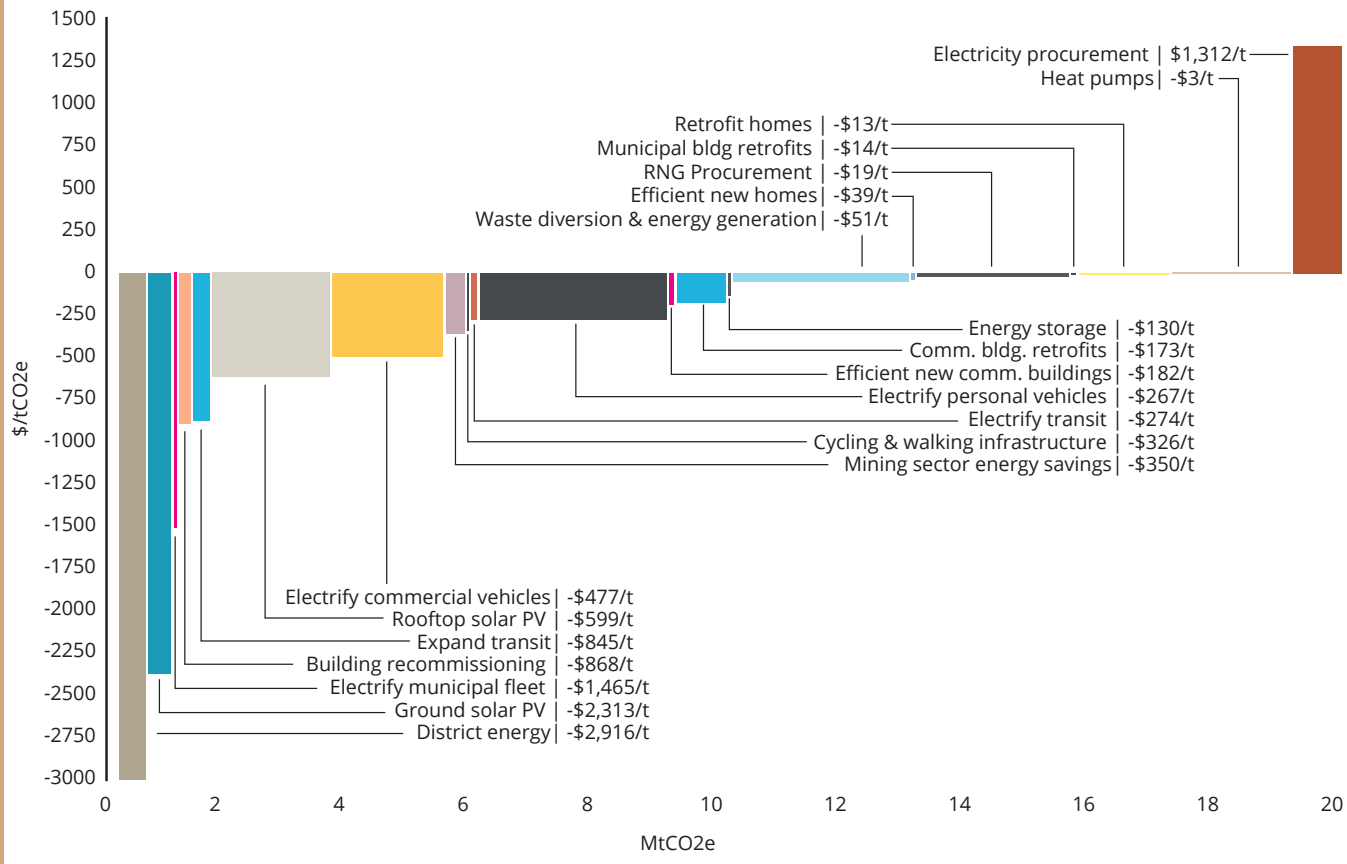


Figure 2. Summary of annual CEEP costs (above x-axis) and savings (below x-axis) relative to the BAU scenario.

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.



x-axis: tonnes CO2e reduced by the action (wider bars = greater reductions)
y-axis: net financial return or cost of the action (taller bars = greater return/cost)

Figure 3. CEEP marginal abatement cost (MAC) curve, showing the cost/savings per tonne of emissions reduced by action. Horizontal axis: megatonnes CO_2e 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.

GREATER SUDBURY
COMMUNITY ENERGY AND EMISSIONS PLAN
Summary Document

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Greater Sudbury's Community Energy and Emissions Plan (CEEP) describes the efforts required to achieve net-zero greenhouse gas emissions by 2050 through 8 strategy sectors and 18 goals.

Compact, Complete Communities Actions

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.

Primary Action: Coordinate land-use development through the Executive Leadership Team, Growth and Infrastructure Department, and Transit Services Division to direct land-use development in achieving compact, complete communities.

Efficient Buildings Actions

Goal 2: Periodically increase the energy efficiency of new buildings until all new buildings in 2030 onward are Passive House energy efficiency compliant.

Primary Action: Develop a Greater Sudbury Green Standard and rezoning energy efficiency requirements.

Goal 3: The existing building stock is retrofit for 50% increased energy efficiency by 2040 and large buildings are routinely recommissioned.

Primary Action: Develop a deep energy efficiency retrofits program.

Goal 4: Achieve net-zero emissions in City buildings by 2040.

Primary Action: Develop a prioritized list of City buildings to retrofit and perform energy audits, payback analyzes, and retrofits starting with the highest priority buildings.

Water, Wastewater, and Solid Waste Actions

Goal 5: Decrease energy use in the potable water treatment and distribution system by up to 60% by 2050.

Primary Actions:

- Continue with water treatment and distribution system upgrades through pump replacements with more energy efficient models.
- Decrease potable water use by 45% community-wide by 2050 through incentive and education programs.

Goal 6: Achieve 90% solid waste diversion by 2050. An organics and biosolids anaerobic digestion facility is operational by 2030.

Primary Actions:

- Continue to implement and update the services and direction of the Waste Diversion Plan to incrementally improve solid waste diversion each year until the 90% target is reached or exceeded.
- Work with community partners to deliver consumption, conservation, and waste reduction education and awareness programs.
- Perform an updated anaerobic digestion facility study including options for producing electricity and RNG from its outputs.

Low-carbon Transportation Actions

Goal 7: Enhance transit service to increase transit mode share to 25% by 2050.

Primary Actions:

- Update the Transit Action Plan and Transportation Master Plan periodically with increasingly ambitious transit mode share targets.
- Enhance transit service through expanded routes and frequency, as possible.
- Right-size the transit fleet with smaller vehicles serving short and/or low passenger count routes.
- Develop an employer and institution transit incentive program that can be offered to employees and students to encourage transit use.

Goal 8: Achieve 35% active mobility transportation mode share by 2050.

Primary Actions:

- Continue to implement the Cycling and Pedestrian Master Plan (part of the Transportation Master Plan), developing the recommended cycling and walking infrastructure and networks.
- Dedicate and deploy annual capital budget to new active transportation infrastructure that makes significant progress toward implementing the full Cycling and Pedestrian Master Plan.
- Coordinate with community partners to deliver education and awareness programs about the economic and health benefits of active transportation.

Goal 9: Electrify 100% of transit and City fleet by 2035.

Primary Action: Replace transit and city fleet vehicles with electric versions.

Goal 10: 100% of new vehicle sales are electric by 2030.

Primary Actions:

- Implement the recommendations of the Electric Vehicle Study, including:
- Updating building development applications, building permits, rezoning and retrofitting policies;
- Including EV infrastructure data in building records;
- Updating relevant city plans;
- Updating the licensing, regulating and governing of vehicles for hire;
- Coordinating and promoting EV subsidies, purchase incentives, and bulk purchases;
- Coordinating and delivering various sector-specific education and awareness campaigns; and
- Installing charging infrastructure.

Industrial Efficiency Actions

Goal 11: Increase industrial energy efficiency by 50% by 2040.

Primary Action: Create an industry energy efficiency working group composed of industry stakeholders that meets quarterly to discuss energy efficiency progress.

Local Clean Energy Generation Actions

Goal 12: Establish a renewable energy cooperative (REC) to advance solar energy systems and other renewable energy efforts of the CEEP.

Goal 13: Install 10 MW of ground mount solar PV each year, starting in 2022.

Primary Actions:

- Assess land availability for solar farms and prioritize properties on which to install solar energy systems with input from stakeholders and the public. Use the Capreol solar array as a template for installation.
- Secure contracts with solar PV providers to achieve bulk purchase discounts on solar PV arrays.

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.

Primary Actions:

- Include this action as part of the approach of Goal 2;
- Deliver developer and builder information and training through the REC;
- Coordinate homeowner outreach and incentive programs through the REC;
- Coordinate ICI outreach and incentive programs through the REC;
- Arrange bulk solar PV system purchasing; and
- Coordinate with electrical utilities on new metering programming.

Goal 15: Expand the downtown district energy system to 23 MW capacity.

Primary Action: Conduct a system expansion feasibility study that identifies priority buildings to connect to the system, determines system requirements, and demonstrates the business case.

Goal 16: Install 50 MW of renewable energy storage.

Primary Actions

- Engage local utilities in exercises to determine the best approach to energy storage provision and ownership;
- If deemed necessary, perform a feasibility study on energy storage options; and
- Incrementally install renewable energy storage in concert with new renewable energy systems.

Low-carbon Energy Procurement Actions

Goal 17: Procure 100% of community-wide grid electricity and 75% of natural gas demand from renewable sources by 2050.

Primary Actions:

- Engage subject matter experts to complete a preliminary study evaluating procurement options, including:
- Public-private partnerships (City, major property owners, large institutions) that sign long-term power purchase agreements with renewable energy developers; and
- Establishing a local (municipal) electricity retailer, allowing the City to purchase renewable electricity for all local customers that sign on.
- Following initial study, establish a stakeholder working group to identify/evaluate procurement options, opportunities, and obstacles.

Carbon Sequestration Actions

Goal 18: Increase the reforestation effort of the Regreening Program.

Primary Action: Increase the resources available to the Regreening Program for its reforestation efforts through operating budget assignment and coordination with businesses, institutions, and community groups.