



Red Deer's Community Energy and Emissions Plan

Actions Assessment

September 20, 2018

Prepared in partnership with:



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Executive Summary

A Community Energy and Emissions Plan (CEEP) is a tool to help define community priorities around energy consumption in order to improve efficiency, cut emissions, and drive economic development. Over 180 communities in Canada, representing 50 percent of the Canadian population, have such plans.¹

Fulfilling direction set in the Environmental Master Plan (EMP, 2011), the CEEP establishes a community-wide energy use and emissions inventory, identifies potential emissions reductions targets, and proposes policies and actions to achieve those targets. The CEEP identifies ways to manage the future by producing and using energy more wisely, building efficient homes, travelling in energy efficient ways, producing less waste, and better managing the waste produced.

This document takes the second step in completing the CEEP by acknowledging current actions and identifying future actions that The City and members of the community can take to reduce energy use and emissions. Actions in seven themes are analyzed for what's already happening in the community, what actions could be taken to go further, how those actions would reduce emissions, and the benefits of taking those actions.

Achieving the CEEP Goals (outlined below) and reducing emissions requires the participation of all community members. This Actions Assessment identifies how the community can move forward toward the goals, and how The City can help facilitate the process.

CEEP Goals

1. Red Deer will support the long-term quality of life, health, and mobility of residents, while partnering with its businesses and institutions, through energy and emissions actions.
2. Red Deer's buildings will become more efficient and its neighbourhoods even more liveable.
3. Efficient and convenient mobility options will be increasingly available.
4. How resources are used and disposed of will become increasingly efficient.
5. Energy production and use will become increasingly sustainable and resilient.
6. Red Deer will deliver innovative and pragmatic energy and emissions solutions, creating a more prosperous and sustainable city.

Places to start on the path to reducing GHG emissions in Red Deer, for The City of Red Deer and for the community at large, include:

City Actions

- Examine where energy efficiencies can be found, for example by doing building audits and reviewing opportunities for alternative energy sources like solar and co-generation.
- Appraise opportunities for more complete neighbourhoods, redevelopment and implementation of the Multimodal Transportation Plan to make more efficient modes of transportation more attractive.
- Create a public campaign to educate the community about GHG emissions, and how and why Red Deer needs to address this issue for the betterment of current and future generations.

Community Actions

- Understand the impact of GHG emissions and why they need to be addressed.
- Take the initiative to reduce personal GHG emissions.
- Be leaders in neighbourhoods, workplaces, and schools to educate others on reducing GHG emissions personally and in their organizations.

The CEEP goals set forth an opportunity for Red Deer, as a community, to take action to protect the environment into the future. The degree of implementation and success will depend on the resources allocated to each individual action by all levels of government and the community, and the willingness of the community to shift behaviour.

¹ QUEST's Community Energy Planning: The Value Proposition, Environmental, Health and Economic Benefits (Feb. 2016), p.5. http://gettingtoimplementation.ca/wp-content/uploads/2016/02/Full-Report_ValueProposition_OnlineVersionFeb92016.pdf

1. Introduction

Following up on the analysis performed for *Red Deer's Community Energy and Emissions Plan: Current path and options to reduce greenhouse gas emissions* (September 13, 2017), this document reviews City and community actions that could be taken to reduce energy and emissions across the city, while contributing to economic development and a healthier community.

This document groups actions into 7 major energy and emission themes relevant to City operation and responsibility areas. These are:

1. Buildings
2. Transportation
3. Energy
4. Solid waste
5. Building complete, compact communities
6. Forests and natural spaces
7. Food and agriculture

Actions were assessed using an energy, emissions and land-use scenario modelling tool. The actions were modelled over the period of 18 years, from 2017 to 2035. 2035 is consistent with Red Deer's Environmental Master Plan target year for its planned actions and targets. The baseline year for Red Deer's energy and emissions inventory is 2010.

Financial modelling numbers presented are for the year 2035—the investments and returns expected in that year (as opposed to the combined total finances for 2010-2035). The estimated investment total for each action includes the cost of creating the required number of jobs (direct, indirect, and induced) to implement the action, the cost of any required infrastructure, and the cost of any technologies and their installation/implementation. The estimated returns for each action include revenues gained and costs avoided from the implementation of the action. As outlined in the *Current path and options to reduce greenhouse gas emissions* report, there is evidence that over the long term, investments will realize a positive return. However, the main achievement is reducing energy use and emissions, which is the right thing to do.

2. Community and CEEP Actions

This section sets out actions to reduce energy use and emissions in Red Deer. It is recognized that this initiative largely relates to a shift in long-established practices. Actions reflect a moderate effort scenario in an attempt to help Red Deer develop a new norm in approaching energy and emissions reductions.

How to Read This Report

This report provides detailed assessments of 26 actions that could be taken, and they are divided into 7 major energy and emissions themes. There are four major content components for each theme:

- 1. Community Tables:** these present a summary of the energy and emissions theme and give key information on actions under this theme. Community Tables include:
 - *A Goal statement:* what is hoped to achieve by implementing actions under the theme area.
 - *What are the impacts?:* a description of what impacts action implementation is expected to have.
 - *Key action:* an example of one of the most important energy and emissions reduction actions that can be taken under the theme area.
 - *What else can Red Deerians do?:* examples of actions that Red Deerians could take to reduce energy, avoid emissions.
 - *What's happening in the community?:* examples of actions that have already been initiated by residents.
 - *What has The City done to help?:* examples of actions that The City is taking to reduce energy and emissions.
 - *What City strategies support this?:* City bylaws, plans, and strategies that give direction, require, or support the actions under the theme.
 - *How else could The City support the community?:* a list of potential actions The City could take under the theme area.
- 2. CEEP Action Tables:** these present a potential energy and emissions reducing action that The City and/or the community could take (detailed further on the next page). Note that numbers in the table are for the year 2035. Given what is known today, the financial analysis recognizes, in some cases, initial investment is required with an expected positive rate of return. Each year between 2017 and 2035 will have different values for each table element. Also note that the anticipated health and equity outcomes are high-level estimates only, based on the modelling team's knowledge of academic, observed, and planning practitioner information on the subjects.
- 3. CEEP Action Graph:** the graphs show the emissions reductions each action achieves between 2017-2035. The shaded area of each graphed action is the total amount of emissions reduced during the time period. Each graph shows the Business As Usual emissions scenario (top line) and the Moderate Effort emissions reduction scenario (bottom line).
- 4. Theme Area Outcomes:** each theme and its actions are reviewed, including content on their energy and emissions reduction effectiveness.

Understanding the CEEP Action Tables

Action #	Proposed Action	Assumptions	Actions sub-category
1	Set an example by exploring establishment of a corporate policy to define energy efficiency standards for new City-owned buildings.	Results in 100% of new City buildings achieving 40% energy reduction.	New ICI buildings

Assigned CEEP action number

A description of the proposed action

The estimated energy and/or emissions results of taking the action

Further classification of the action

Action #	Energy Reductions in 2035 (GJ)	Percentage of Total Energy Reductions	Emissions Reductions in 2035 (tCO2e)	Percentage of Total Emissions Reductions	Jobs Created	Investment (\$M)	Return (\$M)	Health Impacts	Equity Impacts
1	60,000	2.0%	10,000	5.0%	50	\$5.2	\$12.0	Low	High
2	50,000	1.7%	5,000	2.5%	35	\$4.7	\$9.5	High	Medium
Sum	110,000	3.7%	15,000	7.5%	85	\$9.9	\$21.5		

Assigned CEEP action number

The modelled energy reductions achieved by the action in the year 2035, measured in gigajoules

This action's energy reduction expressed as a percentage of the total energy reduction achieved by all CEEP actions

The modelled emissions reductions achieved by the action in the year 2035, measured in tonnes carbon dioxide equivalent

This action's energy reduction expressed as a percentage of the total energy reduction achieved by all CEEP actions

The modelled number of jobs expected to be created in the year 2035

The expected investment to be made in 2035 by The City, the community, and businesses to implement the action

The expected return on investment to be made in 2035 for taking the action

The high-level estimated community health benefits resulting from taking the action (low, medium or high)*

The high-level estimated community equity impacts resulting from taking the action (low, medium or high)**

*Health outcomes: qualitative estimated level of improvement of population health for incidences of asthma, chronic obstructive pulmonary disease, ischaemic heart disease, heart failure, and diabetes type 2.

**Equity outcomes: qualitative estimated level of improvement of population access to amenities, improved mobility, and decreased household expenditures.

Buildings

The energy used by Red Deer's buildings predominantly comes from natural gas and coal-fired electricity. Substantially reducing building energy use will have a major positive impact on energy use, emissions production, and air pollution.

Goal: Live and Work in Energy Efficient Buildings

What are the impacts?

Energy used in buildings accounts for about 80% of the energy used and 70% of greenhouse gas emissions in Red Deer. Most of this energy is used for heating.

Key action: improve insulation

Improving insulation is the most efficient method to conserve energy when heating or cooling buildings. Weatherproof and improve insulation in roof, walls and basement.

What else can Red Deerians do?

- Install and set programmable thermostats
- Wash clothes in cold water and hang to dry
- Turn out lights
- Use LED light bulbs
- Buy Energy Star appliances and electronics
- Get rid of old second refrigerator

What's happening in the community?

Energy efficient schools, healthcare facility and private businesses

What has The City done to help?

- LED light bulb and Christmas light exchanges
- Conservation toolkits at Red Deer Public Library
- Upgrade to energy efficient lighting in City buildings
- Energy audits of some City buildings
- Earth Hour
- Build energy efficient buildings

What City strategies support this?

- Municipal Development Plan 9.12, 9.13, 17.9
- Environmental Master Plan actions around building efficiency
- Social Policy Framework goal of Poverty Prevention & Reduction

How else could The City support the community?

Quickest wins:

- Explore establishment of a corporate policy to define energy efficiency standards to retrofit existing City-owned buildings.
- Create an education campaign surrounding consumer options for high efficiency home building.
- CEEP actions: 1-8

CEEP Building Actions

Action #	Proposed Action	Assumptions	Actions sub-category
1	Explore establishment of a corporate policy to define energy efficiency standards for new City-owned buildings.	Results in 100% of new City buildings achieving 40% energy reduction.	Energy efficiency improvement in new ICI buildings
2	Explore establishment of a corporate policy to define energy efficiency standards to retrofit existing City-owned buildings.	Results in 100% of existing City buildings achieving 50% energy reduction.	Energy efficiency improvement through ICI building retrofits
3	Explore establishment of a corporate policy to define energy efficient operational standards for City-owned buildings.	Results in 100% of existing City buildings achieving 10% energy reduction.	Energy efficiency improvement through ICI building retrofits
4	Identify and engage Industrial/Commercial/Institutional users of electricity and natural gas in the city who have the most potential to reduce use to conserve/identify barriers to conservation	Results in 10% of ICI buildings achieving 25% energy savings.	Energy efficiency improvement through ICI building retrofits
5	Create an education campaign surrounding consumer options for high efficiency home building.	10% of new residential construction is 40% more efficient.	Energy efficiency improvement in new residential buildings
6	In City developments for which there is a Request for Proposal (commercial and multi-family buildings) implement a process wherein social, cultural, economic and environmental criteria are considered.	5% of new residential and ICI development is 15% more efficient.	Energy efficiency improvement in new residential and ICI buildings
7	Develop programs to engage Red Deerians on actions that will have the biggest energy reduction effects on their buildings: insulate roofs, improve building envelopes, change furnace/HVAC (e.g. Edmonton and Medicine Hat programs).	Results in 2.5% increase in residential energy efficiency.	Energy efficiency improvements through residential building retrofits
8	Encourage energy efficient new buildings and retrofits on privately owned property by reducing financial barriers	Results in 10% of new residential construction achieving 40% efficiency.	Energy efficiency improvement for new residential buildings

Action #	Energy Reductions in 2035 (GJ)	Percentage of Total Energy Reductions	Emissions Reductions in 2035 (tCO2e)	Percentage of Total Emissions Reductions	Jobs Created	Investment (\$M)	Return (\$M)	Health Impacts	Equity Impacts
1	59,250	1.14%	8,000	1.00%	N/A	N/A	N/A	Low	Low
2	220,000	4.24%	44,000	5.48%	29	\$2.8	\$9.7	Low	Low
3	47,000	0.91%	5,800	0.72%	9	\$0.6	\$5.5	Low	Low
4	220,000	4.24%	44,000	5.48%	29	\$2.8	\$9.7	Medium	Low
5	6,300	0.12%	2,000	0.25%	N/A	N/A	N/A	Low	Low
6	23,500	0.45%	3,850	0.48%	N/A	N/A	N/A	Low	Low
7	53,700	1.03%	19,200	2.39%	12	\$1.3	\$5.5	Medium	Medium
8	6,300	0.12%	2,000	0.25%	N/A	N/A	N/A	Low	Medium
Sum	636,050	12.25%	128,850	16.03%	79	\$7.6	\$30.4		

CEEP Building Actions Emissions Reductions

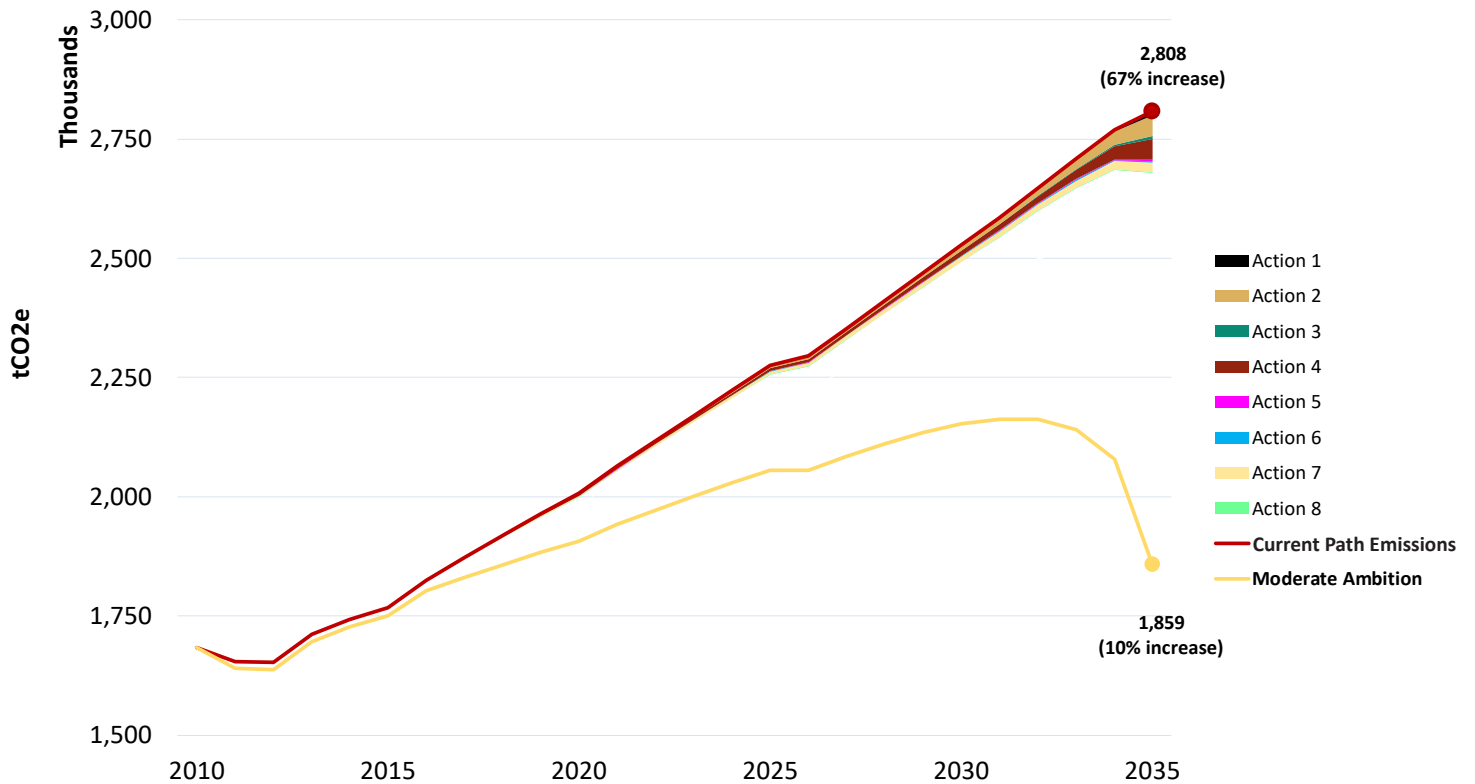


Figure 1. CEEP Building Actions Emissions Reductions to 2035

Buildings Action Outcomes

The 8 suggested actions under the Buildings theme would account for 11% of the energy reduced and 14% of the total emissions reductions achieved by all CEEP actions, in the year 2035.

The big energy and emissions reductions under the Buildings theme come from retrofitting existing City and industrial-commercial-institutional (ICI) buildings. This action is also reflected in the Community Table's key action: improve insulation. Due to the fossil fuel intensive nature of building energy use in Red Deer, actions that make buildings more energy efficient have large impacts on their emissions production.

Some of the easiest wins for The City under this theme lie in addressing its own existing and future building stock. Building energy use assessments can be performed on existing buildings in order to determine the most effective energy efficiency retrofits, such as upgrading the building envelope for airtightness, improving insulation, modernizing and upgrading light fixtures, and recommissioning building HVAC equipment. The City can also mandate increased energy performance in any new buildings to be added to its stock.

Some actions under this theme encourage action from The City in supporting the work of the construction industry, ICI building owners and operators, and home owners and buyers. Persistent relationship-building and energy efficiency incentive programs initiated, promoted, and maintained by The City are key components to success in these areas. Many cities have failed to garner substantial interest and deliver positive results with their incentive programs due to poor implementation—even after thoughtful incentive program design. Appropriate staff resources and budgets must be provided so that effective relationships and programs can be built and maintained.

These actions require new design and construction jobs, new energy efficiency expertise, and program resourcing. In 2035, 79 new private sector jobs are expected to be added in the building energy efficiency trades. Financing these jobs and other associated costs of the actions is expected to cost around \$7.6M in 2035. These investments will be made by The City, home or business owners and buyers, institutions, the construction industry, and others. However, the expected return on this investment is \$30.4M, due largely to energy cost savings.

The major health improvement outcomes of building energy efficiency actions are in improved indoor air quality, with decreased ground-level ozone and radon infiltration due to improved building envelopes, as well as a reduction in indoor fuel combustion for heating and cooking. The major equity improvement outcomes are in energy poverty reduction. Energy poverty is typically defined as household energy spending in excess of 10% of annual household income. It has recently been estimated that about 455,000 Albertans live in energy poverty.² Energy reduction actions in buildings thus contributes to achieving goals set out in Red Deer's Social Policy Framework.

For larger energy and emissions reductions, there is great potential in the residential building sector. The residential actions modelled here constitute a good start and will get home owners, home buyers, and the local construction industry moving toward increasingly energy efficient retrofits and new homes. Great emissions reductions can be achieved through increased ambition in this sector.

² As reported in several sources, for example by the [Alberta Real Estate Foundation](#).

Transportation

Most Red Deerians make trips to work, stores, schools, entertainment, and almost everywhere else by car. As the city expands outwards, trips from home to these destinations can get longer. Taking fewer, well-organized trips, using public transit, and using an electric vehicle are some ways to reduce transportation-related greenhouse gas emissions.

Goal: Move Efficiently

What are the impacts?

Transportation is the second largest source of GHG emissions in Red Deer, and vehicle emissions are also the largest source of air pollution.

Key action: don't idle vehicles for longer than 1 minute

If unnecessary vehicle idling was eliminated in Red Deer fuel use would be reduced by 1,678,721 litres and GHG emissions by 4,079 tonnes. This is equal to taking 2,914 vehicles off the road or planting 24,479 trees all just by turning the key.

What else can Red Deerians do?

- Take the Smart Drive Challenge
- Use active transportation or Transit
- Carpool
- Use a block heater timer
- Choose low emission vehicles
- Maintain tire pressure and change oil regularly

What's happening in the community?

- Red Deer Association for Bicycle Commuting's Cyclovia event
- Electric vehicle charging stations at hotels and businesses
- Alberta Bike Swap
- All schools are idle free zones

What has The City done to help?

- Improve Transit experience with Google Transit, bikes on the bus
- Purchased electric car
- Compressed natural gas buses
- Block heater timer program
- Commuter Challenge and World Car Free Day
- Provide regional Transit services
- Carpool.ca (2012-2016)
- City facilities are idle free zones

What City strategies support this?

- Municipal Development Plan 7.4, 11.10, 16.1, 16.4, 16.7, 16.9, 16.10, 16.12, 16.13, 16.15
- Multimodal Transportation Plan/Mobility Playbook
- Neighbourhood Planning and Design Standards Principle 3: Multi-modal choice
- Social Policy Framework goal of Poverty Prevention & Reduction

How else could The City support the community?

Quickest wins:

- Create a low-emissions and electric vehicle strategy to educate Red Deerians about their choices, remove barriers and increase benefits to choosing low emitting vehicles.
- Implement trails, active transportation connections and Transit improvements outlined in the Multimodal Transportation Plan .
- CEEP actions 9-16

CEEP Transportation Actions

Action #	Proposed Action	Assumptions	Actions sub-category
9	Identify the largest heavy-duty Industrial/ Commercial/Institutional fleets in the city and work with them to conserve/identify barriers to conservation.	Results in 10% ICI fleet efficiency.	Fuel efficiency
10	Create a low-emissions and electric vehicle strategy to educate Red Deerians about their choices, remove barriers and increase benefits to choosing low emitting vehicles, e.g. electric charging stations, preferred parking for carpoolers.	Results in 10% increased EV ownership.	Fuel efficiency, low carbon fuel
11	Support Red Deerians choosing active transportation by working towards implementing a comprehensive trail plan as outlined in the Multimodal Transportation Plan.	Results in 2% modeshift to walking/cycling.	Mode shift - active transportation
12	Support Red Deerians choosing active transportation by working towards implementing a comprehensive city plan for connection in/through new neighbourhoods for modes of active transportation as outlined in the Multimodal Transportation Plan.	Results in 2.5% modeshift to walking/cycling.	Mode shift - active transportation
13	Support Red Deerians cycling by creating educational tools, for example on rules of the road, driver and cyclist behaviour.	Results in 1% modeshift to cycling.	Mode shift - active transportation
14	Continue to build upon and review existing bike parking infrastructure with overall changes in transportation habits and trends.	Results in 1.5% modeshift to cycling.	Mode shift - active transportation
15	Review policies, procedures and technology used for traffic signal optimization to prioritize Transit needs, including Intersection Priority Sequencing which will ensure transit and EMS vehicles have priority at key intersections.	Results in 2% mode shift to transit.	Mode shift - public transit
16	Support Red Deerians choosing Transit by investing in direct Transit routing and frequent service to multiple destinations with an improved waiting experience, as outlined in the Multimodal Transportation Plan.	Results in 5% mode shift to transit.	Mode shift - public transit

Action #	Energy Reductions in 2035 (GJ)	Percentage of Total Energy Reductions	Emissions Reductions in 2035 (tCO2e)	Percentage of Total Emissions Reductions	Jobs Created	Investment (\$M)	Return (\$M)	Health Impacts	Equity Impacts
9	4,300	0.08%	17,000	2.12%	N/A	N/A	N/A	Medium	Low
10	144,000	2.77%	35,000	4.36%	N/A	N/A	N/A	Medium	Low
11	54,000	1.04%	4,000	0.50%	N/A	N/A	N/A	High	Medium
12	67,000	1.29%	5,000	0.62%	N/A	N/A	N/A	High	Medium
13	27,000	0.52%	2,000	0.25%	N/A	N/A	N/A	High	Medium
14	40,000	0.77%	3,000	0.37%	N/A	N/A	N/A	High	Medium
15	54,000	1.04%	4,000	0.50%	N/A	N/A	N/A	Low	Low
16	134,000	2.58%	9,700	1.21%	N/A	N/A	N/A	Low	High
Sum	524,300	10.10%	79,700	9.92%					

CEEP Transportation Actions Emissions Reductions

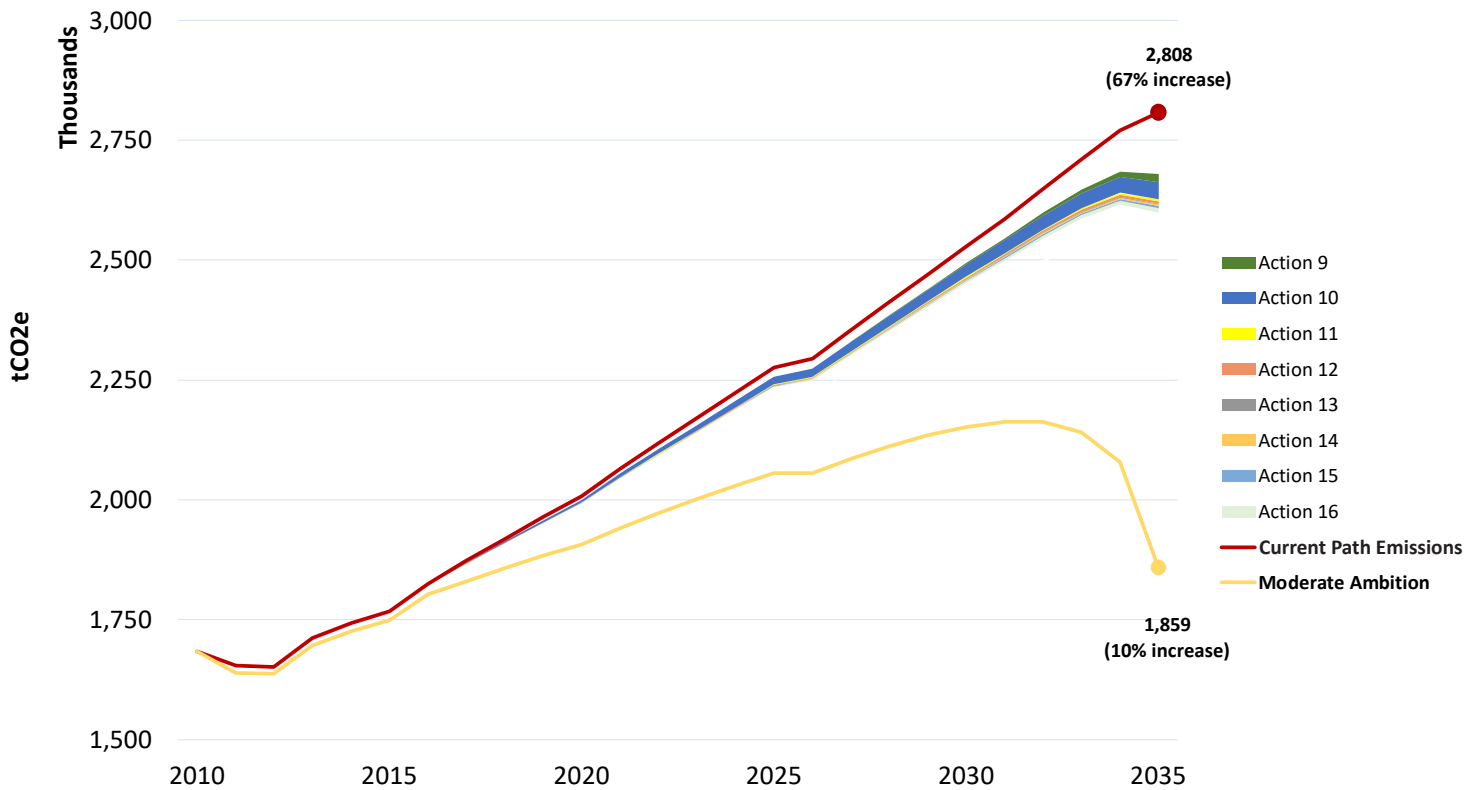


Figure 2. CEEP Transportation Actions Emissions Reductions to 2035

Transportation Action Outcomes

The 8 suggested actions under the Transportation theme would account for 9% of the energy reduced and 12% of the total emissions reductions achieved by all CEEP actions, in the year 2035.

The biggest energy and emissions reductions under this theme are produced by switching from gasoline/diesel automobiles to electric vehicles (EVs). As EVs become increasingly available and their costs decrease, Red Deerians will increasingly choose EVs to replace their current cars and trucks. To be fully effective at reducing emissions, the uptake of EVs must be paired with the greening of the electric grid. While studies show that it is currently advantageous to convert to electric vehicles in Alberta,³ the grid's current predominant make up of coal-fired and natural gas-fired electricity production means that EVs produce emissions by using grid electricity as their energy source. As the emissions factor associated with electricity from the grid decreases with the planned phase out of coal-fired electric plants, EVs will become increasingly viable as a way to reduce transportation emissions.

As with the Buildings theme, actions under the Transportation theme will benefit from relationship-building and incentive programs that can be performed by The City and its partners. Increasing vehicle fuel efficiency, reducing trip lengths, and reducing the carbon content of fuels used represent great emissions reduction potential in this sector. Working with ICI fleet managers to achieve these outcomes is a worthwhile endeavour.

As proven in various cities around the world, balancing the provision of infrastructure, application of appropriate land-use policy, and use of market forces is the most effective way to achieve transportation mode shift away from personal vehicles to transit, walking, and biking. Focusing on one of these elements without attention to the others results in poor services, low uptake, and negative stigmatization of the so-called alternative modes of transportation. By aptly considering all three in any transit or active transportation efforts made, The City may achieve success in progressing towards its mobility goals.

Creating walking networks, cycling infrastructure, and trails are key activities to encouraging active transportation and promoting active lifestyles. Health organizations can be keen partners on these types of projects due to the health benefits associated with active transportation.⁴

The equity benefits of improving mobility choices and services include reduced household transportation costs, increased accessibility to amenities and family elsewhere in the city, and improved quality of life. Making the city more easily accessible benefits everyone.

There are major energy and emissions reductions still to be made by increasing the number of trips made by transit and active transportation. The mode shift actions modelled here are modest starts—although if all actions were successfully implemented by 2035, a total mode shift of 14% could be achieved.⁵

³ "Even in Alberta, with its high-carbon electricity, there are GHG benefits associated with fuel production and use in shifting from gasoline to electric-powered personal vehicles. For a typical personal-use vehicle driven 15,000 km/yr, the benefit is 1 to 1.5 t CO₂e per vehicle per year. For new vehicles in 2015, that represents approximately 33% reduction in emissions, but by 2040, the reduction is estimated to be 50%. Retrieved from <http://www.cesarnet.ca/sites/default/files/pdf/CESAR-Scenarios-Potential-Impact-EVs.pdf>.

⁴ Such as those presented on pp.25-26 of the [Healthy Built Environment Linkages Toolkit](#).

⁵ As envisioned in Red Deer's Mobility Playbook.

Energy

The vast majority of Red Deer's energy for powering homes, retail and commercial buildings, and vehicles comes from fossil fuel sources. Choosing renewable sources of energy can help support local energy businesses while reducing greenhouse gas emissions.

Goal: Use Cleaner Energy

What are the impacts?

For the foreseeable future most of Alberta's electricity will still be generated by coal, which has high GHG emissions and contributes to air pollution.

Key action: buy renewable energy

Invest in renewable energy by installing renewable systems or purchasing renewable energy credits.

What else can Red Deerians do?

- Support businesses who use clean energy
- Learn more about types of renewable energy
- Try solar chargers for cell phones

What's happening in the community?

- Red Deer College's Alternative Energy Lab for teaching, demonstration and applied research related to alternative energy opportunities
- Solar generation in Red Deer has grown five-fold from 2013 to 2017, and is estimated to grow five-fold again in 2018

What has The City done to help?

- Co-generation at Collicutt Centre and Wastewater Treatment Plant
- Purchased renewable energy for City facilities (2005-2016)
- Solar electricity generation at Civic Yards

What City strategies support this?

- Economic Development Strategy 5.2.5 Strategy B5: Promote "green" technology companies
- Environmental Master Plan actions to promote renewable energy

How else could The City support the community?

Quickest wins:

- Build internal capacity and structure at City of Red Deer to support emerging citizen/business micro-generation needs and allow The City to encourage development of renewable energy sources.
- CEEP actions 17-19

CEEP Energy Actions

Action #	Proposed Action	Assumptions	Actions sub-category
17	Build internal capacity and structure at City of Red Deer to support emerging citizen/business micro-generation needs and allow The City to encourage development of renewable energy sources.	Results in 2.5% fuel switch to renewables.	Renewable energy
18	Develop and build internal capacity to create and implement an energy optimization strategy for Red Deer to learn what are the contextually appropriate, best return on investment options for Red Deer, for example investigating community scale renewable energy projects, district energy, community owned/municipal renewable energy utility, grid optimization, energy efficiency, etc.	Results in 2.5% fuel switch to renewables.	Renewable energy
19	Organize renewable energy group purchases: bulk buying of renewable energy systems (e.g. heat pumps, solar PV panels, solar thermal panels, ground-source heat pumps) for building owners.	Results in 2.5% fuel switch to renewables.	Renewable energy

Action #	Energy Switched to Renewables in 2035 (GJ)	Percentage of Total Energy Reductions	Emissions Reductions in 2035 (tCO2e)	Percentage of Total Emissions Reductions	Jobs Created	Investment (\$M)	Return (\$M)	Health Impacts	Equity Impacts
17	206,000	—	19,000	2.36%	500	\$48	N/A	Low	Low
18	206,000	—	19,000	2.36%	500	\$48	N/A	Low	Low
19	206,000	—	19,000	2.36%	500	\$48	N/A	Low	Medium
Sum	618,000	—	57,000	7%	1500	\$144			

CEEP Energy Actions Emissions Reductions

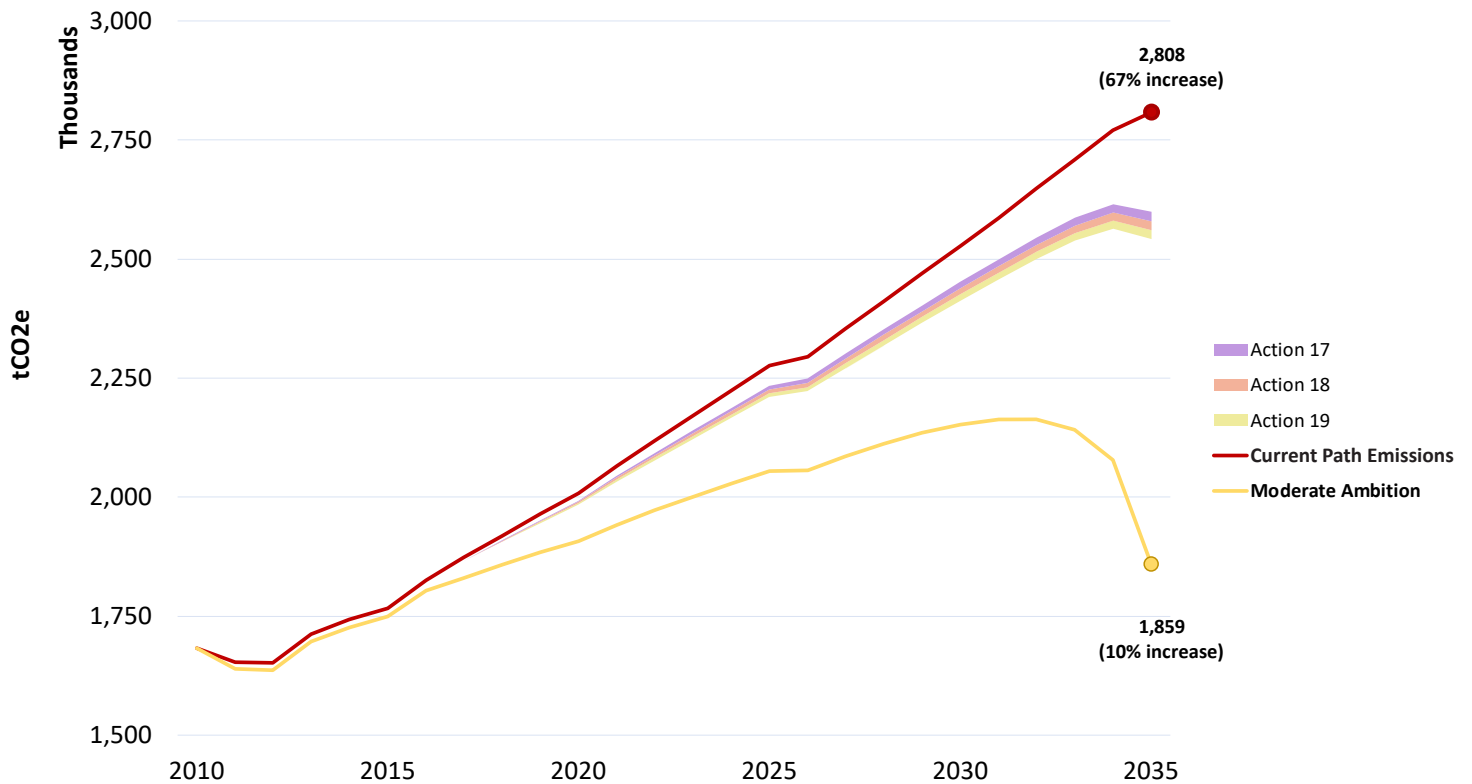


Figure 3. CEEP Energy Actions Emissions Reductions to 2035

Energy Action Outcomes

Switching from fossil fuel based energy sources to renewable energy is the most effective emissions reduction strategy. Currently, natural gas and electricity prices are so inexpensive in Alberta that it is challenging to finance the switch to renewables. However, the costs of renewable and efficient energy sources such as district energy and solar power are decreasing, and are affordable with the right circumstances and incentive programs in place.

The three potential renewable energy actions modelled here result in switching 618,000 GJ (172,000 MWh) from fossil fuel sources to renewable energy sources in the year 2035 alone, reducing GHG emissions by 57,000 tCO₂e in that year. Actions 17 and 19 result in more small-scale residential and commercial renewable energy installations, while Action 18 could result in larger scale community energy projects. More detailed energy analyses are required to determine the most appropriate renewable energy systems to install.

There are many jobs to be created in the renewable energy industry. A report on Alberta's renewable energy jobs sector⁶ details the jobs created in construction and operations and maintenance (O&M) by renewable energy technology type, listed in Table 1. Assuming that the jobs created by Actions 17-29 are solar power jobs, and two-thirds in the residential sector and one-third in the commercial sector, 1,500 jobs would be created in 2035 alone.

Estimates for investment requirements for installed energy systems vary greatly. Considering only solar energy (keeping consistent with the job creation estimates approach), the estimated costs of installing 618,000 GJ (172,000 MWh) of residential and commercial solar power systems at \$225/MWh is about \$39M for the year 2035.⁷ Assuming \$70,000 cost per job created, job investment in 2035 is \$105M for 1,500 solar energy jobs. The total investment of \$144M would be provided by industry, home owners, business owners and operators, and The City.

Health and equity benefits to switching to renewable power include improved respiratory health from reduced air pollution and, in some cases, reduced energy costs over the long term.

Generation Type	Annual FTE/MW
Wind construction	0.95
Wind O&M	0.1
Solar construction (blended)	12.5
Solar O&M	0.3
Solar residential construction	20
Solar residential O&M	1
Solar commercial-scale installation	15
Solar commercial-scale O&M	0.3
Solar utility-scale O&M	0.2
Run-of-river hydro installation	5.76
Run-of-river hydro O&M	0.08

Table 1. Annual jobs created per MW of installed renewable energy type.

⁶ Jeyakumar, Binu. *Job Growth in Clean Energy: Employment in Alberta's emerging renewables and energy efficiency sectors*. The Pembina Institute, 2016, p.15. Available [here](#).

⁷ "Lazard's Levelized Cost of Energy Analysis - Version 11.0" (PDF). Lazard. 2017-11-02. Retrieved at: <https://www.lazard.com/media/450337/lazard-levelized-cost-of-energy-version-110.pdf>. An average was taken from the spectrum of costs.

Waste

Solid and liquid waste take up space, and require treatment, and produce greenhouse gases. Buying fewer packaged products, increasing recycling, and using reusable items helps cut down on waste while making Red Deer cleaner.

Goal: Reduce Waste

What are the impacts?

Organic waste decomposing in landfills and during wastewater treatment account for about 6% of Red Deer's greenhouse gas emissions.

Key action: compost at home and/or use the Green Cart

About 40% of residential waste is organic (was once alive). It's important to keep organic waste out of landfills because it is a key source of greenhouse gas emissions. Using compost to feed plants, gardens, lawn, trees and shrubs returns nutrients to the earth.

What else can Red Deerians do?

- Conduct a garbage audit and make a strategy to reduce waste
- Borrow or rent items instead of buying; choose second hand or items made from recycled content
- Use reusables like grocery bags, coffee mugs and avoid disposable items
- Reduce food waste
- Choose items with less packaging

What's happening in the community?

- ReThink Red Deer's Garbage Free February
- Red Deer Public Library/ReThink Red Deer's repair cafés
- Second hand/consignment stores
- 92% participation in curbside recycling
- Restaurants voluntarily going 'straw free' for beverages
- Trash to Treasure Swap Meet at Kerry Wood Nature Centre

What has The City done to help?

- Composting at Home program
- Green Cart and Blue Box programs
- Kick it to the Curb
- Divert gypsum and shingles
- Feed 500 (2016)
- Methane management at Waste Management Facility and Wastewater Treatment Plant
- Tours of Waste Management Facility and classroom presentations on waste

What City strategies support this?

- Municipal Development Plan 17.5
- Waste Management Master Plan
- Environmental Master Plan actions to reduce waste

How else could The City support the community?

Quickest wins:

- Create policy to reduce waste to landfill, for example differential tipping fees leading to disposal bans of divertable materials
- CEEP action 20

CEEP Waste Outcomes

Action #	Proposed Action	Assumptions	Actions sub-category
20	Create policy to reduce waste to landfill, for example differential tipping fees leading to disposal bans of divertable materials and lobbying for extended producer responsibility on packaging.	Results in 5% increased waste diversion.	Waste diversion

Action #	Energy Reductions in 2035 (GJ)	Percentage of Total Energy Reductions	Emissions Reductions in 2035 (tCO2e)	Percentage of Total Emissions Reductions	Jobs Created	Investment (\$M)	Return (\$M)	Health Impacts	Equity Impacts
20	-	-	7,000	0.87%	N/A	N/A	N/A	Low	Low
Sum			7,000	0.87%					

CEEP Solid Waste Actions Emissions Reductions

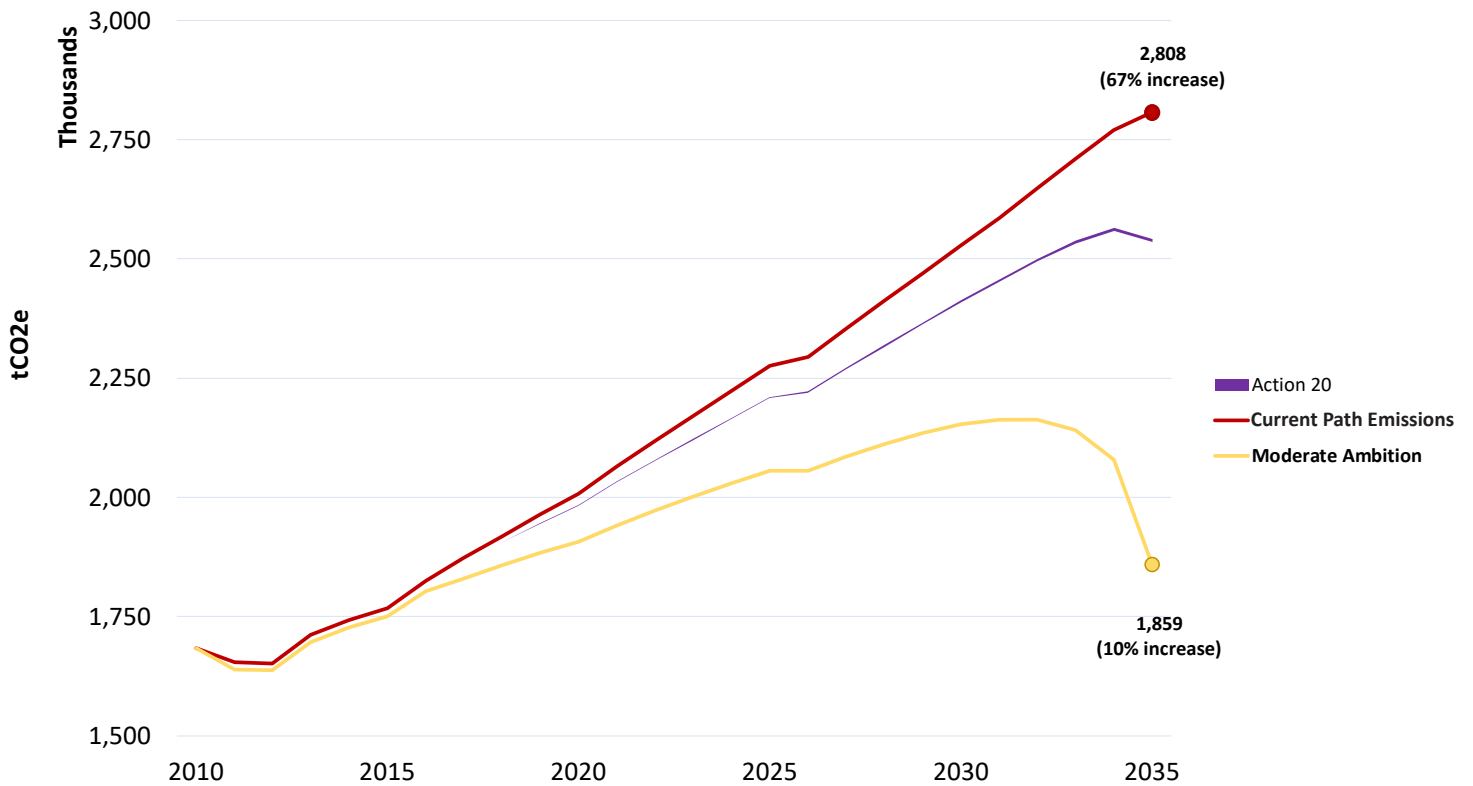


Figure 4. CEEP Solid Waste Actions Emissions Reductions to 2035

Waste Action Outcomes

Currently, 16% of solid waste is diverted from Red Deer landfills (2016 numbers). Red Deer aims to increase its total waste diversion to 50% by 2035 (Environmental Master Plan). Action 20 seeks to further increase diversion by 5% by 2035. Although this action only reduces emissions by 7,000 tCO₂e in the year 2035, the GHG benefits are not insignificant. Reducing and diverting waste has other benefits as well, including:

- Preventing pollution caused by reducing the need to harvest new raw materials;
- Saving energy used in waste treatment processes;
- Preserving land for higher value uses;
- Protecting soil and waterways from landfill leachates;
- Saving costs associated with waste materials processing and storage; and
- Allowing products to be used to their fullest extent.

With continued promotion and enforcement of Red Deer's Blue Box, Green Cart, and extension of the cart pilot programs, The City should be able to achieve these waste diversion goals.

Building Complete, Compact Communities

Well-designed, walkable neighbourhoods with a mix of housing types, stores, places to work, public spaces, and civic spaces (like community centres and libraries) have many opportunities for energy saving and emissions reductions.

Goal: Live in and Support Complete Neighbourhoods

What are the impacts?

As cities expand outward they tend to convert agricultural land to urban uses. Costs increase for the municipality to provide and maintain infrastructure such as roads, pipes and emergency services, and residents are more likely to be dependant on cars, driving longer distances, and adding stress and time to commutes. Once neighbourhoods are built it can be difficult to alter the development pattern, establishing transportation patterns, building design, infrastructure and energy supply for decades to come. All these have impacts on energy use and GHG emissions, so it makes sense to upgrade existing communities where possible and ensure new communities are complete.

Key action: take advantage of services offered in the neighbourhood

Try walking to destinations that are less than a kilometre away. It takes less than 15 minutes for most people to walk that distance, increasing healthy activity and supporting neighbourhood businesses.

What else can Red Deerians do?

- Choose a home that is within a 30-minute walk, bike or transit ride from daily activities, e.g. work, school or play
- Shop locally, including supporting businesses in more densely developed areas like downtown
- Learn more about neighbourhood planning and support changes to more complete communities
- Choose to live in neighbourhoods with a range of services such as schools, grocery stores, medical, parks and pathways, recreation centres
- Support re-use of vacant or underused buildings

What's happening in the community?

- Families choosing to live in a neighbourhood where they can walk to school or church
- Clearview Market is a neighbourhood where people can walk to grocery, pub, medical services, etc.
- Many new businesses and services choosing to open in Red Deer's downtown

What has The City done to help?

- Riverlands/Capstone development
- Approve carriage houses and secondary suites
- Continue to develop multi-use trail system to improve connectivity
- Repurpose Central Elementary School as the Canada Games Celebration Plaza

What City strategies support this?

- Municipal Development Plan 5.9, 5.10, 5.17, 5.18, 7.3, 7.6, 10.4, 10.7, 10.9, 10.10, 11.4, 11.5, 12.5, 12.8, 12.10
- Neighbourhood Planning and Design Standards Principle 2: Mixed Land Uses
- Economic Development Strategy 5.3.2 Ensure new housing is aligned with vision and guiding principles; 5.3.7 Leverage brownfields for higher-density redevelopment; 5.6.1 Create higher-density development downtown
- Environmental Master Plan actions around infill, increased density, complete compact communities with transportation options, brownfield redevelopment, downtown redevelopment

How else could The City support the community?

Quickest wins:

- Continue to design neighbourhoods that integrate land use and transportation plans
- CEEP actions 21-24

CEEP Building Complete, Compact Communities Actions

Action #	Proposed Action	Assumptions	Actions sub-category
21	Continue to explore strategies (policy, marketing, etc.) to promote: 1) higher density residential and mixed use development; and 2) brownfield and underutilized site redevelopment; through dialogue with the public and in relation to forthcoming MDP updates.	Results in 5% of new residential and commercial construction located in re-developed areas, and 5% in new mixed-use greenfield developments, resulting in 25% increase in new building energy efficiency in those buildings and 5% mode shift to walking/cycling trips.	New development
22	Continue to encourage the planning and design of neighbourhoods that integrate land use and transportation plans. Plan and design neighbourhoods with transit supportive densities within nodes and along planned transit routes that support frequent transit service during peak times (transit oriented development).	Results in 10% of new residential and commercial construction located in brownfield developments, resulting in 25% increase in new building energy efficiency and 10% mode shift to walking/cycling trips and 10% mode shift to transit.	New development
23	Consider utilizing Intermunicipal Collaboration Agreements with bordering municipalities (part of revised Municipal Government Act and must be in place by April 1, 2020) as a tool to explore regional efficiencies in relation transportation, growth, and waste issues.	Results in 2.5% mode shift to transit, 5% increase in local food consumption, and 10% increase in waste diversion.	New development
24	Explore establishing redevelopment guidelines and policies in line with NPDS, which aim to encourage neighbourhoods wherein residents can live, work, play & learn.	Successful amenity retrofitting of 10% of suburban neighbourhoods results in a 10% mode shift to walking/cycling.	Existing development

Action #	Energy Reductions in 2035 (GJ)	Percentage of Total Energy Reductions	Emissions Reductions in 2035 (tCO2e)	Percentage of Total Emissions Reductions	Jobs Created	Investment (\$M)	Return (\$M)	Health Impacts	Equity Impacts
21	1,502,000	28.93%	160,000	19.91%	153	\$15.4	\$249	High	High
22	2,010,000	38.72%	196,700	24.48%	155	\$15.6	\$417	High	High
23	71,000	1.37%	77,000	9.58%	N/A	N/A	N/A	Medium	High
24	448,000	8.63%	31,000	3.86%	N/A	N/A	N/A	High	Medium
Sum	4,031,000	77.65%	464,700	57.82%	308	\$31	\$666		

Building Complete, Compact Communities Actions Emissions Reductions

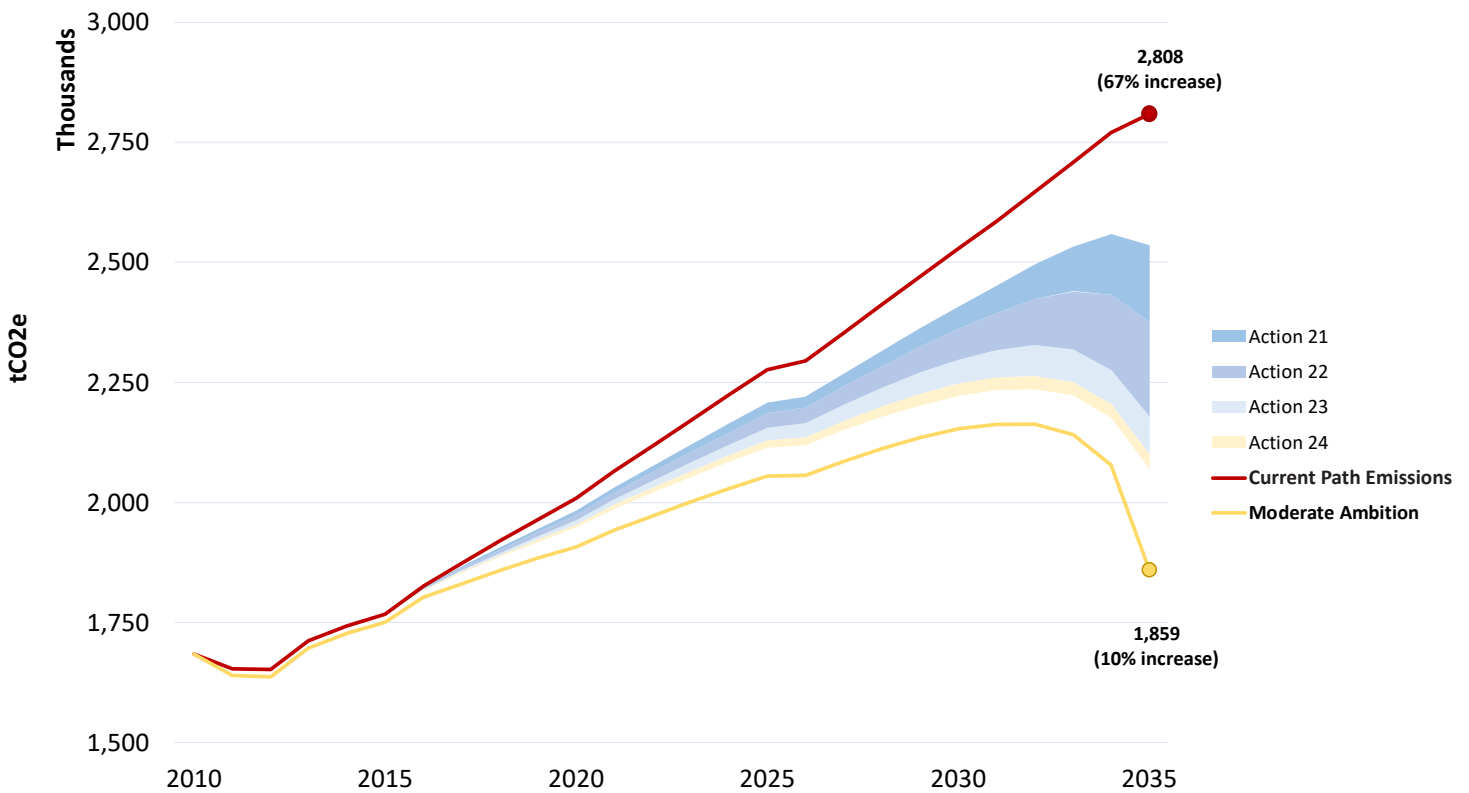


Figure 5. Building complete, compact communities actions emissions reductions to 2035

Building Complete, Compact Communities Action Outcomes

Land-use development patterns have cascading effects (i.e. mixtures of effects on buildings, transportation, infrastructure, waste, etc.) and result in locking-in transportation, energy, and other infrastructure uses for decades. They are widely recognized as one of the most important city-scale interventions in reducing GHG emissions.⁸ For example, increased population density increases the viability of district energy, enhanced transit and the likelihood that people will walk and cycle.

As evidenced by the CEEP actions modelling, a complete, compact communities approach to land-use planning can achieve great energy and emissions reductions. Mixing residential, retail, office, commercial, civic and public spaces in balanced manners, CEEP Actions 21-24 are responsible for over 75% of the total energy reductions and over half of the total emissions reductions of all CEEP actions modelled. Actions 21 and 22—which focus on redevelopment and complete neighbourhood greenfield development—together constitute 68% of the total energy reductions and 44% of the total emissions reductions achieved by all CEEP actions.

This type of land-use planning is the most cost-effective action available for reducing energy and emissions. It does not rely on expensive technologies or complex actions—it is instead a robust exercise in land-use planning. The primary energy and emissions savings result from:

- Sufficient population density to allow for frequent transit service;
- Nearby services and amenities (e.g. shopping, restaurants, grocery, entertainment, offices, community centres) that do not require car trips to access;
- Sufficient building floorspace and density to allow for district energy systems;
- An increase in shared walls between homes (e.g. in apartments and row houses), which reduces energy loss that would occur in single family homes;
- Fewer and more efficient building energy systems that serve a greater number of homes, as compared to a set of energy systems for each single family home; and
- Smaller average home sizes that consume less energy for heating, cooling, and lighting.

⁸ Seto, K. C., Dhakal, S., Bigio, A., Blanco, H., Delgado, G. C., Dewar, D. et al. (2014). Human settlements, infrastructure and spatial planning. Retrieved from <http://pure.iiasa.ac.at/11114>

Forests and Natural Spaces

Forests and natural spaces are some of the most enjoyable places in Red Deer. Preserving and enhancing them has ecological, human, and greenhouse gas emissions benefits.

Goal: Protect and Enhance Forests, Wetlands, Natural and Green Spaces

What are the impacts?

Forests, wetlands, trees, natural and green spaces all remove carbon dioxide from the atmosphere, reducing greenhouse gas emissions. They also provide areas for wildlife, enhance biodiversity and act as recreational areas.

Key action: naturescape yard

Naturescaping uses smart design and drought-tolerant plants to reduce the environmental impact of urban yards while still creating a beautiful, usable space. Naturescaping saves water, reduces maintenance and increases biodiversity.

What else can Red Deerians do?

- Leave grass clippings on the lawn
- Plant a pollinator garden
- Plant and maintain healthy trees on their property
- Install a rain garden

What's happening in the community?

- Rooftop gardens at Berry Architecture and Catholic Social Services
- ReThink Red Deer's Piper Creek Restoration Agriculture Project
- Community tree planting events
- Naturescaping courses

What has The City done to help?

- Oriole Park Naturalization Project
- Use ecological profiles to guide development
- Naturescaping standards in Land Use Bylaw
- Naturescaping contest
- O'Brien Wetlands
- Green Deer, Adopt a Park and Yellow Fish Road programs
- Distribute tree saplings to grade 1 students on Arbour Day
- Pollinator Parks

What City strategies support this?

- Municipal Development Plan 9.1, 9.6, 9.7, 9.8, 9.9, 9.11
- Neighbourhood Planning and Design Standards Principle 1: Natural Areas
- Draft Urban Forest Management Plan
- Economic Development Strategy 5.3.2 Ensure new housing is aligned with vision and guiding principles; 5.3.7 Leverage brownfields for higher-density redevelopments; 5.6.1 Create higher-density development downtown
- Environmental Master Plan actions under the Ecology focus area and around an ecology carbon capture education campaign

How else could The City support the community?

Quickest wins:

- Achieve 50-75% of total potential canopy cover for the entire city as outlined in the draft Urban Forest Management Plan
- CEEP action 25

CEEP Forest and Natural Spaces Actions

Action #	Proposed Action	Assumptions	Actions sub-category
25	Achieve 50-75% of total potential canopy cover for the entire city as outlined in the draft Urban Forest Management Plan.	Results in increasing the urban tree stock by 20%.	Increased forest cover & natural spaces

Action #	Energy Reductions in 2035 (GJ)	Percentage of Total Energy Reductions	Emissions Reductions in 2035 (tCO2e)	Percentage of Total Emissions Reductions	Jobs Created	Investment (\$M)	Return (\$M)	Health Impacts	Equity Impacts
	—	—	400	0.05%	N/A	N/A	N/A	Medium	Medium
Sum			400	0.05%					

Forests and Natural Spaces Actions Emissions Reductions

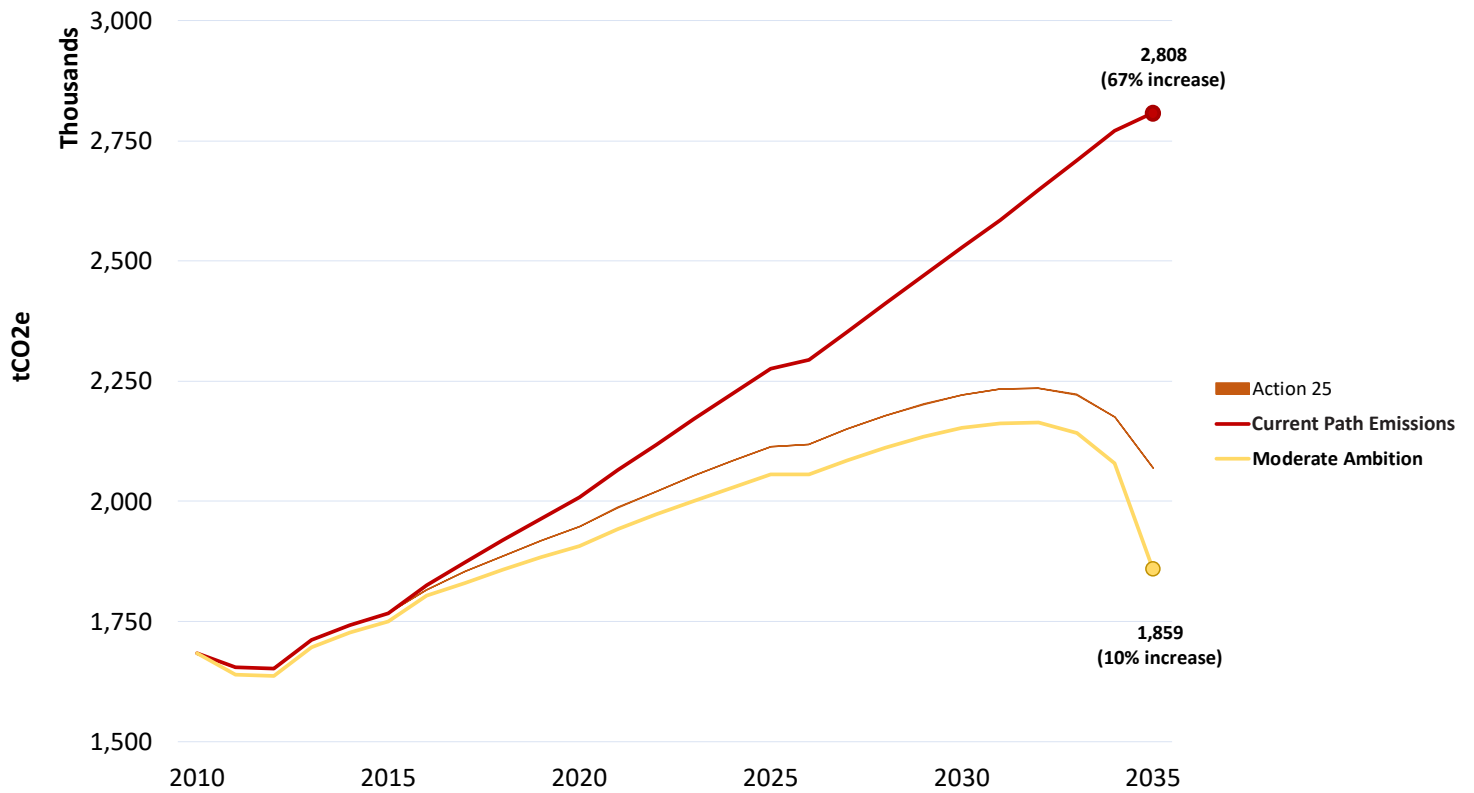


Figure 6. CEEP Forest and Natural Spaces Actions Emissions Reductions to 2035

Forests and Natural Spaces Action Outcomes

Red Deer has set a target of increasing the number of urban trees to the point that 50-75% of the total potential canopy area is covered. CEEP Action 25 estimates the effect of planting trees throughout the city. The 400 tCO₂e of GHG emissions reduced in the year 2035 would be the result of growing over 10,000 saplings for 10 years.⁹ The US Environmental Protection Agency and the Department of Energy have catalogued the carbon sequestration capacity of myriad tree species.¹⁰ This information can be used to precisely calculate the carbon sequestration of the tree species intended for planting.

A great volume of urban trees is required to reduce substantial amounts of GHG emissions. In addition to sequestering carbon, trees provide a beautiful urban aesthetic, and thermal comfort by helping to regulate the local climate and reduce the heat island effect of urban settings. The latter effect helps reduce cooling costs in the summer. Urban trees also provide animal habitat, and can produce fruit as part of a local food production program.

⁹ EPA GHG Equivalencies Calculator: <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

¹⁰ US DOE *Method for Calculating Carbon Sequestration by Trees in Urban and Suburban Settings*. April 1998. Retrieved at: <https://www3.epa.gov/climatechange/Downloads/method-calculating-carbon-sequestration-trees-urban-and-suburban-settings.pdf>

Food and Agriculture

Food production and transport can be carbon-intensive activities. Growing and eating local food contributes to the local economy while reducing emissions that result with imported food.

Goal: Eat Locally

What are the impacts?

How Red Deerians get food accounts for about 10% of Red Deer's GHG emissions.

Key action: choose local first

Red Deer has deep agricultural roots. Local producers of vegetables, honey, berries, beef, pork, poultry, eggs and more abound. By widening the definition of local by just 800 km, apples, pears, grapes and much more are also available.

What else can Red Deerians do?

- Grow a garden
- Choose food that is in season and learn to can, freeze or dehydrate it
- Take the Locavore pledge
- Go meatless one day a week
- Drink tap water
- Pay attention to where in the world food comes from and choose closest sources

What's happening in the community?

- Canadian Liberated Urban Chicken Klub (CLUCK)
- Westerner Park Urban Farm Festival
- Community Supported Agriculture
- Local public and farmers' markets
- Garden Club
- Little Green Thumbs
- Gardening/permaculture classes

What has The City done to help?

- Urban chicken bylaw
- Community garden plots
- Food forests

What City strategies support this?

- Economic Development Strategy 5.2.6 Promote and expand agribusiness
- Environmental Master Plan actions around food production and gardening

How else could The City support the community?

Quickest wins:

- Support Red Deerians by creating a food and agriculture strategy to encourage a resilient food and agriculture system that reduces food miles travelled
- CEEP action list: 26

Food and Agriculture Actions

Action #	Proposed Action	Assumptions	Actions sub-category
26	Support Red Deerians by creating a food and agriculture strategy to encourage a resilient food and agriculture system that reduces food miles travelled, and contributes to the local economy.	Results in 5% increase in local food consumption.	Local food consumption

Action #	Energy Reductions in 2035 (GJ)	Percentage of Total Energy Reductions	Emissions Reductions in 2035 (tCO2e)	Percentage of Total Emissions Reductions	Jobs Created	Investment (\$M)	Return (\$M)	Health Impacts	Equity Impacts
	—	—	66,000	8%	N/A	N/A	N/A	Medium	Medium
Sum			66,000	8%					

Food and Agriculture Actions Emissions Reductions

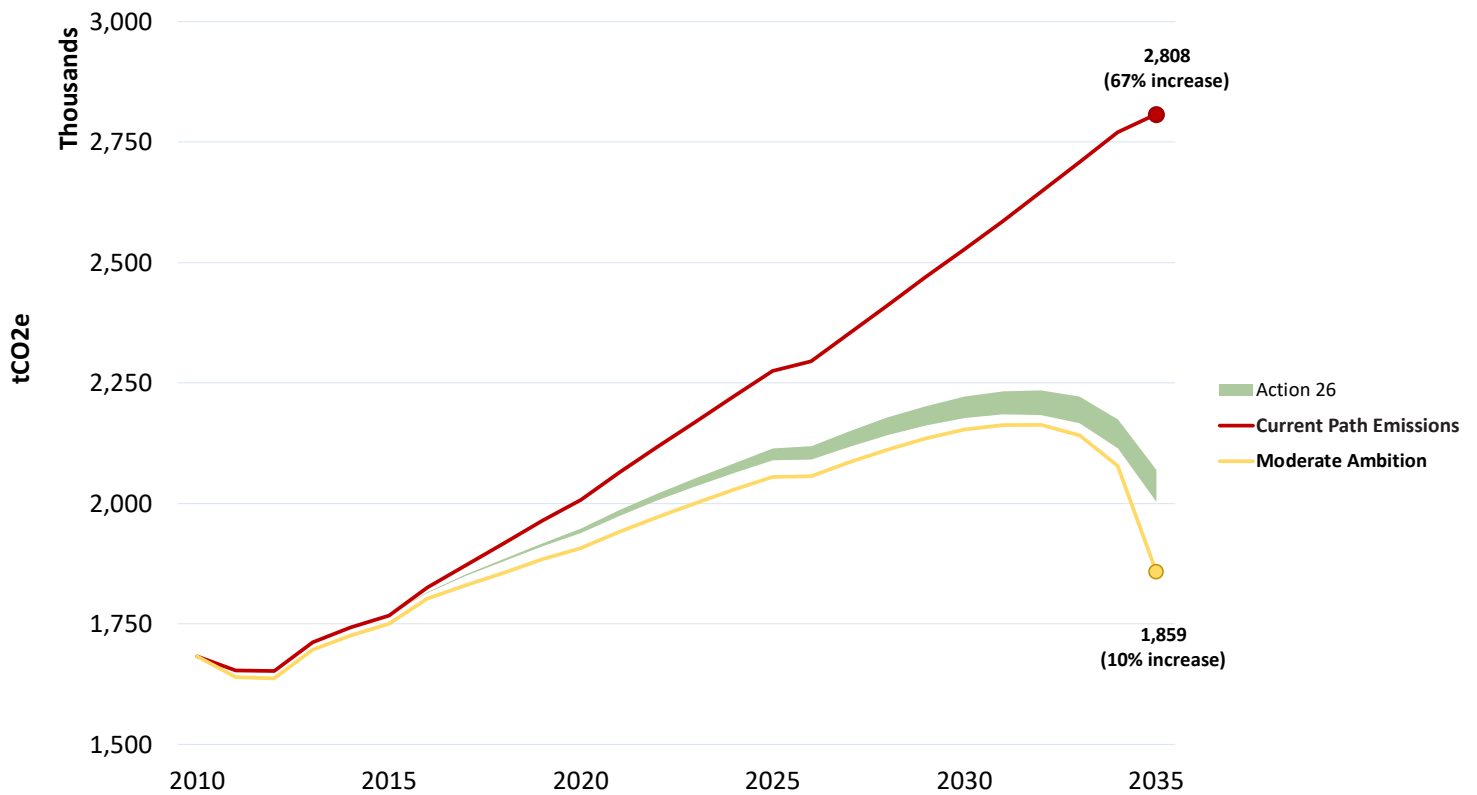


Figure 7. CEEP Food and Agriculture Actions Emissions Reductions to 2035

CEEP Food and Agriculture Action Outcomes

The last 60 years has seen the majority of Canadian food consumption shift from locally grown to imported sources. Although certain foods can be grown in more energy efficient manners elsewhere in the world (e.g. tropical fruits), their importation has large energy and emissions effects. The modelling of CEEP Action 26 demonstrates that small increases in local food production and consumption can have large emissions reduction effects. The food and agriculture modelling assumes that on average 0.13 kgCO₂e is emitted per kg of food locally produced, versus an average of 3.6 kgCO₂e per kg of imported food. Imported food is thus 28 times more carbon intensive, on average.

A host of efforts can be made to support local farming and food processors. Buy local public campaigns, business and institution procurement commitments, farmers markets, roof top and community garden programs, and community supported agriculture programs are some examples of activities that support local production and consumption of food. Health benefits to consuming locally grown food include improved respiratory function due to reduced air pollution from avoided food transport and eating food that is harvested at its peak ripeness and nutritional value. Equity benefits include saving money by growing food, access to healthy food, and decent wages for local farmers.

3. Moving Forward

Achieving the Moderate Effort Scenario Emissions Reduction Target

In April 2013 City Council adopted a greenhouse gas inventory and plan to reduce GHG emissions for The City of Red Deer as an organization. Much progress has been made, but it became clear that more community effort was needed to achieve substantive change for Red Deer as a whole. The modelled CEEP actions demonstrate that energy and emissions reductions can be made through moderate efforts. The total energy reduced from the CEEP Actions is 5,200,000 GJ for the year 2035. As compared to the projection of 21,620,000 GJ for 2035 in the Current Path scenario modelled in *Red Deer's Community Energy and Emissions Plan: Current path and options to reduce greenhouse gas emissions* (September 13, 2017), the CEEP Actions achieve a 24% decrease in energy use.

The GHG emissions reduced from the CEEP Actions total 803,650 tCO₂e. This is a 29% reduction from Current Path emissions amounts. This reduction doesn't quite reach the Moderate Effort Scenario modelled in the September 2017 CEEP report—there remains a 144,000 tCO₂e gap in 2035.

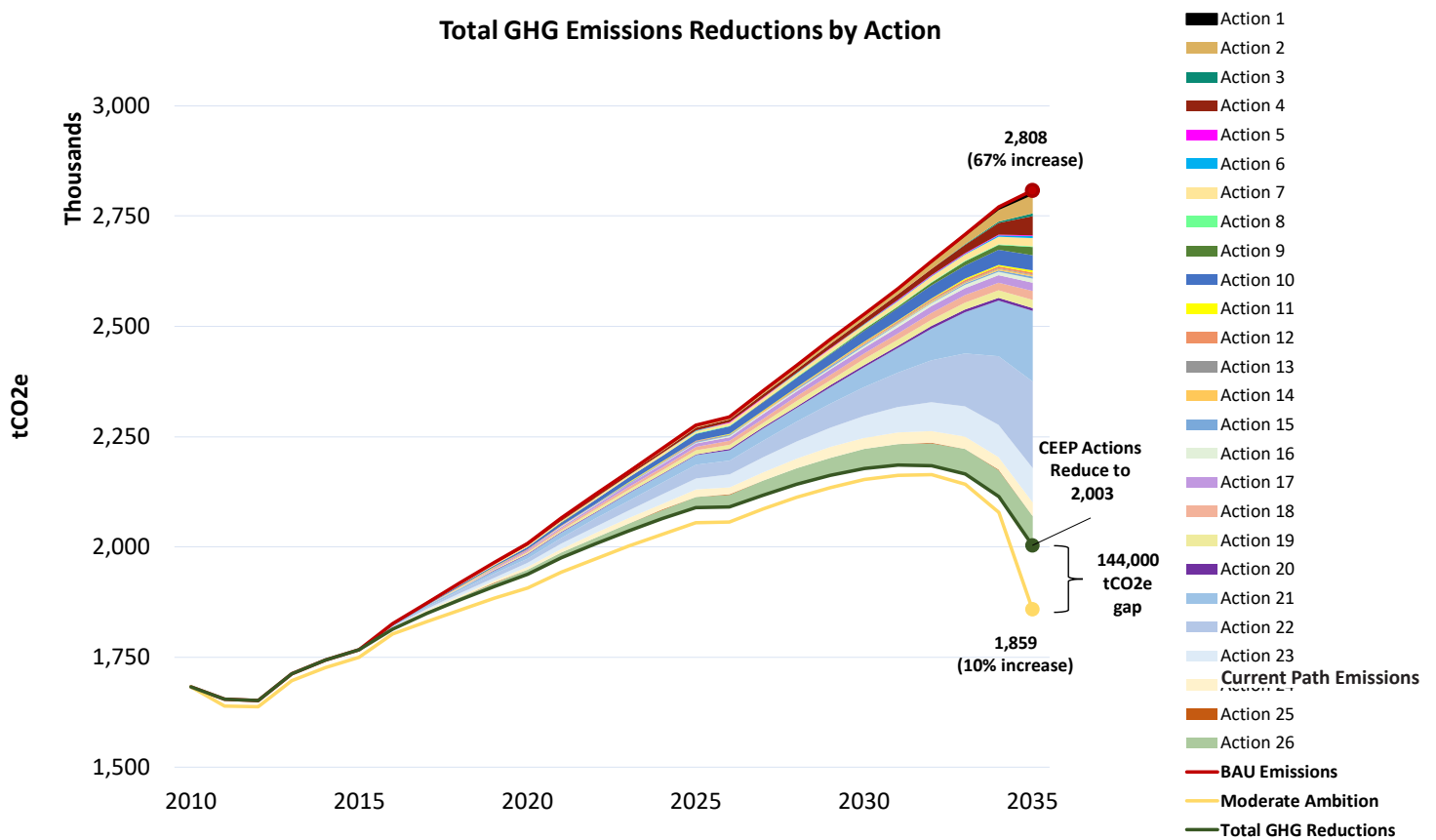


Figure 8. Total GHG Emissions Reduction by Action to 2035

Most of the CEEP Actions result in small to medium sized emissions reductions, perhaps making it seem challenging to bridge this emissions reduction gap to achieve the Moderate Effort scenario target. However, the actions that achieve the greatest reductions also happen to be the most cost-effective and/or result in returns on investment that recoup up front costs over the long run. The emissions reduction gap could easily be bridged by any or all of the following actions:

- Increasing existing City building energy efficiency from 10% to 30% for all buildings;
- Increasing existing residential building energy efficiency targets from 10% to 20%;
- Installing 3 times the modelled renewable energy; and/or
- Increasing the floorspace targets in building compact, complete communities by 5% or more.

Achieving the Ambitious Effort Scenario Emissions Reduction Target

Red Deer's Current Path scenario will see the city's emissions increase by 67% by 2035. The Moderate Effort scenario has a target of limiting increased emissions to 10% over 2010 levels by 2035. The Ambitious Effort scenario has a target of decreasing Red Deer's emissions by 50% under 2010 levels by 2035, which is in-line with global climate change experts' opinion on safe emissions levels.

Modelling the CEEP Actions reveals the magnitude of achieving the Ambitious Effort scenario emissions reduction target. As buildings are the largest energy user and the majority of the energy used in buildings creates large volumes of GHG emissions, they must be the priority target for energy and emissions actions. Increasing the energy efficiency of existing buildings and ensuring that new buildings are exemplary in their energy performance are critical actions.

Installing renewable energy is also a critical action. Setting and achieving a target of 100% renewable energy would plunge emissions levels by 20% under 2010 levels—almost halfway to the Ambitious Effort target of -50%.

The third critical action is to change the way Red Deer develops and uses land. Expanding forever outwards will lock the city into a high energy consumption and emissions production path.

To achieve the Ambitious Effort scenario emissions reduction target would take significant effort, requiring major changes to Red Deer's energy production and use, and to the cities' land-use pattern. It can be done, but a concerted effort would be required.

The Costs of Inaction

The modelled CEEP Actions demonstrate the magnitude Red Deer's challenge in reducing energy use and GHG emissions production. As a growing city whose development pattern is trending outwards from the city core, the challenge to reduce energy use and emissions will continue to increase .

The costs of inaction are predicted to increase exponentially. As the atmospheric concentration of carbon increases, extreme weather event frequency and severity are projected to increase, resulting in increased damage to homes and city infrastructure. Weather fluctuations are expected to increase as well, making repeated brief freeze-thaw cycles more common and resulting in more common cold snaps in late spring months, creating hazards for infrastructure and crops. The costs of rebuilding and creating infrastructure in response to climate impacts is significantly higher than the costs of taking action now.¹¹ As demonstrated by modelling the CEEP Actions, many climate change preventative actions are low cost.

Furthermore, Red Deerians will not fully realize the many co-benefits of energy and emissions actions such as decreased obesity rates, hospital trips, traffic accident injuries, money spent on home energy, time spent in traffic, car related expenses, a less noisy city, municipal expenditures, and energy poverty.

¹¹ *The costs of climate change are rising.* Globe and Mail, May 15, 2018. <https://www.theglobeandmail.com/business/commentary/article-the-costs-of-climate-change-are-rising/>

Integration and Implementation

Many of the CEEP Actions are related (e.g. building compact, complete communities and increasing transit frequency; increasing population density and installing district energy systems) and should be implemented together. Also, considering the implementation timing and effects of certain actions alongside others is important. For example, determining the effects of increased building energy efficiency in a neighbourhood affects the decision as to proceed with installation of a district energy system. If the buildings can be made energy efficient at reasonable cost, the need for a district energy system may be precluded. Another example is the encouragement and incentivizing of electric vehicle purchases. At current electricity grid emissions factors, the addition of EVs is not as beneficial as it will be when more electricity is generated from renewable and alternative sources.

Thoroughly considering the development of compact, complete communities is an effective way to coordinate energy and emissions actions for particular areas of the city, as there are many energy and emissions related decisions to be made in planning new or redeveloped neighbourhoods. This will require the coordination of all parties involved and affected, including most City departments. Awareness by multiple departments of the considerations required to achieve compact complete communities—and for other CEEP Actions as well—will increase the likelihood of success while reducing the likelihood of conflict and actions redundancy.

Measuring Success

Red Deer's Environmental Master Plan sets out targets and indicators of success in The City's endeavour to be a better steward of the environment. Following this example, indicators and measurement intervals should be developed for CEEP Actions. Annual reports on energy and emissions reductions will help Red Deer track its progress and become increasingly effective in its efforts. As with other plans that have originated from the EMP, reporting on energy and emissions reductions should be incorporated into the EMP Annual Report to help Red Deer track its progress and become increasingly effective in its efforts.

Next Steps

The goals within this plan set forth an opportunity for Red Deer, as a community, to take action to protect the environment into the future. The degree of implementation and success will depend on the resources allocated to each individual action by all levels of government and the community, and the willingness of the community to shift behaviour. The CEEP can serve as a climate lens to be applied to City decision-making, helping to achieve positive environmental, social, and economic outcomes with each City action taken.

