AGEN

Alberta Green Economy Network

Recommendations

SUBMISSION TO

The Climate Change Advisory Panel

2015

The Alberta Green Economy Network recognizes, acknowledges, and honours:

- The Treaty Six, Treaty Seven, and Treaty Eight Territories.
- The full participation of the indigenous peoples and elders, as key expert knowledge holders.
- The knowledge of elders regarding how to conduct ourselves responsibly on these lands in accordance with the four natural laws upon which all life depends: Land, Air, Water, Sun/Fire.

The Alberta Green Economy Network further recognizes that the knowledge of elders is expert knowledge gained after thousands of years. We therefore regard elders as experts in their field and as the first stewards of these lands. Their knowledge informs our sense of responsibility to ensure that we return this land in the condition that we borrowed it from future generations, with the goal of returning it better than we found it.

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Executive Summary

The Alberta Green Economy Network (AGEN) is an alliance of green businesses, First Nations/Métis/Inuit (FNMI), NGOs, unions and individuals promoting a diversified, low carbon green economy for Alberta. This document outlines concrete proposals for Alberta's Climate Change Advisory Panel and the Government of Alberta on how to achieve this goal:

- 20% renewable electricity production by 2020, with a minimum of 800 megawatts (MW) of solar electricity (PV) in the mix.
- An economy-wide increase of energy efficiency of 6.6% by 2020
- Provide preferred access to energy efficiency retrofits and renewable energy installations to rural communities, cooperatives, low-income families and FNMI organizations.
- Green the operations of Government of Alberta (including green supply chain and net zero/zero carbon standard for all new government buildings).
- Phase out most coal-fired electricity production by 2020, 100% by 2025.
- Put a price on carbon ($50/t CO2e by 2017, with an additional $10/t every year after until $150/t is reached).
- These measures are estimated to cost $6.2B over 5 years, with estimated energy savings of $11.2B for end users, and annual GHG emission reductions of 26.6 Mt CO2e by 2020 (10% of 2013 emissions), or 36% of the Government of Canada target of 17% reductions of 2005 emission levels by 2020. These measures will produce an estimated 271,500 new job years.

POLICY	GHG Reduction (Mt)	End User Savings ($B)	Cost ($B)	Green Jobs (/annum)	Green Jobs (5 yrs)
RENEWABLE ENERGY	9.2	-	0.9	8,600	43,000
ENERGY EFFICIENCY	17.4	11.2	5.3	46,000	230,000
COAL PHASE OUT	*	-	-	-300	-1,500
CARBON PRICING	-	-	-	-	-
TRANSPORTATION	TBD	-	-	-	-
TOTAL	**26.6**	**11.2**	**6.2**	**54,300**	**271,500**

* **NOTE** coal phase-out = 17.85 Mt CO2e emission reduction/annum. Replaced by renewables (9.2 Mt) and electrical portion of efficiency (8.65 Mt). Coal-phase out emission reduction not shown in table to avoid double counting.

Introduction

The ground has shifted before our feet. The option of transitioning from a carbon-based, extractive economy to a sustainable, resilient one has become a social and economic imperative. The Alberta Government faces significant challenge in diversifying our economy away from fossil fuel industries that offer well-paying jobs and incomes that have been the envy of Canadians. The Green Economy Network (AGEN) is committed to assisting the Alberta Government in addressing this challenge and helping lay out a path to a greener, prosperous and more equitable future for Albertans.

The Green Economy Network brings together trade unions, Metis and First Nations, environmental organizations, academics and green businesses. Although we represent different constituents, we have come to understand that the multiple challenges we face as Albertans are interconnected and, as such, the path forward must address the concerns of workers, communities, and businesses that share our natural environment.

We envision a resilient, diversified economy that provides a high quality of life and creates the foundation for a low-carbon energy future. Our mission is to accelerate a just transition to a green and fair economy.

When Rachel Notley attends the Paris conference, we hope that she will announce policies and targets that put Alberta on a new footing. We would be proud of a government that builds an economy based on a better quality of life for all and respects the ecological limits of the planet. With this in mind, the AGEN calls on the Notley government to adopt binding emissions targets and address five key focus areas: renewable energy, energy efficiency, coal phase out, carbon pricing and transportation.

If AGEN's recommendations are adopted, the Alberta Advantage will come to include:

- reduced CO2 emissions;
- significant job creation;
- equitable access to green jobs for First Nations and Metis communities;
- the leveraging of massive private investment, and
- the localization of Alberta's energy production.

Recommendations

Renewable Energy

We recommend that the Government of Alberta:

1. **Commit to having 100% of its electricity come from renewable sources (wind, solar, etc) by 2050. Further to this goal, we recommend setting the following interim targets:**

   1.1 That 40% of Alberta's electricity come from renewable sources by 2030

   1.2 That 20% of Alberta's electricity come from renewable sources by 2020 with at least 800 megawatts coming from solar, enough to power over 133,000 homes.

2. **Provide dedicated support to First Nations, Metis, rural and community cooperatives to install and utilize renewable energy.**

   2.1 Modify Alberta's Microgeneration regulation to allow producers of renewable energy to install larger systems and sell more of the electricity that is generated. This would increase the portion of renewable energy on the grid from small producers.

   2.2. Enable First Nations to sell power into Alberta's grid and repeal legislative barriers that presently prevent them from doing so.

3. **Create a smart grid with dynamic pricing allowing all Albertans to participate in the spot price market and to support the deployment of nondispatchable renewables ("renewablefriendly grid").**

COST
$ 900 million
(cumulative to 2020)

BENEFITS
CO2e reduction/annum
9.2 Mt CO2e (2020)

JOBS CREATED
8,600 FTE
43,000 FTE (over 5 years)

Energy Efficiency

We recommend that the Government of Alberta:

4. **Achieve a 6.6% increase in energy efficiency in Alberta by 2020 through an energy efficiency retrofit fund.**

   4.1 Transform CCEMC/Climate Change Central into: a 1% interest clean technology retrofit loan and grant fund (40% residential, 25% commercial/municipal, 25% industrial/agricultural/forestry, 5% low income support, 5% research).

5. **Support municipal efforts at Greenhouse Gas (GHG) emission reductions through legislation (e.g. PACE, city charters) and funding.**

6. **Support rural municipalities and partner with First Nations and Metis communities to make investments in GHG emissions reduction through energy efficiency.**

7. **Provide provincial climate leadership by reducing its own carbon footprint (eg, zero carbon government buildings, gren supply chain, green operations).**

COST
$5.3B

BENEFITS
CO2e reduction/annum
17.4 Mt (2020)
174 Mt over retrofit life cycle; $31.2 $/tonne CO2e capital cost, or a net cost of $16.4 when including savings

JOBS CREATED
230,400 FTE
46,000/a (over 5 years)

ENERGY SAVINGS
$11.2B

COST
$0
Precedent in other jurisdictions suggests taxpayers will not have to bear compensatory costs for coal plant closure.

BENEFITS
CO_2e reduction/annum (2020 and every year after)
17.85 Mt CO_2e
These benefits are not counted separately from energy efficiency improvements and the introduction of renewables to avoid double counting.

JOBS CREATED
Minus 300 FTE
Minus 1,500 FTE (over 5 years)

Coal Phase-out

We recommend that the Government of Alberta:

8. **Enable an orderly phase out of coal fired power by 2025, with the vast majority of plants closing by 2020.**

   8.1. Every effort should be made to transition from coal directly to renewables, avoiding the use of natural gas.

COST
While revenue projections are not presently available, at a price in excess of $50/tonne revenues from the carbon tax would exceed the requirements of the investments proposed in the costed recommendations.

Carbon Pricing

We recommend that the Government of Alberta:

9. **Replace Alberta's failed SGER approach to climate management which has not resulted in any absolute reduction in emissions.**

10. **Apply an economy-wide carbon tax that applies to all measureable sources of emissions, rather than a cap-and-trade system carbon pricing policy**

    10.1. The tax should be applied on 100 percent of emissions across all sectors of the economy, starting at fifty dollars per tonne of carbon dioxide in 2016 and escalating by ten dollars per year to one hundred and fifty dollars per tonne in 2026.

    10.2. The tax must be progressive, with sufficient rebate mechanisms to ensure that it does not disproportionately affect low income households.

    10.3 Government income accruing from the tax should not be directed towards general revenues, but rather into funds designated for investments in renewable technology, energy efficiency and transportation infrastructure as specified in these recommendations.

Transportation

We recommend that the Government of Alberta:

11. **Ensure that Alberta invests in creating the infrastructure to support electric vehicles (EVs) throughout the province, including in rural communities and in partnership with First Nations and Metis governments.**

    11.1. Set a target for EV use in Alberta and create a plan to convert the government's fleet to electric and plugin hybrid electric vehicles.

12. **Increase funding to cities and rural municipalities for walking and bicycle infrastructure, including dedicated support to single-use transportation alternatives for rural, First Nations and Metis communities.**

13. **Provide increased, stable and predictable funding to urban municipalities as well as First Nations, Metis and rural communities to invest in public transit infrastructure and operations, beyond what is currently planned within the funding allocations for the Municipal Sustainability Initiative and intended rural bus service initiative.**

COST & BENEFIT
projections are not presently available for transportation investments and they have not been included in our accounting of total costs and benefits for the entire set of recommendations.

About Us

AGEN Alberta Green Economy Network

VISION

To accelerate the transition to a green, just, and low carbon economy within the ecological limits of the planet.

VALUES

- We acknowledge we are on First Nations traditional territory. All are Treaty Peoples. We have a shared obligation to uphold the spirit and intent of the Treaties by being responsible stewards of the planet and respectful of the rights of all First Nations, Metis and Inuit people.
- We acknowledge and value the different strengths and assets we bring.
- We work cooperatively to reach our common goals and protect the public interest.
- We work in a spirit of cooperation and mutual respect.
- We work with hope to bring about a just transition that will benefit not only our generation but the next one as well.

AGEN TEAM

GOALS

- Help transition Alberta to a low carbon economy by developing, and pushing for government policies that support the adoption of renewable energy, energy efficiency, mass transit, and the reduction of greenhouse gas (GHG) emissions.
- Develop credible low carbon economic strategies.
- Mobilize public support for policies that support the adoption of renewable energy, energy efficiency, mass transit and GHG emission reductions.
- Articulate the type of, and potential for green, union and non-unionized jobs in Alberta.
- Become a respected and effective advocate for a sustainable environment.

AGEN

Backgrounders; Policy Documents

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Renewable Energy

Executive Summary:

We recommend that the Government of Alberta,

Commit to having 100% of its electricity come from renewable sources (wind, solar, etc) by 2050. Further to this goal, we recommend setting the following interim targets:

- 40% of Alberta's electricity come from renewable sources by 2030
- 20% of Alberta's electricity come from renewable sources by 2020 with at least 800 megawatts coming from solar, enough to power over 133,000 homes.
- Provide dedicated support to First Nations, Metis, rural and community cooperatives to install and utilize renewable energy.
- Modify Alberta's Micro-generation regulation to allow producers of renewable energy to install larger systems and sell more of the electricity that is generated. This would increase the portion of renewable energy on the grid from small producers.
- Enable First Nations to sell power into Alberta's grid and repeal legislative barriers that presently prevent them from doing so.
- Create a smart grid with dynamic pricing that allows all Albertans to participate in the spot price market and to support the deployment of non-dispatchable renewables ("renewable-friendly grid").

BENEFITS:

CO2e reduction/annum (in 2020): 9.2 Mt CO2e.

JOBS CREATED:

8600 FTE/year, 43,000 FTE over 5 years

COSTS:

Approximately $ 900 million (cumulative to 2020)

Renewable Energy Targets:

At the end of 2014, hydroelectric and wind generation sources accounted for 15.4% of installed capacity in Alberta and contributed 6.6% of Alberta's electricity generation for that year. Other renewable energy technologies did not generate a significant portion of Alberta's electricity at that time. Building on this baseline, we recommend the following targets to guide Alberta's transition to renewable electricity generation:

In line with the Alberta Renewable Energy Alliance's (AREA) recommendations, we recommend a target of 800 Megawatts (MW) installed capacity of solar photovoltaics (PV) to help meet this goal. This would be equivalent to 133,000 homes each fully powered by a 6-kilowatt solar PV array.

Also in line with AREA, we recommend a target of 200 MW of electrical storage capacity. This will help to mitigate the intermittent availability of some renewable energy resources.

The installation of 33 MW of deep geothermal electricity generation capacity may also be possible to help meet this target. To develop and justify a map of how to get to our 2020, 2030, 2050 geothermal targets would cost an estimated $500k - 625k over three years. However, it must also be noted that some First Nations partners have indicated strong opposition to the development of geothermal generation.

We recommend an additional 2,000 MW of wind generation capacity. Although the Alberta Electrical System Operator's (AESO's) Planned In Service Date reports that Alberta is expected to exceed this target before 2020; we are in support of this development

If renewable energy capacity of 3200 additional MW is installed by 2020 an investment opportunity of approximately $7.5 Billion will be created; and more than 40,000 new jobs will be created. The following table, developed by AREA, provides a further breakdown.

Table 1: Investment opportunities and job creation associated with investments in renewable.

TECHNOLOGYTO BE ADDED	Capacity (MW)	Capacity Factor	Annual Generation in Year 2020 (TWh/year)	Unit Cost ($ / kW)	Investment in Alberta	New Jobs
Wind	2,000	35%	6.1	$2,000	$4,000,000,000	19,600
Solar	800	16%	1.1	$2,500	$2,000,000,000	14,400
Geothermal	30	85%	0.2	$5,000	$150,000,000	390
Bioenergy	150	60%	0.8	$4,000	$600,000,000	5,100
Small Hydro	50	35%	0.2	$5,000	$250,000,000	575
Energy Storage	200	20%	0.4	$2,500	$500,000,000	3,050
TOTAL	3,230		8.8		$7,500,000,000	43,115

- 40% renewable electricity generation in the province of Alberta by 2030.
- 100% renewable electricity generation in the province of Alberta by 2050.

Post 2019, following the closure of older coal units, combined-cycle gas turbines (CCGTs) currently in the AESO queue would assist in firming grid reliability. However, the Planned ISDs (Industrial System Designation. i.e, facilities providing power for industrial applications.) should be carefully reviewed given the anticipated lessening in electricity demand. As well, no new CCGTs should be deployed post 2019 as this action would detract from the advancement of renewable generation.

Policies to Support Renewable Energy

In order to meet Alberta's renewable energy targets, we recommend that Alberta develop policies that provide targeted support for the implementation of renewable energy technologies. In particular, policies that support the ability of indigenous and rural communities to invest in renewable energy systems will help ensure the delivery of social outcomes alongside environmental performance. We recommend that Alberta develop policy in the following areas to support the accelerated deployment of renewable energy technologies in Alberta:

Energy Storage

Some renewable energy resources, such as wind and solar, are only available intermittently. This can sometimes create problems in the electricity grid since electricity generated from these sources is not directly dispatchable. As we phase out coal generation in Alberta, energy storage technologies will play an important role in ensuring a stable transition to renewable energy.

Alberta is uniquely positioned to take a leadership role in the development and implementation of energy storage technologies. The province's friendly investment climate, deregulated electricity generation sector, and demonstrated capacity for technological innovation and deployment provide an excellent foundation for this shift. What has been missing, however, is a vision from the Government of Alberta to guide the change and policies to support it. California is leading the United States in this regard, having legislated that 1,330 MW of energy storage capacity must be in place by 2020.

Offer electric car owners an electric tariff that includes slightly higher day-time rates and lower night-time rates

BENEFITS
Electric car owners save money overall on their electric bills by plugging in at night

Political support for energy storage in Alberta would provide much-needed leadership to research and deploy technologies of pumped hydro, batteries, flywheels, flow cells, compressed air energy storage, and other devices. Energy storage initiatives could take place at the grid-level scale, or on a smaller scale, distributed in homes throughout Alberta.

Intermittent renewable energy sources pair well with hydroelectricity generation; hydroelectric facilities can essentially serve as a large battery for sources such as wind and solar. Although Alberta does not have a large hydroelectric capacity, our neighbouring province has tremendous hydro resources. Improving the intertie with British Columbia would increase our ability to store intermittent renewable energy and make it more dispatchable.

Smart Grid with dynamic Pricing

Some renewables (wind, solar) have irregular production schedules (i.e. they are "non-dispatchable"). Energy storage is one way to deal with this, once the renewable energy portion of the grid becomes very large. Another option is to affect grid demand, by shutting down non-essential energy users temporarily when insufficient grid supply exists. Large producers in Alberta are already being billed for their single highest monthly total demand (peak demand). However, the current metering system for most commercial users is not responsive to Alberta-wide peak demand.

Two-way communication between AESO (Alberta's electrical grid regulator) and end-users would permit a response from the end user to grid peaks. For example, some California utilities offer electric car owners an electric tariff that includes slightly higher day-time rates and lower night-time rates. This way, electric car owners save money overall on their electric bills by plugging in at night, while utilities save money by not having to provide expensive electricity during day-time peaks. This kind of beneficial arrangement requires meters that are capable of determining the time of use of each Wh consumed (smart meters). Smart meters are also capable of alerting end-users to particular peak demands, and allowing users to respond directly to unexpected peaks. A tariff that rewards users for this behaviour can be beneficial to both the grid and the end user (dynamic pricing).

A smart grid, capable of integrating decentralized electrical generation and increased responsiveness is widely regarded as an approach to a grid that is more reliable and allows better integration of renewable energy (it has greater "renewable friendliness") . We therefore recommend the creation of a smart grid with time-of use and/or dynamic pricing that allows all Albertans to participate in the spot price market and to support the deployment of non-dispatchable renewables (a renewable-friendly grid).

Grid Access for small Producers in Indigenous and Rural Communities

- Inherent in these recommendations is the recognition that renewable energy projects provide benefits far beyond the generation of electricity. At a household or community level, technologies like solar PV and wind generation provide cascading benefits, including environmental education, improved energy literacy and conservation, better health through improved air quality, as well as financial savings and/or revenue generation. Moreover, the suitability of renewables for small-scale production allows indigenous and rural communities to participate in electricity generation. Accordingly, we recommend that Alberta explore the policy options outlined below to increase renewable energy access for indigenous and rural communities:

- Alberta's Micro-Generation Regulation, under the Electric Utilities Act, restricts each applicant to only install enough capacity to produce the electricity that is used on-site. Relaxing this restriction would allow participants to install larger renewable energy systems and sell more of the electricity that is generated, increasing the proportion of renewables on the grid. We recommend that this option be made available to all Albertans.

- Provision of grant funding would help to encourage initial investment in renewable energy systems and accelerate the deployment of these technologies. As the industries gain momentum, this grant funding could be scaled back.

- Ensuring that Albertans receive a fair price for the renewable energy they produce would make projects more financially viable and increase investment.

- Pass enabling legislation to allow municipalities and communities to negotiate power-purchase agreements with small renewable energy generators.

Renewables for small-scale production allows indigenous and rural communities to participate in electricity generation

BENEFITS
Improved energy literacy and air quality, as well as financial savings and/or revenue generation.

Economic Viability

Renewable energy technologies typically require a large expenditure of up front capital. Because of this characteristic of renewable energy projects, investment is unlikely without reasonable access to capital and a fair return for the investment.

In light of this, we have suggested a potential fiscal framework for stimulus investment in renewables. The stimulus requirements are based on the difference between the AESO pool price in 2014 and the price required to achieve simple payback in ten years, as set out in Table 2.

	MW	Cap factor	Annual generation MWh/yr	Generation over 10 years (MWh)	Unit cost ($/MW)		Price to achieve simple payback in 10 years ($/MWh)
wind	1	35%	3,066	30,660	$2,000,000	$2,000,000	$ 65
solar	1	16%	1,402	14,016	$2,500,000	$2,500,000	$ 178
geothermal	1	85%	7,446	74,460	$5,000,000	$5,000,000	$ 67
bioenergy	1	60%	5,256	52,560	$4,000,000	$4,000,000	$ 76
small hydro	1	35%	3,066	30,660	$5,000,000	$5,000,000	$ 163
energy storage	1	20%	1,752	17,520	$2,500,000	$2,500,000	$ 143

Table 2: Comparative prices required to achieve payback in ten years for various forms of renewable power generation.

The price required to achieve a ten-year simple payback as set out in Table 2 is consistently higher than the average AESo pool price in 2014. Based on the additional investment required to fill this gap, an estimation of government stimulus requirements can be made as seen in Table 3 below. To calculate this estimate, we draw on the MW of additional renewables as proposed in Table 1.

	MW	Cap factor	Annual generation MWh/yr	Generation over 10 years (MWh)	Unit cost ($/MW)		Price to achieve simple payback in 10 years ($/MWh)
wind	1	35%	3,066	30,660	$2,000,000	$2,000,000	$ 65
solar	1	16%	1,402	14,016	$2,500,000	$2,500,000	$ 178
geothermal	1	85%	7,446	74,460	$5,000,000	$5,000,000	$ 67
bioenergy	1	60%	5,256	52,560	$4,000,000	$4,000,000	$ 76
small hydro	1	35%	3,066	30,660	$5,000,000	$5,000,000	$ 163
energy storage	1	20%	1,752	17,520	$2,500,000	$2,500,000	$ 143

Table 3: Stimulus investments required for large producers (annually in 2020) to give a price consistent with ten year simple payback (notes: 1. average grid pricing only provides a general guideline to incentives required for each source of renewable energy production depending on time of production. 2. lower incentives would be required for small producers who fall under Alberta micro-generation regulations).

As per table 3, the annual stimulus investment requirement for all renewables in 2020 will be about 283 million dollars per year in 2020. In our fiscal framework, this level of investment would then need to be maintained for the next six years to achieve ten-year payback (assuming investment starts in 2016). The cumulative cost to 2020, assuming a linear build-up in equal increments over five years, would be approximately 850 million dollars.

	Renewable Incentive ($)	
year 1 (2016)	56,625,112	
year 2 (2017)	113,250,224	
year 3 (2018)	169,875,336	
year 4 (2019)	226,500,449	
year 5 (2020)	283,125,561	
5 year total	849,376,682	

The investment requirements presented here are order of magnitude estimates and it is important to acknowledge their limitations. For example, we take the cost per megawatt for renewables at the current price point. This cost may in fact come down as technology advances over the five year period in question. Moreover, the AESO pool price upon which these estimates are based is liable to fluctuate, as evidenced by the 40% drop from 2013 to 2014. Lastly, the present discounted value of the proposed government investment would be lower than the capital cost of installation. Other factors, such as inflation, are unlikely to be significant in comparison with these effects.

Despite the foregoing disclaimer, it is critical to note that the revenue tools we have proposed (see Recommendation 9) would be an order of magnitude in excess of the total investment requirements for renewables and considerably larger than total cost of all investments (ie including energy efficiency) we have proposed.

Renewable Energy Working Group

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Energy Efficiency

Executive Summary

We recommend that the Government of Alberta:

- Achieve a 6.6% increase in energy efficiency in Alberta by 2020 through an energy efficiency retrofit fund.
- This fund can be created by transforming the CCEMC/ Climate Change Central into a 1% interest clean technology retrofit loan and grant fund (40% residential, 25% commercial/municipal, 25% industrial/agricultural/forestry, 5% low income support, 5% research).
- Support municipal efforts at Greenhouse Gas (GHG) emission reductions through legislation (e.g. PACE, city charters) and funding.
- Support rural municipalities and partner with First Nations and Metis communities to make investments in GHG emissions reduction through energy efficiency.
- Reduce its own carbon footprint by providing provincial climate leadership e.g. zero carbon government buildings, green supply chain, green operations).

BENEFITS

CO2e reduction/annum (2020): 17.4 Mt (estimated 174 Mt over retrofit life cycle; $31.2 $/tonne CO2e capital cost, or a net cost of -$16.4 when including savings)

JOBS CREATED:

230,400 job years by 2020 (46,000 per annum over 5 years)

ENERGY SAVINGS:

$11.2 B (over the course of the retrofits' life)

COSTS

$5.3 B (Paid for out of carbon pricing fund of $1.06B/annum over 5 fiscal years)

Energy Efficiency Target

The International Energy Agency has identified energy efficiency as the biggest opportunity globally for reducing greenhouse gas (GHG) emissions between now and 2020.[1] Moreover, Energy efficiency has very high job creation potential. The Canadian Energy and Mines Ministers estimate job creation at 30-57 job years/$million invested in efficiency.[2] We therefore recommend the following targets to encourage improvements in energy efficiency:

A 6.6% Increase in Energy Efficiency by 2020

- The Government of Alberta set a target of a 6.6% increase in Energy Efficiency by 2020. This goal is consistent with projected overall efficiency gains to be achieved by 2050 (e.g. RMI.org).
- To achieve this goal, a fund (described below) should be created to focus on energy efficiency investments, but also include other measures with high carbon return on investment, including renewable energy, waste management, and forestry and agricultural practices.

Policies to support Energy Efficiency

The policies outlined below describe how Alberta can achieve a 6.6% increase in energy efficiency.

Transform CCEMC/Climate Change Central into Energy Efficiency Fund

- We propose the Alberta government transform the Climate Change and Emissions Management Corporation (CCEMC) and re-fund Climate Change Central (CCC) to administer a large GHG reducing revolving loan fund and grant program, with a focus on energy efficiency, as well as other measures with a high carbon reduction return on investment. Residential programs should be administered by CCC, others by CCEMC.

CCEMC currently administers GHG reduction programs for the province, with an annual revenue of approximately $68.4 M, of which $9.1 M are used for administration.[3] The fund had $286.1 M at its disposal in May 31, 2014. Based on the Government of Alberta June 2015 announcements (carbon levy of $30/t CO2e on 20% of large emitter emissions by 2017), the fund should accumulate an estimated additional $1.09 B by 2020, for a total fund currently earmarked for CCEMC of $1.37

Abbreviations:

B = billion

M = Million

Mt = mega-tonne

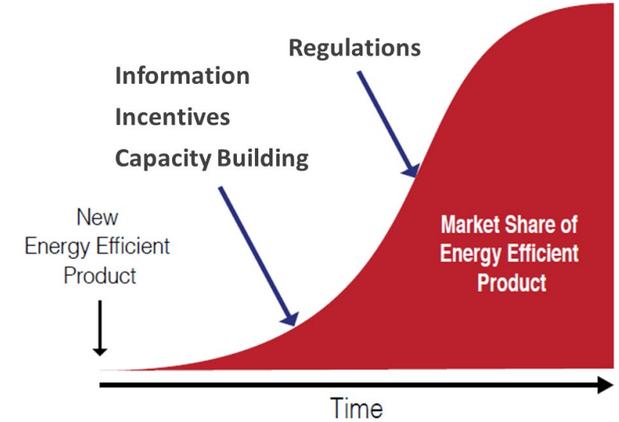
CO2e = carbon dioxide equivalent global warming potential over a 100-year horizon (IPCC)

1 International Energy Agency. 2014. *Global energy efficiency market 'an invisible powerhouse' worth at least USD 310 billion per year.* http://www.iea.org/newsroomandevents/pressreleases/2014/october/global-energy-efficiency-market-an-invisible-powerhouse-at-least-usd-310byr.html . Also see: McKinsey & Company. 2009. Pathways to a Low-Carbon Economy: Version 2 of the Global Greenhouse Gas Abatement Cost Curve. McKinsey & Company, New York.

2 nrcan.gc.ca/sites/www.nrcan.gc.ca/files/www/pdf/publications/emmc/14-0176_Energy%20Efficiency%20Update%202014_e.pdf

3 http://ccemc.ca/_uploads/2011-2014-Business-Plan-Final.pdf

- AGEN proposes that the Alberta government top up this fund with an annual amount of $785.2 M, for a total fund of $5.3 billion by 2020.
- The moneys would be used as follows: revolving, 1% interest energy efficiency and clean tech retrofit fund and/or grants: 40% residential, 25% commercial/municipal, 25% industrial/agricultural/forestry), 5% social housing and low income, 5% Alberta efficiency/clean tech research (academic/commercial).
- Making a large portion of the fund available to Alberta families for residential retrofits is justified as Alberta families pay most of Alberta's income tax, and should benefit from resource royalties accrued from resources owned by Albertans. For example, at an average utilization rate of the funds at $10,000 per family, 212,000 Alberta families or approximately 549,000 Albertans willing to commit to GHG reducing retrofits would directly benefit from low-interest loans. Furthermore, this wide application would act as an important opportunity for education outreach on the importance of acting on climate change (Fig. 1 below, Energy Efficiency Adoption. Source: Pembina Institute)



- Given that each million invested into energy efficiency translates into an average of 43.5 job year, the proposed fund would generate 230,400 job years (46,000 per annum over 5 years).

Support municipal efforts at GHG emission reductions through legislation (PACE, city charters) and funding

- Modify the Alberta Building Code to require nearly zero-energy buildings by 2020[1]
- Mandate installation of electric vehicle (EV) charging stations in large multi-family buildings, provide matching funding for public level 2 and level 3 EV charging stations to municipalities.
- Legalize the use of PACE (property assessed clean energy financing for green retrofits) throughout Alberta.[2]
- Accelerate city charter status for City of Edmonton and City of Calgary to support municipal efforts for sustainability.
- Support other municipal sustainability initiatives through legislation and matching funding.

Reduce the Government of Alberta's carbon footprint by providing provincial climate leadership (zero carbon government buildings, green supply chain, green operations)

Buildings account for 39% of North American carbon dioxide emissions. It is estimated that 80% of today's building stock will still be in use in 2050, accounting for the bulk of building-related greenhouse gas emissions.

- Require zero carbon, net zero, PassivHaus or similar high performance design target for all future new Government of Alberta buildings
- Develop a retrofit plan to achieve net zero for all existing Government of Alberta buildings by 2050, starting with "low-hanging fruit"
- Co-ordinate with federal government to create EnerGuide ratings for all energy-consuming products in Canada not yet covered under EnerGuide legislation (e.g. computers, lights). Mandatory disclosure of EnerGuide rating of products for sale or rent.[3]
- Require mandatory NRCan EnerGuide ratings for new buildings, buildings for sale, and buildings for rent starting in 2017.
- Adopt a green supply chain directive for all Government of Alberta operations (e.g. covering minimum purchase standards for energy efficiency of products, recycled content, forest stewardship certification)
- Determine the carbon return on investment of a high-speed train link between Edmonton and Calgary.

1 eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0031&from=EN

2 E.g. en.wikipedia.org/wiki/PACE_financing, http://www.ecoissues.ca/index.php/Retrofitting_Buildings_using_Local_Improvement_Charges, http://www.davidsuzuki.org/publications/downloads/2011/Property-Assessed-Payments-for-Energy-Retrofits-recommendations-1.pdf, http://www.institutebe.com/InstituteBE/media/Library/Resources/Financing%20Clean%20Energy/Setting-the-PACE-Financing-Commercial-Retrofits.pdf

3 eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32010L0030%20

- Adopt a sustainable transportation policy for Government of Alberta operations and staff favouring public transportation, renewably powered electric vehicles, and other low carbon modes of transportation.

Note: cost-benefit analysis of CO2e emission reductions, energy savings, job creation and cost limited to the CCEMC/CCC energy efficiency/climate fund. Benefits for supporting municipal efforts at GHG reduction and reducing the government's own carbon footprint have not yet been quantified.

Definitions:

Near-net zero building:

definition @ eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0031&from=EN

Net zero building:

A building that offsets its grid-sourced operational energy consumption by an equivalent amount of renewable energy produced on-site on a net annual basis

PassivHaus:

http://www.passivehouse-international.org/index.php?page_id=70

Zero Carbon Building:

A high-performance building that offsets its grid-sourced operational energy consumption by an equivalent amount of renewable energy produced on-site or in the community on a net annual basis (derived from UK Department for Communities and Local Government. 2006. Building A Greener Future: Towards Zero Carbon Development. Communities and Local Government Publications, London.)

Energy Efficiency Working Group

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Coal Phase Out

Executive Summary

We recommend that the Government of Alberta:

- Enable an orderly phase out of coal fired power by 2025, with the vast majority of plants closing by 2020.
- Every effort should be made to transition from coal directly to renewables, avoiding the use of natural gas.

BENEFITS

CO2e reduction/annum (2020 and every year after): 17.85 Mt CO2e. These benefits are not counted separately from energy efficiency improvements and the introduction of renewables to avoid double counting. Jobs lost: (300) FTE, (1500) FTE over 5 years.

COSTS

Precedent in other jurisdictions suggests that there are no direct costs are associated with the coal phase-out.

Coal Phase-out Target

Alberta consumes more coal than the rest of Canada combined or in per capita terms, forty pounds per day. In 2014, coal represented 67% of Alberta's electricity generation and 43% of its generating capacity. Generation from coal saw an absolute increase of 13% over 2013 when it represented 63% of electricity generation.

The province is home to eighteen generators, twelve of which are in the Wabuman area--immediately upwind of Edmonton. The oldest generator is Battle River 3, which opened in 1969 and is scheduled to close with three others in 2013. The newest is Keephills 3 which opened in 2011 and is scheduled to close in 2061.

In terms of pollution and air quality, coal-fired power is responsible for 33% of Alberta's sulfur dioxide emissions, 10% of nitrogen oxide emissions, 6% of fine particulate matter emissions (including 44% of mercury emissions) as well as lead, cadmium, hexachlorobenzene, polycyclic aromatic hydrocarbon and arsenic emissions. The sulfur oxides and nitrogen oxides produced from the Wabamun area are also the most significant contributor to the secondary formation of fine particulate matter in Edmonton, which was shown to exceed the Canada Wide Standards in the 2009-2013 period.

HARMFUL
In terms of pollution and air quality, coal-fired power is responsible for 33% of Alberta's sulfur dioxide emissions, 10% of nitrogen oxide emissions, 6% of fine particulate matter emissions!

The health effects of these emissions are pronounced. A model presented in "A Costly Diagnosis" (2013) suggests that short-term exposure to air pollution from coal plants is annually responsible for 700 hospital visits and eighty hospital admissions in Alberta. Meanwhile, long-term exposure to air pollution from coal plants in Alberta is a contributing factor in 100 premature deaths per year. Moreover, these statistics do not consider the effects of mercury from coal emissions on neurological development, lung development, cardiac disease, cancer and other chronic illnesses.

Such health effects do not come without a price. The model presented in a Costly Diagnosis suggests that "the total economic damages in Alberta associated with the health impacts of air pollution from coal plants are in the range of $300 million annually, which would translate into approximately 0.7 ¢/kWh. (p. 2)" Other estimates have ranged as high as 2.1 ¢/kWh. The report also points to a low-range estimate from Environment Canada that suggests that the social costs of coal may be 2.9 ¢/kWh. Adding various estimates of the health and social impacts of coal to the AESO pool price gives a "true" cost of in the range of 10.2 – 20.3 ¢/kWh.

From a climate change perspective, coal-fired power produces forty-three megatonnes of carbon dioxide annually in Alberta. This represents 18.5% of total emissions and 36% of industrial emissions which is equivalent to all oilsands emissions combined. Indeed, five of the top seven emitters in Alberta are coal plants. Even Keephills 3, the newest plant, releases 858 tonnes of carbon dioxide per GWh (vs. 1053 tonnes per GWh for the average coal plant). This is twice the federal limit for plants built after 2015.

Many other jurisdictions are phasing-out coal, and Alberta would be in good company joining them. Examples include:

- Ontario: Accomplished in 2014 (10 year phase out)
- UK, multipartisan effort (LibDems, Conservatives, Labour): proposed ten to fifteen year phase out
- Denmark: target 2025
- Michigan: no timeline
- Los Angeles: target 2025

Ten Year Coal Phase-out

In light of these serious concerns associated with coal-fired power, we propose an aggressive ten-year timeline for the phaseout of coal, with the majority of the plants closing by 2020 and the rest by 2025.

Assuming 8.8 TWh of renewable energy replace coal (as we propose) by 2020, carbon dioxide emissions will be reduced by approximately 9.2 MT: 1.05 MT CO2e/TWh X 8.8 TWh = 9.2 Megatonnes CO2e (old coal emissivity).

Policies to Support a Coal Phase-out

While there are various policy means by which Alberta can meet the ten year coal phase-out timeline, it is critical that the province transition directly to renewables and avoid the use of natural gas as a bridge fuel. This can be accomplished via the aggressive development of renewables , as well as through increases in energy efficiency. We therefore recommend that that Alberta pursue a direct transition to renewables and discuss various policy options that may help accomplish the coal phase-out.

A Direct Transition to Renewables

When a source of power is taken offline, the subsequent gap in electricity production may be filled through either an increase in other forms of generation or by reducing demand through energy efficiency. Both will be necessary to avoid using natural gas to compensate for the loss of coal. While energy efficiency is discussed elsewhere in this submission, it is worth reminding ourselves that various American jurisdictions have set impressive targets for reducing energy consumption. These include:

TRANSITION

A direct transition to renewables preferred; avoiding the use of natural gas as a bridge fuel!

- Alaska: 15% target by 2020 (from 2010 levels)
- Arizona: 22% target by 2019 (from 2010 levels)
- Maryland: 15% target by 2015 (from 2007 levels)
- Massachusetts: 2.6% annual reduction (from 2015)
- New Jersey: 20% target by 2020 (from predicted 2020 usage)
- Texas: 30% of all load growth to be met by energy efficiency
- Multiple states have annual targets of 0.85%-1.2%

Other jurisdictions around the world have set impressive targets for the adoption of renewable energy, such as:

- Germany (32.5% of generation by 2014, projecting 45% by 2025)
- California (25% of electricity retail sales by 2016, projecting 33% by 2020, 50% by 2030)
- Nova Scotia (25% of electricity sales by 2015, projecting 40% by 2020)

Alberta should draw on the best of these examples in devising policy to meet the demand left in the absence of coal.

Options to Implement the Phase-out

Legislated closure of units

- Legislation requiring coal plants to close according to a certain schedule may help effect the elimination of coal. For example, four units could close in 2015 given the present oversupply faced by the market. Subsequently, one unit could close a year until 2026, with the newest units closing in 2028 and 2030 respectively. While this scenario would slightly exceed the ten year target, it would mean that plants had an average lifespan of 37.3 years at closure, which is comparable to Ontario's coal phase-out (38.7 yrs average age at closure).

Hard cap on emissions, ratchet down

- Another approach is to cap the emissions from coal as a sector. Currently, coal is responsible for forty-three MTs of carbon dioxide in Alberta annually. Ratcheting down annually from this maximum and forcing industry to comply with the cap may help to bring about coal plant closures.

Require payment of externalities (pollution)

- Legislation requiring the payment of externalities would force coal-fired power producers to pay for emissions of sulfur oxides, nitrogen oxides and mercury among other things. This, combined with a carbon tax, would likely price coal out of the market. However, it does not guarantee the timeline for shutting plants.

Cap lifespan of coal units at 40 years

- While regulatory precedent exists at the federal level for capping the lifespan of coal plants, this approach is less desirable as it may allow plants to operate for the longest amount of time (until 2051 in Alberta).

Coal Phase Out Working Group

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Carbon Pricing

Executive Summary

We recommend that the Government of Alberta:

Replace Alberta's failed SGER approach to climate management which has not resulted in any absolute reduction in emissions.

Apply an economy-wide carbon tax that applies to all measureable sources of emissions, rather than a cap-and-trade system carbon pricing policy

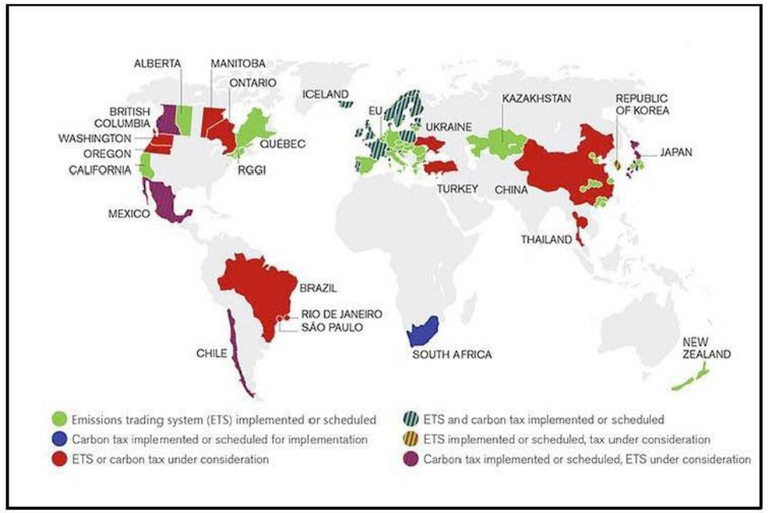
- The tax should be applied on 100 percent of emissions across all sectors of the economy, starting at fifty dollars per tonne of carbon dioxide in 2016 and escalating by ten dollars per year to one hundred and fifty dollars per tonne in 2026.
- The tax must be progressive, with sufficient rebate mechanisms to ensure that it rises with household income and therefore does not disproportionately affect low income households.
- Government income accruing from the tax should not be directed towards general revenues, but rather into funds designated for investments in renewable technology, energy efficiency and transportation infrastructure as specified in these recommendations.

The Case for a Carbon Tax

Economists have long recognized the flexibility and efficiencies provided by carbon pricing policies. We are observing recognition of this fact, with an increasing number of industry and environmental organizations calling on governments to put an effective price on carbon.

Most recently, 43 CEOs across 20 economic sectors — with operations in 150 jurisdictions and $1.2 trillion in revenue in 2014 — called for an explicit or implicit price on carbon as part of their vision of a climate deal. Similarly, Europe's largest oil and gas companies — while accepting cost implications — jointly called on governments to price carbon for its benefits in providing "a clear roadmap of future investment, a level playing field for all energy sources across geographies and a clear role in securing a more sustainable future."

An increasing number of federal- and state-level governments are adopting carbon pricing — such as carbon tax/levy or cap-and-trade policies — to reduce emissions and guide investment decisions.



Source: World Bank

In the Alberta context, carbon pricing could help the province address three key challenges that presently confront it. First, the province is suffering economic impacts by not doing enough to fight climate change. Second, the economy lacks the diversity and innovation needed to succeed in a rapidly changing world. Third, the delivery of government services is too dependant on highly variable resource revenues.

A meaningful, economy-wide carbon price could help solve all three challenges by reducing carbon pollution, encouraging economic diversification and raising revenue. Despite the recent increases to the provinces carbon price, the policy remains weak relative to B.C.'s carbon tax. Alberta could make progress on these challenges using an economy-wide carbon tax approach. In our recommendations, we discuss a carbon tax because of it simplicity and because of the economic and environmental success that B.C. has achieved to date.

Policies to Support a Carbon Tax

Elimination of SGER

According to the National Roundtable on the Environment and the Economy, "more cost-effective emission reductions are available in Alberta than in any other region." An economy-wide carbon tax in Alberta can contribute towards building a more resilient economy and energy sector, and the higher the carbon price, the more incentive it would provide for in-house emission reductions and investments in lower carbon energy pathways.

A carbon tax is a relatively simple policy to design and administer. Experience in B.C. shows a carbon tax policy could be designed and implemented in about six months. The government can set a schedule of tax rates starting with a relatively low rate of $30 and increasing over time to give industry and household's time to plan. It can also be broad based, translating to reductions in carbon pollution spread across more of the economy.

- B.C.'s carbon tax was implemented with a five-year schedule of rate increases starting at $10 per tonne in 2008, rising by $5 per tonne per year to $30 per tonne in 2012. Evidence shows that the per capita fossil fuel combustion in that province is down and the economy has performed well relative to the rest of Canada.

For discussion purposes — at $30 per tonne carbon tax the current price in B.C. — Alberta could generate approximately $7 billion in revenues. At $50 per tonne, this could increase to as much as $11 billion.

"British Columbia's carbon tax is as near as we have to a textbook case, with wide coverage across sectors and a steady increase in the rate."

— Mr. Angel Gurría, OECD Secretary-Genera

The coverage would be comparable to Quebec's cap-and-trade system and amount to about 85 per cent of Alberta's carbon pollution. This preliminary revenue estimate is based on a carbon tax being applied to all sources of carbon pollution that can be accurately measured and does not include tax and royalty interactions. It also doesn't account for any changes in carbon pollution that would occur because of the carbon tax.

At $30 per tonne, Alberta would be able to demonstrate that its price on carbon is as strong as the leading jurisdiction in North America.

An Economy-wide Carbon Tax

Past inaction in improving Alberta's price on carbon has been criticized at home and abroad - damaging the reputation of the province and its energy sector. The oilsands in particular has been singled out for being a carbon intensive source of oil and for being the fastest growing source of carbon pollution in Canada.

The SGER has not resulted in significant improvements in the sector's emission intensity and the province's emissions are expected to continue to grow. A carbon tax could help to address some of these criticisms by strengthening climate policy in the province. It will also better position the Alberta's energy sector to prepare for a world that is increasingly pricing carbon pollution and moving towards lower carbon energy pathways. important to note that B.C.'s carbon tax has earned praise from within the province and from respected international bodies such as the World Bank and OECD.

Many companies operating in Alberta's oil and gas sector are already accounting for higher carbon prices in their investment decisions through the use of an internal shadow carbon price. In other words, companies in Alberta and around the world are already making investment decisions based on the assumption that significant pricing of carbon is inevitable. The government can provide regulatory certainty through a more effective and longer-term price schedule.

Source: World Bank. 2015. Carbon Pricing Watch 2015. Washington, DC: World Bank.

Use of Revenue

As with any provincial revenues, the government must carefully decide how to invest in ways that best meet the needs of Alberta. Possibilities, which are not mutually exclusive, include:

- Investing in renewable energy, energy efficiency and clean transportation systems to help Albertans reduce their carbon pollution.
- Protecting low-income Alberta households from potential adverse impacts of higher energy costs.
- Reducing deficits to allow government to invest in core government services, such as health care and education, and invest in infrastructure.
- Protecting the competiveness of Alberta industries that could be placed at a material disadvantage because of increasing carbon prices.

Carbon Pricing Working Group

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Transportation

Executive Summary

We recommend that the Government of Alberta:

Ensure that Alberta invests in creating the infrastructure to support electric vehicles (EVs) throughout the province, including in rural communities and in partnership with First Nations and Metis governments.

- Set a target for EV use in Alberta and create a plan to convert the government's fleet to electric and plugin hybrid electric vehicles.
- Increase funding to cities and rural municipalities for walking and bicycle infrastructure, including dedicated support to single-use transportation alternatives for rural, First Nations and Metis communities.
- Provide increased, stable and predictable funding to urban municipalities as well as First Nations, Metis and rural communities to invest in public transit infrastructure and operations, beyond what is currently planned within the funding allocations for the Municipal Sustainability Initiative and intended rural bus service initiative.

Costs and Benefits

Cost and benefit projections are not presently available for transportation investments and they have not been included in our accounting of total costs and benefits for the entire set of recommendations.

Sustainable Transportation Targets

Transportation is the third largest source of emissions in Alberta, representing 11% of emissions in 2013. But despite the challenge this presents, the popular appeal of transportation infrastructure improvements and immense benefits beyond emissions reduction helps to justify the expenditure of both economic and political capital on this issue. In Ontario, for example, public transit featured prominently in the last provincial election and the winning party sought a mandate for aggressive transportation investments.

Beyond public transportation; walking, cycling and electric vehicles (EVs) are key components of a sustainable transportation strategy. EVs in particular should be the focus of special attention from government. In conjunction with a clean grid, EVs have the potential to significantly reduce emissions from the transportation sector. We therefore recommend that the Government of Alberta set a target for EV use in the province and implement policies to help achieve it.

Setting a Target for EV use

The adoption of EVs on a wide scale will require leadership from government, but the benefits will be substantial. A Pembina Institute study notes that the life cycle GHG emissions of an EV are approximately 82% lower than that of a gasoline vehicle. The study goes on to examine three communities in British Columbia and finds that if EV use grows substantially, a 25% reduction in GHG emissions from passenger vehicles and light trucks could be expected by 2035 relative to 2007 levels (Clean Air Benefits from Electric Vehicles, Pembina Institute, 2007). Accordingly, we recommend that the government both set a target for EV use in the province and adopt mechanisms to meet it. Greenpeace Canada identifies the following tools to encourage the growth of EV market share:

- Increasing electric vehicle awareness,
- Negative incentives (e.g., taxes) on fossil fuel–powered vehicles
- Positive incentives for EVs (such as exemptions from VAT and sales taxes, free toll roads and restricted lane access, free parking, free charging, and low annual road fees)
- Sufficient EV charging infrastructure
- Purchase rebates,
- Support for home charging infrastructure
- Zero Emissions Vehicle mandates.

BENEFITS

The benefits of investing in walking and cycling networks may be four to five times greater than the costs when health benefits, improved air quality and reduced noise and parking costs are factored in.

Policies to Support Sustainable Transportation

A comprehensive plan for low-carbon transportation requires not only a shift to more sustainable personal vehicles, but also a reduction in personal vehicle use. Policies that encourage the use of EVs should be supported by policies that reduce the demand for personal vehicles in the first place. Such policies would include investment in walking, bicycling and public transit.

Investing in walking and bicycling infrastructure

A Pembina Institute study, Options for Reducing GHG Emissions in Calgary, notes that the benefits of investing in walking and cycling networks may be four to five times greater than the costs when health benefits, improved air quality and reduced noise and parking costs are factored in. In this context, cycling infrastructure may include separated bike lanes, improved wayfinding for cyclists, bicycle parking and bicycle storage. Pedestrian infrastructure may include improvements to make walking "easier, safer and more attractive." Improvements leading to a pedestrian-oriented design can reduce local vehicle kilometers travelled by up to 10% within a specific neighbourhood.

Investing in Public Transit

Public transportation investments are consistently well-received by voters and parties often compete on the strength of their public transportation platforms. There is good reason for this: public transportation is directly related to social, economic and environmental outcomes. For example, a 2012 Pembina Institute study entitled Behind the Wheel: Opportunities for Canadians to drive less, reduce pollution and save money notes that replacing a car with public transportation allows an individual to save almost $10,000 annually and reduce personal transportation emissions by 60%.

On the social side, there is research noting the relationship between economic development and access to transit. Specifically, the 2010 Three Cities within Toronto report indicates that the poorest neighbourhoods in the city also have the poorest access to Toronto's rapid transit system.

Underinvestment in public transportation is a symptom of Alberta's larger infrastructure deficit and the opportunities to build higher-order transit are immense. However, an aggressive shift towards public transit will require a rate of growth in transit networks much greater than is presently occurring. Indeed, the Pembina Institute's Fast Cities report notes that only 21% of Calgary residents live within 1km of rapid transit. We therefore recommend that the government invest in public transit above and beyond what is presently planned.

Transportation Working Group

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Disclaimer: While the background papers justify, contextualize and suggest various methods by which the recommendations may be implemented, the endorsements does not imply support of the entire content of the background papers.