



An Emergency Climate Policy Plan For Deep-Decarbonization In Canada



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[Policies Simulated at energyhub.org/Pembina](https://energyhub.org/Pembina)

Executive Summary

Canada has recognized the need to reduce its greenhouse gas (GHG) emissions by 80% in 2050 from 2005 levels. However, current policies that have emerged from the Pan-Canadian Framework (PCF) fall short on meeting this target. This report identifies five complementary policy recommendations that strengthen and add to the PCF, each targeting a specific concern not addressed by the others. The analysis performed shows that no single policy is sufficient in meeting Canada's GHG reduction targets. It also shows that each policy plays an important and unique role and that when policies are enacted together, their environmental, economic, and social impacts are greater-than-additive – they are synergistic. Ultimately, the policies recommended in this report create an optimal pathway to reduce 341Mt of GHG emissions, and save an additional \$56 billion and 1,472 lives per year by 2050 when added to the PCF. The political feasibility of implementing such policies is supported by their strong social and economic impact, as well by the recent trend of municipalities in Canada declaring a climate emergency.

Background

Canada is one of 195 signatories to the Paris Agreement, an international effort to limit global temperature increases to 1.5°C above pre-industrial levels.¹ Under this agreement, Canada has submitted its Mid-Century Strategy to the UNFCCC highlighting the need to reduce greenhouse gas (GHG) emissions by 80% in 2050 from 2005 levels.² In 2016, the federal government released the Pan-Canadian Framework (PCF), a mid-term action plan to reduce GHG emissions by 30% in 2030 from 2005 levels.³ However, according to the Pembina Institute, current policies are due to fall short of these targets, highlighting the need to strengthen PCF policies to 2030 and beyond.⁴

Roughly 70% of all GHG in Canada come from energy-related sources with industry (48%), transportation (26%), and buildings (23%) being the largest contributors. The remaining 30% comes from industrial processes emissions with natural gas & petroleum systems (38%) and agriculture (27%) being the largest contributors.

Political Context

The PCF is Canada's collective plan to grow the economy while reducing GHG emissions and building resilience to climate change.³ When the PCF was released in 2016, it included over 50 specific actions that the government would take to help achieve these goals. As of 2019, roughly a dozen climate-related policies have emerged and are currently modeled into the Energy Policy Simulator created by the Pembina Institute and Energy Innovation LLC.⁵

Each policy recommended in this report is designed to be complementary and synergistic with each other, while fully recognizing the current political context in Canada. In total, five recommendation categories are provided and, if implemented, will allow Canada to reach its 2050 goals while saving a significant amount of money and human lives along the way (see Figure 1 for emissions projection).

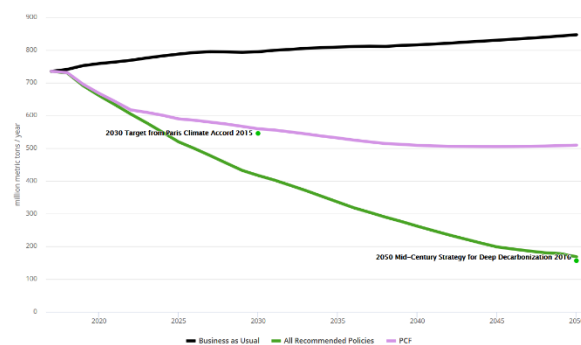


Figure 1. GHG emissions projection comparing Business as Usual, PCF, and all policies recommended in this report.

Policy Recommendations

Extended Carbon Levy

The federal carbon levy is the most significant component of the PCF, contributing to more GHG reductions than any other policy. Its current pricing schedule appears to align with Canada's central estimate for the Social Cost of Carbon (SCC) – raising \$10/ton per year from \$20 in 2019 to \$50 in 2022.⁶ And while this is a good start, the levy falls short on international pricing recommendations, best practice design principles, and exercising the precautionary principle.

International Best Practice. Sweden first implemented a carbon tax of €23/ton in 1991 and has steadily increased it to its current level of €114/ton in 2019.⁷ During this period, Sweden's GDP rose 78%, and the government now touts the tax as being a low-cost way to raise government revenue. Part of the success, they claim, is due to the gradual stepwise way they increased the tax giving businesses and households time to adapt and to improve the political feasibility of tax increases. The carbon tax is generally accepted among the public, possibly due to continued labour tax reductions since 1993.⁸

In order to reach the goals set by the Paris Agreement, the High-Level Commission on Carbon Pricing recommends a carbon price between \$40-\$80/ton USD by 2020.⁹ In order

to keep global warming below 1.5°C, the Intergovernmental Panel on Climate Change (IPCC) recommends a carbon price between \$135-\$6,050/ton USD by 2030 and between \$245-\$14,300/ton USD by 2050.¹⁰ Canada's price on carbon will miss these targets without further increases.

The federal carbon levy also fails to adequately account for the precautionary principle. The scheduled price of \$50/ton in 2022 falls near the 50th percentile of Canada's SCC estimate,¹¹⁰ but this does not account for inherent statistical uncertainty nor the potential severity of climate change impacts. A more cautious approach may be to align pricing at the 95th percentile, \$235/ton in 2030 and \$320/ton in 2050.

Major investment in carbon abatement projects requires long term planning, and carbon pricing should be defined at least a decade into the future to provide investors with much-needed certainty and government commitment.¹²

Policy Recommendation #1

Announce a continued \$10/ton/year price increase on the federal carbon levy through to 2050.

When this policy is added to the PCF, it is projected to reduce GHG emissions by 235Mt and save an additional \$8.6 billion and 1,213 lives per year by 2050 (see Table 1 for details).

While this extended carbon levy has a significant impact on GHG emissions reductions, it falls well short on meeting Canada's 2050 targets. Further policies must be enacted, with special emphasis on transportation and agriculture process emissions where the carbon levy has little to no impact (see Figures 2 and 3).

Strengthened EV Sales Mandate & Feebate

Part of Canada's transportation strategy under the PCF is a zero-emission vehicle (ZEV) sales mandate of 30% by 2030,¹³ along with roughly \$100 million in funding to deploy over 1,000 direct-current fast charging (DCFC) stations across the country.¹⁴ However, stronger post 2030 targets and a point-of-sale (POS) financial incentive are needed to meaningfully accelerate the reduction of GHG emissions from the transportation sector.

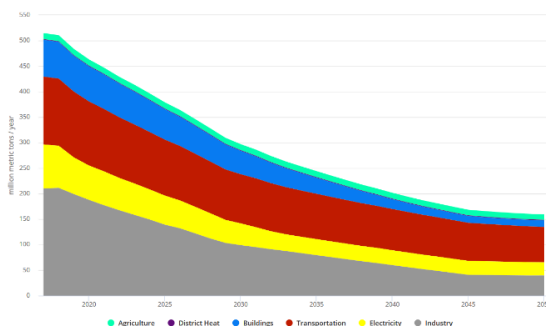


Figure 2. Energy emissions by sector showing that the extended carbon levy has little impact on transportation emissions.

International Best Practice. Norway has set a national goal of 100% zero-emission vehicle sales by 2025,¹⁵ the most aggressive of any ZEV policy in the world. However, this target is only possible because of a long history of government policy dating back to 1990. Policies include driver perks (reduced parking and ferry tolls, bus lane access), reduced taxes (purchase, import, VAT, business), and the building of a DCFC network. The ultimate success of this program may largely be because when these incentives are considered, comparable car models are cheaper upfront in the electric version compared to their fossil-fueled counterpart.

British Columbia has a short-term ZEV sales target of 30% by 2030 and is on pace to reach 100% by 2040.¹⁶ This path is possible because of long-standing POS incentives and policy to expand the province's DCFC network. POS financial incentives are important for ZEV purchases because customers sometimes strongly discount fuel savings when purchasing vehicles.¹¹

One of the strongest POS policy incentive options may be the Feebate. A Feebate is a revenue-neutral economic instrument designed to offer cash incentives to lower the cost of ZEV purchases, paid for by fees charged on emitting vehicles. A best-practice feebate program would charge fees on emitting vehicles based on a continuous function of the vehicle's fuel economy.¹¹ Incentives can then be offered on ZEV purchases, early retirement of emitting vehicles, or home charging infrastructure.

International Best Practice. The Bonus-Malus System in France is the largest vehicle Feebate program in the world.¹¹ The program is designed to be revenue neutral, with fees on new gasoline and diesel vehicle purchases used to fund incentives for new electric and plugin hybrid vehicle purchases.¹⁷ The program also incentivizes the early retirement of gasoline and diesel vehicles, two- and three-wheel electric vehicles, and electric bicycles for tax-exempt households.

Policy Recommendation #2

Commit to a 100% light-duty ZEV and 90% heavy-duty ZEV sales mandate by 2040 while helping provinces implement a feebate program.

When these policies are added to the PCF, they are projected to reduce GHG emissions by 35Mt and save an additional \$6.7 billion and 48 lives per year by 2050.

While this policy recommendation may appear ambitious, it is necessary to reduce emissions in the transportation sector where the extended carbon levy has minimal impact. The shifting market towards ZEVs and DCFC infrastructure

also offers strong support for the feasibility of this recommendation.

Nearly every major vehicle manufacturer, including Ford, General Motors, Toyota, and Volkswagen have announced aggressive plans to electrify their vehicle offerings.¹⁸ Ford, for example, is “all in” on ZEVs, committing \$11 billion in investment and 40 new electric vehicle models by 2022.¹⁸ In terms of charging infrastructure, Petro-Canada recently committed to installing DCFCs from coast to coast across Canada.¹⁹ There is every reason to believe that these trends will continue, giving Canadians many affordable vehicle options and reliable charging infrastructure from coast to coast.

Food Education

The second major emissions category that the extended carbon levy has little effect on is agriculture process emissions. In fact, agriculture process emissions would still increase from 64Mt to 81Mt by 2050.

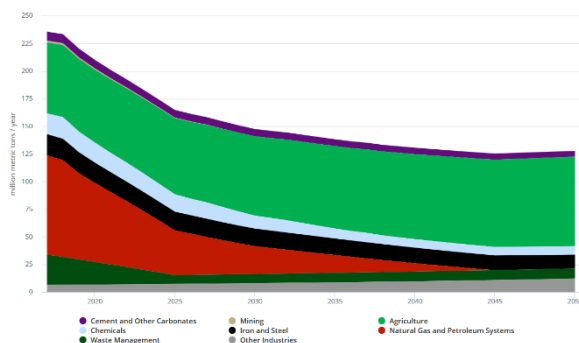


Figure 3. Industry process emissions showing the extended carbon levy has little to no impact on agricultural process emissions.

The only explicit action stated in the PCF related to agriculture is to increase ‘stored carbon’ in agricultural lands,³ however, no policy has yet emerged. In addition, storing carbon in agricultural lands does not address the underlying problem – Canadians are among the largest consumers of high-GHG intensity food in the world, consuming 70Kg of meat per person per year.²⁰

Although some work is being done to limit GHG emissions from livestock (feeding strategies and management practices),²¹ a more effective approach may be to reduce the demand for meat itself.

Several research studies have shown that a >25% reduction in agriculture emissions is possible in several European countries largely by reducing meat intake and shifting towards a more plant-based diet.^{22, 23}

International Best Practice. Brazil’s Dietary Guidelines are regarded as being one of the strongest in the world,²⁴ emphasizing the social and holistic aspects of eating.²⁵

Similarly, Canada’s new Dietary Guidelines include being mindful of eating habits, cooking more often, enjoying food, and eating meals with others. This presents Canada a real opportunity to become another world leader in food education, should the guidelines be properly promoted and implemented across the Country.

In January 2019, Health Canada published their new Dietary Guidelines for Health Professionals and Policy Makers.²⁶ The food choice options place a strong emphasis on eating plant-based proteins in place of red meats and drinking water in place of milk.

Policy Recommendation #3

Dedicate additional resources to promote and increase adoption of the Canada Dietary Guidelines across the country.

When these policies are added to the PCF, they are projected to reduce GHG emissions by 18Mt and free up agricultural land with little economic or social impact.

The education emphasis should be placed on addressing the barriers to adopting the new guidelines. For example, 25% of Canadians said the new food recommendations are not affordable, even though the recommendations would save a family 6.8% on their annual grocery bill compared to the 2007 version of the guide, largely because plant-based protein is currently cheaper than meat.²⁷

An additional positive externality of this policy recommendation is that it frees up cropland for other uses, such as reforestation – as roughly 70% of all agricultural land is used to grow crops to feed to livestock.²⁸

Reforestation, Deforestation, and Forest Management

Canada is home to 346 million hectares of forests representing 9% of the global total.²⁹ Roughly 94% of forest is government owned and follows some degree of sustainable forest management practices.³⁰

However, in 2016 alone, 98Mt of emissions were released on government managed forest lands due to natural disturbances such as defoliation by insects and forest fires.³¹ During this same year, 9.7Mt of emissions were released from intentional deforestation activities, primarily because of agriculture and mining, oil, & gas.

Additionally, sustainable management practices among private forest owners are inconsistent. Some provinces have incentives for private landowners to manage their forests such as Ontario³² and British Columbia,³³ but some highly forested provinces like Saskatchewan do not.

International Best Practice. Switzerland’s Federal Act on Forest and Swiss National Forest Programme provide the

backstop for several forest policy instruments including a ban on deforestation and clearcutting, and financial incentive for the enhancement and protection of forests from natural hazards.³⁴ Since the 19th century, the forest area in Switzerland has grown by 45% with 56% of forests being certified. In Canada, less than half of the forests are certified.

While the PCF refers to improving forest management practices and minimizing loss from invasive species and fires, no explicit action or policy has emerged from these concerns.³

Policy Recommendation #4

Work with every province to implement an incentive for private land forest management, provide funding for R&D to specifically address forest loss from pests and fires, reforest all reclaimed cropland, and stop deforestation by 2050.

When these policies are added to the PCF, they are projected to reduce GHG emissions by 46Mt with little economic or social impact.

Forestry related policies are the final critical component in reducing Canada's GHG emissions to reach its 2050 goals.

Net-Zero Energy Ready Building Code & PACE

Every policy recommended so far has had a minimal overall financial impact. However, strategic building policies can greatly increase the cost savings to Canadians (see Figure 4).

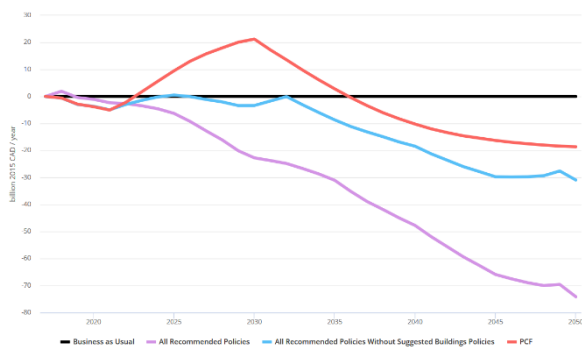


Figure 4. Total cash overlays showing massive financial cost savings due to recommended strategic buildings policies.

Canada's Buildings Strategy under the PCF is a comprehensive plan to improve the energy efficiency of new and existing buildings across Canada.³⁵ The plan includes creating a net-zero energy ready model code by 2030, developing a model code for existing buildings by 2022, and setting new performance standards for heating and other equipment. However, the plan can benefit from stronger implementation targets and a financing mechanism for property owners to easily perform retrofits and efficiency upgrades.

International Best Practice. British Columbia has committed to increasing energy-efficiency requirements in the BC Building Code to make buildings net-zero energy ready by 2032.³⁶ An important step in accomplishing this goal is the creation of an incrementally improving performance-based energy-efficiency standard called the BC Energy Step Code. The standard is completely voluntary but allows local governments to play a leadership role by voluntarily adopting the standard to reduce local GHG emissions.

Building codes are performance standards that generally affect only the bottom of the market, adding efficiency improvements to the lowest acceptable infrastructure where more efficient building is still possible.¹¹ Canada's own Building Strategy admits as much by offering incentives to buildings that perform better than code. An effective approach may be to improve the code to the point where net-zero policy is mandatory, as is planned in British Columbia.

Energy efficiency upgrades can be costly, and the existing building stock should not be forgotten. There is an innovative financing mechanism called Property Assessed Clean Energy (PACE) that allows property owners to upgrade the efficiency of their home on a low interest and long amortization loan attached to the property.¹¹ This allows personal credit scores to be avoided and loans to be paid back through property tax, greatly increasing the number of people who can perform home energy upgrades. The Clean Energy Improvements Regulation enacted in Alberta in 2018 is one recent example,³⁷ although it doesn't incorporate many best practice principles.

International Best Practice. Sonoma County was the first county-wide Property Assessed Clean Energy program in California.³⁸ Since 2008 the program has funded over \$73 USD million in projects, providing energy efficiency upgrades to an estimated 3,500 residential and commercial properties.³⁹ Property owners receive funding on a 10 or 20-year repayment plans through their property tax at 7% interest. A critical aspect of this program is that it raises money through open market bonds, providing access to large capital pools and eliminating the need to use scarce public money.

Policy Recommendation #5

Help provinces adopt a net-zero energy ready building code by 2035 and establish PACE legislation.

When these policies are added to the PCF, they are projected to reduce GHG emissions by 6Mt and save an additional \$32.8 billion and 89 lives per year by 2050.

Net Policy Impact

An important characteristic of the policies recommended in this report is that, when implemented together, their total impacts are greater than the sum of each policy implemented alone (refer to Table 1). This is true across environmental, economic, and social impact categories. This is likely due to the highly complementary nature of the policies - each targeting a specific concern not addressed by the others.

The extended carbon levy forms the base of this policy package as its GHG abatement potential (235Mt by 2050) is necessary to put Canada within the range of its long-term emission goals. The policy also meets international pricing recommendations (\$130 in 2030 and \$330 in 2050), best practice design principles, and properly accounts for the precautionary principle.

The transportation and agriculture policies reduce emissions in areas where the carbon levy has minimal effect. Without the electrification of transport and the reduction in meat demand, transportation emissions will only reduce slightly by 2050 while agriculture process emissions will increase by 26%.

The land saved by the agriculture policies sets the stage for reforestation, an important component of the recommended forestry policies. Forestry policies provide the final push needed to reduce GHG emissions by 80% in 2050.

The building policies are included primarily for their massive financial impact – saving Canadians over \$30 billion on utility costs by 2050.

	Pan-Canadian Framework	Extended Carbon Levy	Transportation Policies	Agriculture Policies	Forestry Policies	Buildings Policies	All Policies Implemented Together	Mathematical Sum of All Policies
Environmental Impact (GHG Reduction)	509	+235	+35	+18	+46	+6	+341	+180
Economic Impact (\$ Saved)	38.6	+68.6	+6.7	1.35	1.65	+12.8	+95.6	+15.3
Social Impact (Lives Saved)	7400	+1773	+48	-1	0	+89	+1472	+1349

Table 1. Environmental, economic, and social Impacts of all recommended policies.

When implemented together and in coordination with the policies that have already emerged from the PCF, recommended policies will reduce Canada's GHG emissions to 168Mt per year by 2050, allowing it to reach its 80% reduction goals.

The policies will also save Canadians an additional \$55.6 billion per year by 2050, only costing Canadians in year 1, compared to the PCF policies alone which will cost

Canadians an average of \$11 billion per year from 2022 to 2036.

Finally, the recommended policies will save an additional 1,472 lives per year by 2050 and double the monetized value of avoided deaths and climate benefits.

The combined environmental, economic, and social impacts of these policies, as well as their complementary and synergistic nature, make them strong candidates for implementation.

Implementation

There are a couple of implementation risks that must be noted. The first is with regards to the transportation, buildings, and forestry policies which will require considerable effort on behalf of the provinces to create and implement the necessary legislation. However, given the PCF is as it's named, 'Pan-Canadian', provincial buy-in is likely achievable provided the benefits and necessity of such policies are communicated clearly.

A larger issue may be with regards to the carbon levy, as increased 'taxes' is often seen as politically unpalatable. However, if the financial savings to Canadians that arise from a revenue-neutral carbon levy are communicated, this risk will be mitigated.

A recent trend also supports the adoption all policies recommended in this report: Vancouver BC, Halifax NS, Edmundston NB, Kingston ON, and most recently Hamilton ON have all declared a climate emergency – officially making climate change a strategic priority.⁴⁰ These municipalities are widening the Overton Window, extending the public conversation about what is acceptable when it comes to climate policy.

Municipalities under climate emergency not only increase the plausibility of strong climate policy, but they can also be the first to adopt many policies recommended in this report, including net-zero energy ready building codes and PACE financing – further accelerating Canada's transition to a low carbon economy.

Conclusion

Energy emission in Canada must be reduced by 80% in 2050 from 2005 levels to fulfill its obligation under the Paris Agreement. The complementary and synergistic policies recommended in this report create an optimum pathway to accomplish this, while also providing significant social and economic benefits to Canadians.

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Energy Policy Simulator Notes

The simulation for all policies found in this report can be found at energyhub.org/Pembina. Assumptions were made for policy recommendations not currently included in the Energy Policy Simulator (EPS). Property Assessed Clean Energy (PACE) was programmed in as Increased Retrofitting. Food Education was programmed in as Livestock Measures and Cropland Management. While the impact of Increased Retrofitting is likely representative of PACE, Livestock Measures and Cropland Management is likely under representative of Food Education – the actual emissions reduction would be far greater than what was programmed into the EPS.

EPS Policy Settings

- Electric Vehicle Sales Mandate: Passenger LDVs: 100% [% of new vehicles sold]
- Electric Vehicle Sales Mandate: Freight LDVs: 100% [% of new vehicles sold]
- Electric Vehicle Sales Mandate: Passenger HDVs: 90% [% of new vehicles sold]
- Electric Vehicle Sales Mandate: Freight HDVs: 90% [% of new vehicles sold]
- Feebate: 100% [% of global best practice rate]
- Low Carbon Fuel Standard: 13% [% reduction in carbon emissions]
- Transportation Demand Management: Passengers: 40% [% of TDM package implemented]
- Building Component Electrification: Urban Residential: 44% [% of newly sold non-electric building components]
- Building Component Electrification: Rural Residential: 44% [% of newly sold non-electric building components]
- Building Component Electrification: Commercial: 44% [% of newly sold non-electric building components]
- Building Energy Efficiency Standards: Urban Residential Heating: 80% [% reduction in energy use]
- Building Energy Efficiency Standards: Urban Residential Cooling and Ventilation: 80% [% reduction in energy use]
- Building Energy Efficiency Standards: Urban Residential Lighting: 90% [% reduction in energy use]
- Building Energy Efficiency Standards: Urban Residential Appliances: 90% [% reduction in energy use]
- Building Energy Efficiency Standards: Urban Residential Other Components: 90% [% reduction in energy use]
- Building Energy Efficiency Standards: Rural Residential Heating: 80% [% reduction in energy use]
- Building Energy Efficiency Standards: Rural Residential Cooling and Ventilation: 80% [% reduction in energy use]
- Building Energy Efficiency Standards: Rural Residential Lighting: 90% [% reduction in energy use]
- Building Energy Efficiency Standards: Rural Residential Appliances: 90% [% reduction in energy use]
- Building Energy Efficiency Standards: Rural Residential Other Components: 90% [% reduction in energy use]
- Building Energy Efficiency Standards: Commercial Heating: 75% [% reduction in energy use]
- Building Energy Efficiency Standards: Commercial Cooling and Ventilation: 75% [% reduction in energy use]
- Building Energy Efficiency Standards: Commercial Lighting: 85% [% reduction in energy use]
- Building Energy Efficiency Standards: Commercial Appliances: 85% [% reduction in energy use]
- Building Energy Efficiency Standards: Commercial Other Components: 85% [% reduction in energy use]
- Increased Retrofitting: Heating: 0.5% [% of existing building components]
- Increased Retrofitting: Cooling and Ventilation: 0.5% [% of existing building components]
- Increased Retrofitting: Envelope: 0.5% [% of existing building components]
- Increased Retrofitting: Lighting: 0.5% [% of existing building components]
- Increased Retrofitting: Appliances: 0.5% [% of existing building components]
- Increased Retrofitting: Other Components: 0.5% [% of existing building components]
- Early Retirement of Power Plants: Hard Coal: 400 [MW/year]
- Coal to Gas Conversions: On [on/off]
- Hard Coal to NG Switching: 50% [% of coal use]
- NG to Electricity Switching: 10% [% of natural gas use]
- Methane Capture: 85% [% of potential achieved]
- Reduce F-gases: 85% [% of potential achieved]
- Worker Training: 85% [% of potential achieved]
- Afforestation and Reforestation: 25% [% of potential achieved]
- Avoid Deforestation: 100% [% of potential achieved]
- Cropland Management: 100% [% of potential achieved]
- Improved Forest Management: 100% [% of potential achieved]
- Livestock Measures: 100% [% of potential achieved]
- Carbon Tax: Transportation Sector: 330 [CAD\$/metric ton CO₂e]
- Carbon Tax: Electricity Sector: 330 [CAD\$/metric ton CO₂e]
- Carbon Tax: Residential Bldg Sector: 330 [CAD\$/metric ton CO₂e]

- Carbon Tax: Commercial Bldg Sector: 330 [CAD\$/metric ton CO₂e]
- Carbon Tax: Industry Sector: 330 [CAD\$/metric ton CO₂e]
- End Existing Subsidies: Hard Coal: 100% [% reduction in BAU subsidies]
- End Existing Subsidies: Natural Gas: 100% [% reduction in BAU subsidies]
- End Existing Subsidies: Petroleum Gasoline: 100% [% reduction in BAU subsidies]
- End Existing Subsidies: Petroleum Diesel: 100% [% reduction in BAU subsidies]
- End Existing Subsidies: Jet Fuel: 100% [% reduction in BAU subsidies]

Figures and Tables

All figure and tables are hosted online for viewing accessibility. URLs can be found below.

Figure 1. <https://energyhub.org/wp-content/uploads/2019/03/CO2-Emissions.png>

Figure 2. <https://energyhub.org/wp-content/uploads/2019/03/Energy-Emissions-Before.png>

Figure 3. <https://energyhub.org/wp-content/uploads/2019/03/Industry-Process-Emissions-Before.png>

Figure 4. <https://energyhub.org/wp-content/uploads/2019/03/Policy-Package-Savings-1.png>

Table 1. <https://energyhub.org/wp-content/uploads/2019/03/Environmental-Economic-and-Social-Impacts-of-Policies-1.png>