



## Building on the Best

How adopting top provincial climate policies across Canada could drive clean growth

October 2016

In early December, Canada's prime minister and premiers will sit down together to negotiate a national clean growth and climate action plan. Some provinces will arrive at that table having already adopted policies that are cutting carbon pollution and driving clean economic development.

Clean Energy Canada set out to examine what those leading provincial policies could achieve if they were applied across the country. We commissioned economic modelling to quantify the impacts of extending these policies Canada-wide. We focused on policies that support a shift from fossil fuels to clean power across the economy.

## We found that:

- Adopting a package of today's leading energy transition policies across Canada would reduce carbon pollution by **34 million tonnes (Mt) in 2030—enough to close 15% of the estimated gap to Canada's national target**. However, adopting today's "best in class" policies as national standards is not enough on its own to get Canada on track to its international climate commitments.
- Under our policy package, **the electricity sector would be nearly two-thirds larger by 2050—but the sector's emissions would be nearly two-thirds smaller**. That positive result is due to the combination of phasing out all coal-fired power by 2030 and replacing it with zero-emission power.
- The package of policies we modelled **are complementary, building on each other to deliver more than the sum of its parts**.
- The policies we modelled would **cut pollution from Canadians' homes by more than half by 2050**, relative to the policies that apply today.
- The **direct financial costs of this policy package are modest**, with an overall net cost increase of 0.3% a year across the economy, relative to current policies.
- Significant new investment in the electricity sector—an annual average of 4.6% more than under current policies, or \$2.8 billion per year—would be required to meet increased demand.
- The policies in this package **would reduce fuel costs for drivers, and the passenger transportation sector as a whole would see a net financial benefit**. For example, over the lifetime of the vehicle, a driver in Ontario would save over \$14,000 in fuel costs by choosing the electric Nissan Leaf instead of the gasoline-powered Nissan Versa.
- While it was not part of our policy package, this project also made an initial assessment of the emission reduction that could be generated by adopting a **low-carbon fuel standard like British Columbia's** as a national policy. Our preliminary finding is that a Canada-wide clean fuel standard could offer a very significant emission benefit, with **potential reductions in the range of 30 million tonnes (Mt) in 2030, equivalent to taking over 6 million cars<sup>2</sup> off the road** that year.
- Recent public opinion research suggests there is **significant public support for the kind of clean growth policies included in this analysis**.

This briefing report provides an overview of the research project and its key findings, as well as a summary of public opinion research demonstrating Canadian support for the type of energy transition policies included in our analysis.

The report concludes with recommendations to Canada's governments as they work to develop a national clean growth and climate action plan.

# Project Description

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Provinces are essential participants in Canadian climate action. They control decision-making on electricity and natural resource development, two crucial levers for generating clean growth and reducing carbon emissions.

During the years when the federal government was largely absent in taking action on climate change, some provinces forged ahead, adopting effective policies in their own jurisdictions. Unfortunately, that kind of leadership was not universal: while some provinces took meaningful action, others did relatively little.

Clean Energy Canada wanted to **understand the emission benefit we would see if the leading provincial policies were extended across the country as part of a pan-Canadian climate and clean growth plan**. This could happen either because all provinces and territories agreed to adopt a best practice, or because the federal government adopted a leading provincial practice as a national standard.

We commissioned Navius Research, a leading environmental economics firm, to quantify the emission reductions that would result from making today's provincial best practices pan-Canadian—i.e. adopting them across Canada.<sup>3</sup>

We focused this analysis on policies to support the transition from fossil fuels to clean power, a shift known as “electrification.”

Earlier this year, Clean Energy Canada published a package of policy recommendations on electrification.<sup>4</sup> The result of a collaborative dialogue with experts and stakeholders, *A Canadian Opportunity* recommends electrification policies for the transportation, buildings, industry and electricity sectors, as well as economy-wide policies to support the shift from fossil fuels to clean power—most notably a price on carbon emissions.

In that document, we noted that each of the policies we recommended should ideally be adopted right across Canada.

The good news is that some provinces have already adopted or announced policies that align with our recommendations. The bad news is that—until very recently—none of those policies was yet a pan-Canadian effort. (The exception is the federal government's October 3 announcement<sup>5</sup> of a national minimum carbon price that would rise to \$50 per tonne by

## A Canadian Opportunity: Why Electrification Matters

The basic recipe for clean growth, whether in Canada or outside our borders, can be summarized in three steps:

- cut energy waste as much as possible
- clean up your electricity supply so that it produces as little carbon pollution as possible, and
- use that clean power as the source of energy for activities that we largely power with fossil fuels today.

So instead of buying cars that run on gasoline, choose vehicles powered by clean electricity. Build super-efficient homes, and then use electric pumps to heat them. Design cutting-edge industrial processes that run on zero-carbon power.

This shift is called electrification. Expert assessments are clear that this shift will be the most significant component of the global energy transition: while there are areas where electrification isn't the most effective answer, it is an **indispensable clean growth solution** for many sectors of the global economy.

In Canada, we'll need electrification to meet today's climate goals and make deeper emission cuts after 2030. So this energy transition—shifting from fossil fuels to clean power—will need to be at the heart of any successful Canadian climate plan.

This energy transition also means that the national climate conversation isn't just about what we need to cut, but about what we want to build. That's because expert assessments show we'll need to bring more clean electricity online as we increasingly shift away from fossil fuels, even while doing as much as we can to cut energy waste. We'll also need more of the infrastructure that supports electrification, including smart grids, electric vehicle charging stations, power storage for communities, and new transmission lines.

Fortunately, Canada has a head start when it comes to clean power. Fully two-thirds of our electricity already comes from water, wind and sunshine, giving Canada one of the cleanest grids in the world today. With the right policies in place, shifting from fossil fuels to clean power could become a real area of comparative advantage for Canada.

2022, which was announced after our modelling assessment concluded.)

The policies we selected for this economic modelling analysis met two criteria:

- they have been adopted or proposed by provincial governments in Canada today, and

- they align in general terms with the recommendations in *A Canadian Opportunity: Tackling Climate Change by Switching to Clean Power*.<sup>6</sup>

Thus, Navius’s modelling analysis allows us to quantify the benefit of making today’s leading energy transition policies the national standard.

Table 1 lists the policies we modelled. (For a more detailed description of each policy, see Appendix A.)

**Table 1: Summary of current leading provincial electrification policies**

SECTOR	POLICY	AS IMPLEMENTED OR PROPOSED IN
Personal transport	Zero Emission Vehicle (ZEV) mandate	Quebec
	Financial incentives for plug-in electric vehicles (PEVs)	Ontario
Residential buildings	Net-zero-carbon building code	Ontario
	Financial incentives for net-zero building components	Quebec & British Columbia
Electricity supply	Accelerated coal phase-out by 2030	Alberta
	Clean energy performance standard	British Columbia
Economy-wide	Carbon price <sup>7</sup>	Alberta / British Columbia (price level) & Quebec / Ontario (coverage)

### Canadians Support Clean Growth Policies

Recent polling suggests that the kind of clean growth policies included in this analysis enjoy significant support from Canadians. A survey of 1,000 Canadians from Nanos Research in September 2016<sup>12</sup> found that:

- 62% support or somewhat support establishing a minimum price on carbon emissions across Canada.
- 73% support or somewhat support stopping the burning of coal for electricity by 2030 (the year modelled in this policy package).
- 80% support or somewhat support adopting a new clean fuel standard to reduce the total carbon emissions from the production and use of gasoline and diesel fuel.

The survey also found significant support for the concept of switching from fossil fuels to clean power:

- 77% of respondents support or somewhat support encouraging Canadians and Canadian businesses to switch from using fossil fuels in vehicles and buildings to using clean electricity.
- 82% support or somewhat support technology and infrastructure investment by the Government of Canada that enables provinces to use more renewable electricity.

## Key Findings

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Adopting leading provincial energy transition policies across Canada would generate significant progress towards Canada's climate and clean innovation objectives.

- Carbon pollution would be reduced by **34 million tonnes (Mt) in 2030—enough to close 15% of the gap** between projected emissions in 2030 and Canada's national 2030 target.
- For example, Ontario has committed to a net-zero-carbon building code in 2030. If that became a national standard, we would see a 121% increase in the carbon pollution reductions from that policy by 2035, relative to an Ontario-alone effort. By 2040, **a net-zero-carbon building code across Canada could reduce carbon pollution by 7 million tonnes—equivalent to taking 1.4 million cars off the road that year.**<sup>8</sup>
- By 2050, the policies we modelled would cut emissions in residential buildings—our homes—by more than half, relative to the policies in place today.
- Under our policy package, **the electricity sector would be nearly two-thirds larger by 2050—but the sector's emissions would be nearly two-thirds smaller.** That positive result is due to the combination of phasing out all coal-fired power by 2030 and replacing it with zero-emission power.
- The **direct financial costs of these policies are modest**, ranging from a net gain in the personal transportation sector to a small net cost of 0.3% annually (relative to current policies) for the energy-intensive sectors of the economy.
- Significant new investment in the electricity sector—an annual average of 4.6% more than under current policies, or \$2.8 billion per year—would be required to meet increased demand.
- The policies in this package **would see drivers save money on fuel, and the passenger transportation sector as a whole sees a net financial benefit.** For example, over the lifetime of the vehicle, a driver in Ontario would save over \$14,000 in fuel costs by choosing the electric Nissan Leaf instead of the gas-powered Nissan Versa.
- Under today's prices, and using today's National Energy Board projections of future prices—which do not include an escalating cost of carbon pollution<sup>9</sup>—it typically costs more to heat and cool a home with electricity than with natural gas. However, our assessment found that the impact is relatively modest: the average annual cost per household is \$97 during the years 2021 to 2050, **a price tag equivalent to just 27 cents a day.**
- The package of policies we modelled **are complementary, building on each other to deliver more than the sum of its parts** (as illustrated in Table 2).

**Table 2: Emission Reductions by Policy**

	EMISSION REDUCTIONS RELATIVE TO CURRENT POLICIES (Mt CO <sub>2</sub> e, millions of tonnes of CO <sub>2</sub> -equivalent) <sup>1</sup>			
	2020	2030	2040	2050
<b>Economy-Wide Policies</b>				
Carbon price	12.30	18.72	21.58	23.97
<b>Transportation Policies</b>				
ZEV mandate & EV purchase incentives	0.00	2.53	2.23	1.10
<b>Building Policies</b>				
Net-zero-carbon building code in 2030	0.00	0.00	7.05	15.66
Building incentives	0.80	0.78	0.74	0.87
<b>Electricity Policies</b>				
Coal phase-out by 2030 and clean energy performance standard	5.08	11.54	12.80	12.34
<b>Totals</b>				
<b>Policy package total</b>	<b>18.12</b>	<b>33.77</b>	<b>46.19</b>	<b>55.43</b>
Total of policies implemented individually	18.19	33.59	44.42	53.95
Policy overlap <sup>2</sup>	0.07	-0.18	-1.77	-1.48

Table Notes:

1. Emission reductions are shown for all sectors (i.e., not just those affected by each policy).
2. A positive value for “policy overlap” indicates that abatement from the policy package is less than the sum of each individual policy’s impacts (i.e., the policies have overlapping impacts). A negative value means that abatement from the policy package is greater than the sum of each individual policy’s impacts (i.e., the policies complement each other).

Table 3 demonstrates the emission reduction benefits of extending policies from their “home” province to apply them across Canada. Table 4 breaks down the emission reductions generated by the policy package by province/region.

**Table 3: The Upside of Applying Top Provincial Policies Canada-Wide**

POLICY <sup>10</sup>	PROVINCE	YEAR OF EMISSION REDUCTION ESTIMATE <sup>11</sup>	ANNUAL EMISSION REDUCTION (MT CO <sub>2</sub> E)		% INCREASE IN REDUCTION
			PROVINCIAL ESTIMATE	NATIONAL APPLICATION	
Carbon price	British Columbia	2020	3 <sup>1</sup>	12	310%
ZEV mandate	Quebec	2025	0.1 <sup>2</sup>	1.6	1630%
EV purchase incentives	Ontario	2020	0.007 <sup>3</sup>	0.01	43%
Net-zero-carbon building code in 2030	Ontario	2035	1.6 <sup>4</sup>	3.6	121%
Building incentives	British Columbia/ Quebec	2030	0.45 <sup>4</sup>	0.78	131%

Table Notes:

1. Although Alberta’s proposed carbon price will be higher than that of B.C. after 2018 (it is designed to increase with inflation), it is also newer, and thus there are fewer estimates of policy impacts to draw from. The estimate in this table comes from Government of British Columbia, 2008, Tax Reductions, Funded by a Revenue Neutral Carbon Tax, [http://www.fin.gov.bc.ca/tbs/tp/climate/tax\\_cuts.htm](http://www.fin.gov.bc.ca/tbs/tp/climate/tax_cuts.htm)
2. Québec, 2016, Analyse des avantages et des coûts d’un projet de norme sur les véhicules zéro émissions, Table 14, available from: [www.mddelcc.gouv.qc.ca/changementsclimatiques/vze/analyse-avantages-couts.pdf](http://www.mddelcc.gouv.qc.ca/changementsclimatiques/vze/analyse-avantages-couts.pdf)
3. Ontario Climate Change Action Plan. Action 2: Increase the Use of Electric Vehicles. Scaled abatement from Action 2 “Increase the use of electric vehicles” by funding spent on plug-in electric (PEV) incentives. Assumes similar \$/t among policies. <https://www.ontario.ca/page/climate-change-action-plan>
4. Estimated based on this analysis.

**Table 4: Emission Reductions by Province / Region (Mt CO<sub>2</sub>e)**

	2020	2025	2030	2035	2040	2045	2050
British Columbia	2.5	2.6	2.6	2.9	2.9	3.2	3.7
Alberta	2.1	8.3	11.0	14.1	17.2	20.0	21.7
Saskatchewan	6.2	7.0	6.9	6.7	5.7	5.0	4.6
Manitoba	1.1	1.3	1.4	1.7	2.0	2.3	2.5
Ontario	2.3	5.1	7.0	10.0	12.6	14.8	17.1
Quebec	0.9	1.3	1.3	1.2	1.1	0.8	0.6
Atlantic	3.1	3.7	3.6	4.0	4.5	4.9	5.2



# Building Stronger Policies On Today's Foundations

While there would be significant emission reductions if the policy package we modelled in this report were implemented across Canada, our assessment also shows that even today's "best in class" policies aren't enough to get Canada on track to meet its international climate commitments.

Under the recently ratified Paris agreement, Canada is committed to help keep the rise in global average temperatures to "to well below 2°C," and to "pursue efforts" to keep warming to 1.5°C.

The Deep Decarbonization Pathways Project<sup>13</sup> is an international research project that assesses the kinds of policies individual countries would need to adopt to take the 2°C limit seriously. In their Canadian scenario, electrification policies accounted for 85 Mt of reductions by 2030—more than twice as many reductions as the 34 Mt from the leading policies we modelled.

Fortunately, most of the policies we selected for this analysis can be ratcheted up. For instance:

- A carbon price can increase through a higher tax rate or a tighter cap on emissions. (Indeed, the Government of Canada's recent announcement of a national minimum carbon price of \$50/tonne by 2022 is already higher than the \$30/tonne we modelled in this analysis, based on what was then the leading provincial price level.)
- The incentives that support investments in net-zero buildings or electric vehicles can increase in dollar terms, or be offered for a longer time period.
- Jurisdictions can adopt a net-zero building code for residences faster than today's leader—Ontario—is currently planning. They could also adopt net-zero standards for non-residential buildings.
- The targets and timelines in a zero-emission vehicle standard like Quebec's can be strengthened and accelerated.

## A clean fuel standard across Canada offers big climate benefits

At first glance, British Columbia's low-carbon fuel standard probably doesn't sound like an electrification policy. The standard requires the province's fuel suppliers to sell cleaner fuel, and many companies will meet the standard by blending biofuels into the gasoline or diesel they sell.

However, the regulation also **allows companies to buy credits for the electricity that fuels electric vehicles**—so the policy could provide a significant incentive for the electrification of personal transportation.

Because it's a complex policy with electrification as just one of its goals, we didn't include low-carbon fuel standards in our recommendations of electrification policies via *A Canadian Opportunity*, or in the policy package we modelled based on those recommendations.

However, **a preliminary assessment shows that the policy has significant potential to cut carbon pollution.** The Government of British Columbia estimates that this policy will reduce emissions by more than three million tonnes (3.4 Mt) by 2030. We **estimate that extending this kind of policy across Canada could generate up to 30.5 Mt of reductions—nearly eight times more emission reductions than the policy generates when it is in effect in B.C. alone.** (However, this extrapolation does not factor in the potential interaction with other transportation policies.)

From that initial estimate, we recommend that further modelling research should look in greater depth at the emission reduction potential of national low-carbon fuels policies, and also assess the extent to which such policies could encourage fuel switching from fossil fuels to clean power.



# Policy Recommendations

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Drawing on the findings of this modelling assessment, we recommend:

- Making policies to support a shift from fossil fuels to clean power a priority in the upcoming pan-Canadian climate strategy.
- Adopting today's "best in class" provincial policies nationwide, either because provinces agree to adopt them or because, where jurisdictionally appropriate, the federal government makes them the national standard.
- Those provinces that have adopted leading energy transition policies become champions of their policy choices with their peer jurisdictions. Leading provinces can make a strong case for their policy choices by clearly communicating the benefits of adopting electrification policies, and by assisting other provinces or the federal government in designing effective policies.
- Considering the potential impacts of this package of policies on low-income and vulnerable Canadians, as well as on emission-intensive and trade-exposed parts of the economy. Where warranted, governments can introduce measures to reduce potential impacts on those groups while preserving the incentive to reduce emissions.
- Considering, and adopting over time, stronger policies than today's "best in class" electrification efforts. Federal, provincial and territorial governments could increase stringency both by filling policy gaps—e.g. extending efforts to shift from fossil fuels to clean power into areas outside our modelling scope, such as freight transportation or industrial processes—and by increasing the stringency of today's leading policies over time.

## Appendix A: Policy Descriptions

SECTOR	POLICY	AS IMPLEMENTED OR PROPOSED IN	DESCRIPTION	MODELLED IMPLEMENTATION DATE
<b>PERSONAL TRANSPORT</b>	Zero Emission Vehicle (ZEV) mandate	Quebec	This policy requires automakers to earn a minimum number of ZEV (zero emission vehicle) credits each year by adding electric vehicles to their sales mix, or by trading with other automakers. We assume that it results in plug-in electric vehicles accounting for 12% of new light duty vehicles sold by 2025.	2025
	Financial incentives for plug-in electric vehicles	Ontario	This policy includes incentives for plug-in electric vehicles (PEVs) between 2017 and 2020: (1) \$15,000 per new PEV sold, made up of a \$14,000 purchase price subsidy and a \$1,000 home charging subsidy and (2) free overnight charging, which is estimated to save drivers about \$180 per vehicle per year <sup>1</sup> . After 2020, the incentives drop to zero.	2017-2020
<b>RESIDENTIAL BUILDINGS</b>	Net-zero carbon building code	Ontario	This policy requires that new residential buildings meet near net-zero carbon standards after 2030. It is modelled by requiring new furnaces to emit zero direct greenhouse gas emissions.	2031
	Financial incentives for net-zero buildings	Quebec & British Columbia	Financial incentives are provided for electric heat pumps (\$800 <sup>2</sup> ) and near net-zero carbon shells (\$3,500 <sup>3</sup> ).	2017
<b>ELECTRICITY SUPPLY</b>	Accelerated coal phase-out	Alberta	All coal-fired power plants cease operations by 2030 unless equipped with carbon capture.	2030, as adopted in Alberta (Note: Ontario phased out coal in 2014, but it is clearly too late for those provinces still burning coal in Canada to match Ontario's timeline)
	Performance standard	British Columbia	This policy requires a minimum of 93% of electricity be provided by renewables or by fossil fuel power plants capable of capturing carbon emissions. <sup>14</sup>	2021
<b>ECONOMY-WIDE</b>	Carbon price	Alberta (price level) & Quebec/Ontario (coverage)	A price of \$30/tonne (constant in real terms) is applied to all sources of combustion and process emissions.	2017

Table Notes:

1. Assuming an average annual distance of 15,000 km per PEV and 80% of charging completed overnight.
2. Based on BC Hydro's Heat Pump rebate.
3. Based on Quebec's RenoClimat initiative including incentives for roof, foundation, and exposed floor insulation as well as air tightness.

# Endnotes

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1. This analysis looked only at the energy-intensive sectors of Canada's economy: buildings, transportation and industry.
2. Calculated using the U.S. Environmental Protection Agency's Greenhouse Gas Equivalencies Calculator at <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>.
3. The full report from Navius is available at <http://cleanenergycanada.org/work/building-on-the-best/>.
4. See "A Canadian Opportunity: Tackling Climate Change by Switching to Clean Power" (June 2016), available at <http://cleanenergycanada.org/work/canadian-opportunity-tackling-climate-change-switching-clean-power/>
5. A backgrounder summarizing the federal plan is available at <http://news.gc.ca/web/article-en.do;jsessionid=aba567a6b3ab3ba1d793139cc607d0020b1ebb6d424f6d7f35796788d0cae415.e38Rbhalb3qNe3eMahz0?mthd=index&crtr.page=1&nid=1132169>.
6. Available at <http://cleanenergycanada.org/work/canadian-opportunity-tackling-climate-change-switching-clean-power/>
7. The carbon price we modelled is a "composite" made up of the best elements of today's existing or proposed Canadian carbon prices. British Columbia's tax offers today's highest price, but it will be surpassed by Alberta's tax—which is indexed to inflation—after 2018. Because they include emissions from both combustion and other industrial processes, Quebec's current—and Ontario's forthcoming—cap-and-trade systems offer Canada's strongest coverage of emissions across the economy. Thus, we modelled a national carbon price that combines the price level we see in B.C. and Alberta with the coverage achieved in Quebec and Ontario.
8. Calculated using the U.S. Environmental Protection Agency's Greenhouse Gas Equivalencies Calculator at <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>.
9. The National Energy Board's most recent energy market projections "only include policies and programs that are law at the time of analysis." However, the analysis also notes that "future policies related to climate change represent a key uncertainty for Canada's energy outlook." See *Canada's Energy Future* 2016, p. 19, <https://www.neb-one.gc.ca/nrg/ntgrtd/ft/2016/2016nrgft-eng.pdf>.
10. Because estimates of the impact of British Columbia's clean energy performance standard would rely on counterfactual projections of electricity decision-making, and because we modelled that policy as a package along with a national coal phaseout, we have not included the nation-wide impact of the electricity supply policies in this table.
11. Because this table draws on public estimates wherever possible, ideally from government sources, the base years for emission estimates vary.
12. Nanos Research conducted completed a random survey of 1,000 Canadians, 18 years of age or older, between September 24th and 27th, 2016 as part of an omnibus survey. The margin of error for a random survey of 1,000 Canadians is  $\pm 3.1$  percentage points, 19 times out of 20. Report detailing the findings of the Nanos survey is available at <http://cleanenergycanada.org/poll-canadians-want-federal-leadership-climate-change/>.
13. <http://deepdecarbonization.org/about/>
14. British Columbia's August 2016 *Climate Leadership Plan* committed to strengthen the standard from 93% to 100%: "Going forward, 100 per cent of the supply of electricity acquired by BC Hydro in British Columbia for the integrated grid must be from clean or renewable sources, except where concerns regarding reliability or costs must be addressed." See [https://climate.gov.bc.ca/wp-content/uploads/sites/13/2016/06/4030\\_CLP\\_Booklet\\_web.pdf](https://climate.gov.bc.ca/wp-content/uploads/sites/13/2016/06/4030_CLP_Booklet_web.pdf), p. 28.

