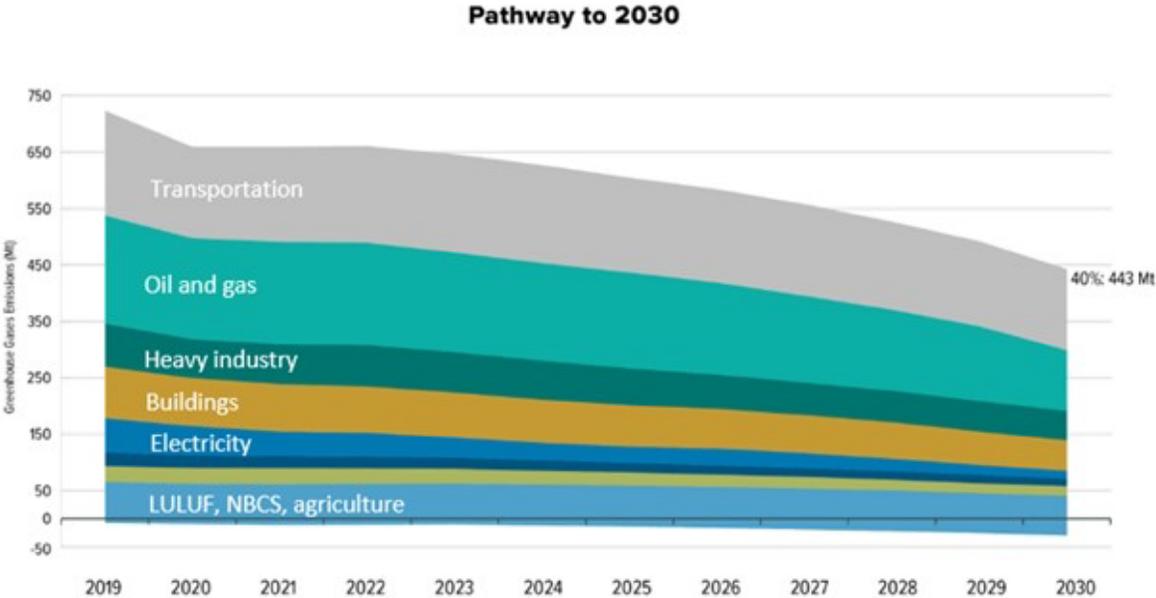


# EMISSION IMPOSSIBLE

## Why Canada’s 2030 emission reduction plan won’t work

by Martin Bush

The Canadian government’s 2030 Emissions Reduction Plan is pinning its hopes on two key technologies. There’s just a slight problem: one doesn’t exist, and the other doesn’t work. What could possibly go wrong?



Canada’s plan for a reduction in GHG emissions by 2030

The government’s plan, released in late March, is based on modelling conducted by Environment and Climate Change Canada which, according to the plan, generates the most “economically efficient pathways” for Canada to follow in order to achieve the emission targets set by the government in 2021. The government’s objective is to reduce greenhouse gas (GHG) emissions by between 40 and 45 percent from 2005 levels by 2030. In 2005, GHG emissions were 739 million tonnes of carbon dioxide equivalent (MtCO<sub>2</sub>e), so a reduction of 40% of this value would indicate a 2030 target of 443 MtCO<sub>2</sub>e.

The ERP takes a sectoral approach, outlining a suite of actions and, in most cases, substantial funding for each of the seven sectors reviewed. These are (in decreasing order of their contribution to Canada's GHG emissions).

- Oil and gas, 26%
- Transportation, 25%
- Buildings, 12%
- Heavy industry, 11%
- Agriculture, 10%
- Electricity, 8%
- Waste and other, 7%

The three largest GHG emitters are the oil and gas sector, transportation, and buildings, which together account for almost two-thirds of Canada's emissions. But there's a problem: between 2005 and 2019, *each of these three sectors significantly increased their GHG emissions.*

- Oil and gas by 19.4%
- Transportation by 16.3%
- Buildings by 8.3%

Agriculture showed little change; electricity, heavy industry, waste and 'other' all recorded a reduction in emissions. The largest decline was in the electricity sector, which registered a 48% decrease in emissions from 2005 to 2019, mainly due to the closure of a number of coal-fired power plants in several provinces.

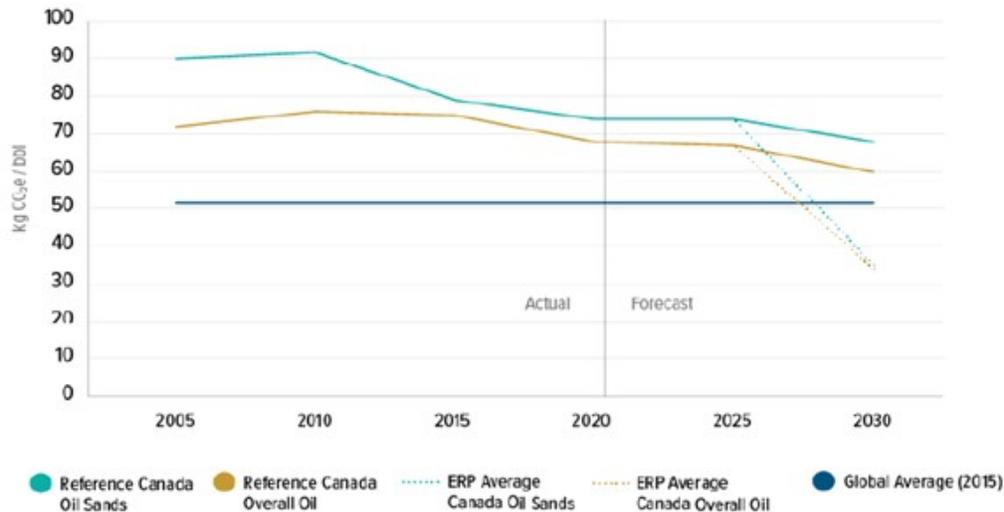
The principal question is therefore this: how does the government intend to reverse this trend for these three key sectors—each of which has *increased* its emissions over the last fifteen years.

## Oil and gas

Although the emission intensity of oil and gas production in Canada has declined, the increased production over the last several decades from the tar sands in Alberta has far outpaced this decline.

It is not clear how the government intends to reverse this trend. In fact, the government apparently believes that the reduction in emissions has already begun; the ERP states: "Canada's oil sector will need to continue to drive down emissions and costs to remain competitive." But there is absolutely no sign that GHG emissions from the oil and gas sector are declining.

## CANADA OIL CARBON INTENSITY VS GLOBAL AVERAGE



Rather than directly address the central question of how to reduce GHG emissions from the sector, the ERP prefers to focus on the carbon intensity of each barrel of oil produced by the industry. The report then presents what is perhaps the most ridiculous graphic ever published in a Canadian government document.

The ERP asks us to believe that the carbon intensity of Canada’s oil production will miraculously take a nosedive some time around 2025 and rapidly drop down to way below the global average. The text that accompanies this graph does not say how this feat is to be achieved, only that “the federal measures outlined in this plan will ensure that Canadian oil and gas production becomes less emissions intensive.” But reducing the carbon intensity of each barrel of oil counts for little if the number of barrels being produced continues to rise; and that appears to be the case: the Canada Energy Regulator’s ‘evolving policy’ forecast is for Canada’s crude oil production to increase by 24.3 % from 2020 to 2030; most of this production will come from Alberta.

To meet the 2030 target, the government’s plan to reduce emissions from the oil and gas sector relies on four lines of action:

- Capping emissions,
- Advancing carbon capture, storage and utilization,
- Further reducing methane emissions,
- Eliminating subsidies for fossil fuel.

Capping emissions: the problem here is that the report doesn’t say what the cap is; only that the government is “considering a range of options to achieve these emissions reductions.” Measures to cap emissions from the oil and gas sector, if strictly applied and

legally enforceable, would show that the government is serious about reducing emissions from the sector. It all depends, of course, on the level of the cap; but for the moment the government is silent on this question.

**Advancing carbon capture, storage and utilization.** Generally referred to as CCUS (or CCS if only storage is proposed), considerable financial resources are being directed to improving the performance of this technology; but despite the millions of dollars invested so far in research and development there is little to show for it. The Quest plant operated by Shell in Alberta has achieved only modest amounts of **carbon capture** (less than 50%) when emissions from the complete process including CO<sub>2</sub> absorption, compression, pumping, and storage are taken into account. Companies seeking government funding have regularly asserted that 95% of CO<sub>2</sub> can be captured, but this performance has yet to be demonstrated and does not take into account the emissions from the full range of engineering processes involved, including the upstream fugitive emissions of methane—a much stronger greenhouse gas than carbon dioxide.

In an unprecedented move, in January this year, over 400 Canadian university professors and colleagues wrote an **open letter** to Chrystia Freeland, Deputy Prime Minister and Minister of Finance, urging the government not to introduce an investment tax credit for CCUS, stating that the technology is neither “economically sound nor proven at scale, with a terrible track record and limited potential to deliver significant, cost-effective emissions reductions.”

A **recent review** by the Institute for Energy Economics and Financial Analysis of 27 carbon capture projects currently operating around the world found that “no natural gas-fired electrical power plant in the entire world currently uses CCS and none are expected to open until 2025. Moreover, natural gas combustion is expected to require greater energy input than coal combustion to achieve a high capture rate.” It is entirely possible that the deployment of carbon capture and storage technology results in absolutely no reduction in GHG emissions if fossil fuels are the source of thermal energy and electrical power for the process.

**Further reducing methane emissions.** Several recent scientific publications have shown that the emissions of methane from oil and gas operation are much larger than many government agencies have reported. Given the high value of the ‘global warming potential’ of methane, the reduction of these emissions from the oil sands installations is a priority. But the ERP provides no details about how this is to be accomplished, except for proposing that the approach should be ‘holistic’. In practice, reducing fugitive emissions of methane from bitumen processing and upgrading is difficult because leaks and losses emanate from a multitude of dispersed sources in and around the high-pressure network of pipes conveying the gas. Moreover, methane is colourless and odourless, which makes emissions hard to identify and control.

**Eliminating subsidies for fossil fuels.** The Canadian government has been promising to eliminate fossil fuel subsidies for years, so a repetition of this supposed commitment is almost meaningless. Moreover, the government’s commitment is only to reduce or

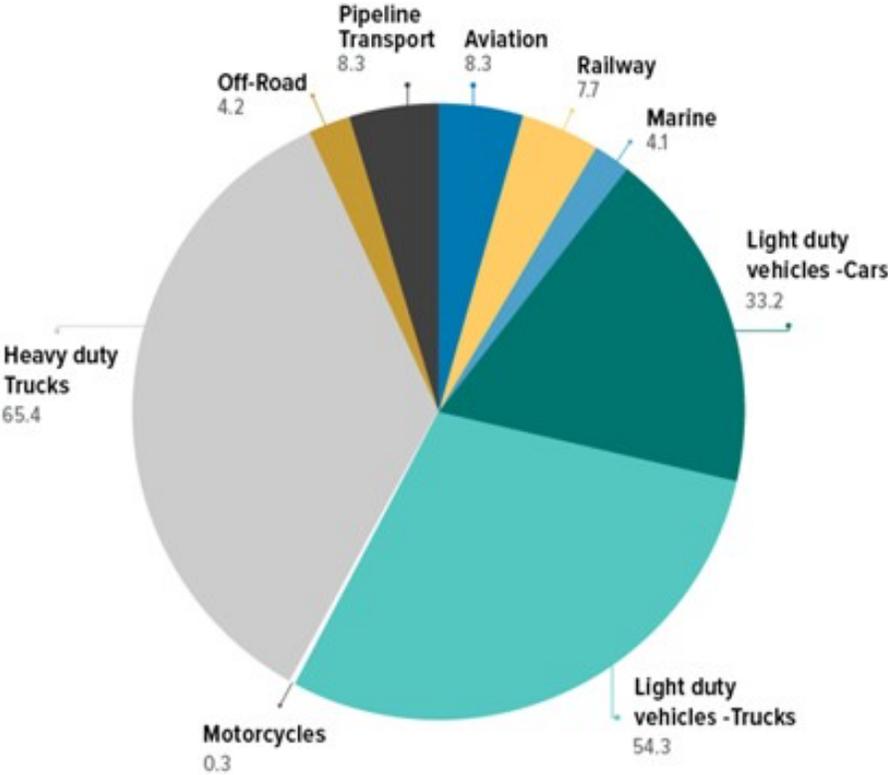
eliminate 'inefficient' subsidies, but since this characteristic is not defined it allows the government to take absolutely no action, arguing that no 'inefficient' subsidies have yet been identified.

The government's plan to reduce emissions from the oil and gas sector by 2030 is almost certain to fail if the production of crude oil continues to increase—which is precisely the scenario forecast by the CER in its 'evolving policies' model.

## Transportation

According to the ERP, the emissions from transportation are only slightly less than emissions from the oil and gas sector, but the report notes that, regionally, transportation is the highest source of emissions in the majority of provinces and territories. Unsurprisingly, most emissions, 81%, come from road vehicles, the majority of which are still powered by internal combustion engines (ICE). A rapid transition to electric vehicles is clearly the key to substantially reducing emissions from this sector.

**2019 CANADA'S TRANSPORTATION EMISSIONS (Mt CO<sub>2</sub>e)**



The ERP sets out the measures that the government has taken so far, and what is planned for the future. There is no doubt that the transition to electric vehicles (EV) is

well underway in Canada. The question is whether the government is doing enough to expedite this essential transformation of the transport sector.

Canada's 'zero emission vehicle' (ZEV) market share for light duty vehicles increased from 3.1 % in 2019 to 5.6% in 2021. Over 94% of sales are in just three provinces: British Columbia, Ontario, and Quebec. But there is clearly room for improvement. According to the ERP, over half of dealerships in Canada do not have ZEVs available to purchase or test-drive and only 13% of small businesses and 19% of large businesses have adopted some form of zero emission vehicles.

The government commitments include a range of measures that promote EVs and their charging infrastructure, including a mandate that 100% of light-duty vehicle sales will be zero emission vehicles (ZEVs) by 2050.

But the ERP does not set any targets for the reduction in emissions; only sales targets are set and, for MHDVs, only where this is judged to be 'feasible'. Since feasibility is not defined, It is difficult to accurately predict the reduction of GHG emissions resulting from the government's portfolio of measures promoting the sale of zero emission vehicles.

The ERP correctly notes that "building a zero-emission public transit system across Canada is a key step to cutting emissions, while helping people get around faster, safer and cheaper." However, the report is silent when it comes to funding: none of the seven 'additional investments' in the transport sector proposed in the ERP relates to public transit—only to ZEVs and their charging infrastructure.

The lack of funding for public transit systems across Canada is a striking omission in the ERP. Although strong support for the transition to zero emission vehicles and their charging infrastructure is a priority, the development of extensive, fully electrified public transit systems is equally important. While the widespread adoption of ZEVs will keep urban air cleaner and reduce pollution, cities need more green spaces and pedestrian areas, and fewer inner-city roads and multi-lane highways congested with cars and heavy-duty vehicles—even if they are all electric.

## **Buildings**

Buildings account for 12% of Canada's GHG emissions; however, when off-site electricity generation is factored in, the sector accounts for about 17% of emissions. Over 85% of the emissions are generated by water and space heating due to the widespread use of natural gas as fuel.

Strict building codes that ensure that buildings are extremely energy-efficient is the key measure for reducing emissions from the sector. However, under Canada's constitution, provinces and territories regulate the design and construction of new houses and buildings. While the national model codes (building, fire, plumbing, and energy codes) are prepared centrally under the direction of the Canadian Commission on Building and Fire Codes, the adoption and enforcement of the codes are the responsibility of the provincial and territorial jurisdictions.

A range of government actions are proposed to help reduce emissions from the building sector. However, no targets are proposed, either for the number of property owners accessing grants programs for retrofits, or in terms of the reduction of GHG emissions from the sector. Given that the number of buildings in Canada is presumably increasing, driven by demographic trends and economic growth, it is a dubious claim for the government to assert without any supporting data that emissions from the buildings sector will decline from now until 2030.

## A failing plan

If the government's 2030 Emission Reduction Plan is to lead to at least a 40% reduction in Canada's total GHG emission by 2030, it is essential that the measures proposed in the plan offer convincing evidence that the three sectors profiled above: oil and gas, transportation, and buildings, will each lead to emission reductions close to or exceeding this level. But this is clearly not the case.

For the oil and gas sector, a very high level of performance of a still unproven technology, carbon capture and storage, is a *sine qua non* for the sector to achieve a significant reduction in emissions. All the evidence from a wide variety of sources suggests that CCS technology is not going to result in any significant reduction in emissions for the industry. Not by 2030 and perhaps not ever, when the full extent of GHG emissions over the entire process, from fossil fuel extraction to the underground storage of carbon dioxide is taken into account. The declining carbon intensity of oil production in Canada doesn't change the fact that the oil and gas sector will *always* produce emissions of greenhouse gases. It is physically impossible to extract, convey, and process hydrocarbon fuels without producing emissions of methane and carbon dioxide and, if the fuels are produced by mining bitumen in Alberta, very considerable disruption and degradation of the local environment.

For the transportation sector, there is no doubt that the transition to zero emission vehicles is underway. But the uptake of electric vehicles in Canada lags far behind the adoption of EVs in several other countries. The government has set a target for the *sales* of only one segment of the market: light duty vehicles (which is mainly cars). The lack of specific targets for light, medium-duty, and heavy-duty trucks means that it is impossible to know to what extent emissions from the sector will decline by 2030.

Reducing emissions from buildings depends on a twin track approach: strengthening building codes so that new construction is more energy efficient and supporting programs that provide funding that enables existing buildings to be retrofitted so that they also meet energy efficiency standards. Although it is the provinces and territories that are responsible for developing and applying building codes, the federal government should find a way to collaborate and partner with provincial governments to ensure that provincial building codes match the federal standards and that retrofit programs are being strongly promoted, fully funded, and are widely available.

As an example, whereas Canada's federal Green Homes Grants program is limited to a derisory \$5000, Toronto's Home Energy Loan Program ([HELP](#)) offers grants of up to

\$125,000. This covers a wide range of essential home energy improvements including high efficiency furnaces, boilers, and air conditioners; air source heat pumps; electric vehicle charging stations; battery storage; and improved insulation, air sealing and caulking. HELP is a municipal program where the loan is repaid through property taxes—which is the most effective way for homeowners to access funding for retrofits and to conveniently repay the loan. The federal government should introduce programs where substantial federal loans to municipalities would support the wider rollout of programs like HELP across Canada.

The 2030 Emissions Reduction Plan is very much a business-as-usual narrative. It assumes that the oil and gas industry will continue to grow—with its pollution conveniently cleaned up by a new helpful technology: carbon capture and storage—essentially a get-out-of-jail-free card for the industry. It simply isn't going to work. Large petrochemical plants conveying gas phase fossil fuels over long distances under pressure will always have fugitive emissions. Higher ambient temperatures and heat waves driven by climate change will only make matters worse, as flanges strain and pipes expand and shift in the heat. Moreover, when production is disrupted by extreme weather: hurricanes, tornadoes, wildfires, and floods, engineers and plant operators scramble to shift operations to a stand-by status and this change of operations not infrequently involves flaring gases and dumping liquids into adjacent waterways just to bring the petrochemical plant to a lower and safer level of operation.

The EPR also relies heavily on the assumption that substantial levels of electrical power will be generated from small modular reactors (SMRs) before 2030. But although an SMR design will perhaps be able to generate power safely by the end of the decade, the cost of this electricity will be several times higher than the cost of power from solar, wind, and hydro. By 2030, it may well be wind power that is too cheap to meter.

## Missing in action

The ERP is also notable not for what it discusses but for what it ignores.

The massive potential of offshore wind across Atlantic Canada is not even mentioned, and the critical importance of the Atlantic Loop interprovincial transmission system is awarded a derisory few million dollars to support further studies. A pan-Canadian high-voltage direct current transmission network is the key to a net zero emissions future for Canada.

The game-changing potential of vehicle to grid (V2G) technology in electricity demand management is not mentioned. Nor is hydropower pumped storage—likely to be a critical element of eastern Canada's and British Columbia's shift to 100% renewable energy. But by 2030, large MW-scale battery storage systems are likely to be commonplace and so cost-effective that every province will have dozens of them located across the peri-urban landscape, each communicating with the others and to the V2G network that maintains perfect grid stability and dispatchability even with 100% renewables.

Finally, the future hydrogen economy is mentioned only in passing. Yet it is an important adjunct to GW-scale windpower where excess electrical energy is directed towards electrolytic hydrogen production that fuels the chemical and metallurgical industries that have genuine difficulties staunching the flow of waste stream carbon dioxide.

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