

**Problematic unknowns in Canada's net-zero by 2050 climate plan:  
the magnitude of "remaining emissions" and the  
feasibility of promised "emissions removals"**

**Proposed amendments to Bill C-12 to strengthen public accountability**

*A submission to the Standing Committee on Environment and Sustainable  
Development for its study of Bill C-12*

May 14, 2021

Standing Committee on Environment and Sustainable Development  
House of Commons  
Sixth Floor, 131 Queen St.  
Ottawa On, K1A 0A6

**Re: Amendments to Bill C-12: strengthening public accountability on key issues**

## INTRODUCTION

The value and purpose of Bill C-12, if carefully designed in its enacted form, is to establish a framework that will effectively guide the development of a climate policy for Canadians offering a realistic chance of achieving the promised “net-zero” emissions outcome by 2050.

An essential feature of an effective framework is that it requires the government to disclose in a timely way key information to Canadian citizens so that constituents (many of whom are parents of children who, in thirty years, will be burdened with the situation we bequeath to them) have the essential information they need to properly assess the efficacy of promised new climate measures. An informed electorate is the foundation of a Parliamentary democracy.

In this submission, we identify four crucial features of Canada’s newly announced climate plan that we believe are lacking particulars on fundamental aspects of the plan essential to assess the viability and feasibility of the overall scheme. In the absence of important amendments to Bill C-12 to require disclosure of additional key information, the value and purpose of the legislation will be nullified. These four key points are:

1. The concept of “net-zero emissions by 2050”, as it is presently framed, offers no meaningful criteria to guide government decision making and the development of future policy. It denies the electorate any means of measuring the “success” or failure of Canada’s progress by 2030 towards meeting the promised net-zero emissions goal.
2. The ability of the electorate to assess this climate plan is impaired by the absence of any government study or scenario showing the projected *future level of Canada’s oil production* that would be consistent with achieving global net-zero emissions by 2050. The government has refused to disclose data on that essential point.
3. The climate plan envisions a prominent role for CCUS technology to reduce emissions particularly in Canada’s oil and gas sector, but no information has been publicly disclosed to show the amounts of CO<sub>2</sub> that would be sequestered, for example by 2030, using CCUS. And even large-scale deployment of CCUS will do nothing to reduce growing downstream emissions from Canada’s expanding oil output, which have global significance in terms of rising CO<sub>2</sub> emissions and climate change.
4. With respect to the newly promised April 22, 2021 target to reduce Canada’s emissions 40% to 45% by 2030 below the 2005 level, the absence of any data showing projected

*sectoral reductions* precludes any opportunity for constituents to assess the plausibility of the promised 40% to 45% reduction, and makes it impossible for constituents to assess whether current policies, for example the ongoing expansion of oil sands production and LNG development, are commensurate with the promised sectoral reductions.

In preparing this submission, we have reviewed *A Healthy Environment and a Healthy Economy* released on December 11, 2020, and its accompanying Annex including Tables 1 and 3; and the Canadian Energy Agency's report *Canada's Energy Future 2020*, released November 24, 2020.

## I. "Net-zero by 2050": disclosure of significant emissions information required

The announcement on November 19, 2020, that Canada has adopted a more ambitious climate plan to achieve "net-zero by 2050" does not reveal the size of the actual reduction of Canada's current emissions that will have to be achieved by 2050 to successfully implement that plan.

In the most recent available data, greenhouse gas emissions in all seven sectors of the Canadian economy in 2019 totalled 730 million tonnes (Mt) of CO<sub>2</sub>eq.<sup>1</sup> Canada's formal commitment under the 2015 Paris Agreement (our Nationally Determined Commitment or "NDC") was to reduce our emissions 30% by 2030, below 2005. The 2005 level was 739 Mt. Canada's NDC is 511 Mt. A more ambitious target of 503 Mt was offered on December 11, 2020. On April 22, 2021, a new promise to achieve a reduction of 40% – 45% by 2030, which would be 401 Mt.

What exactly is the government promising we will do by 2050?

A key promise underlying Canada's new plan is that "negative emissions technologies" will allow us to effectively *remove* CO<sub>2</sub> from the atmosphere and do that on a sufficiently large scale to ensure that by 2050 all further emissions released by Canada into the atmosphere are "balanced" by "emissions removals". The ultimate goal is to ensure that the concentration of CO<sub>2</sub> in the atmosphere does not exceed the critical threshold that will lead to average global surface temperature rising above 1.5°C. But the future availability of the promised technologies remains a conjecture.

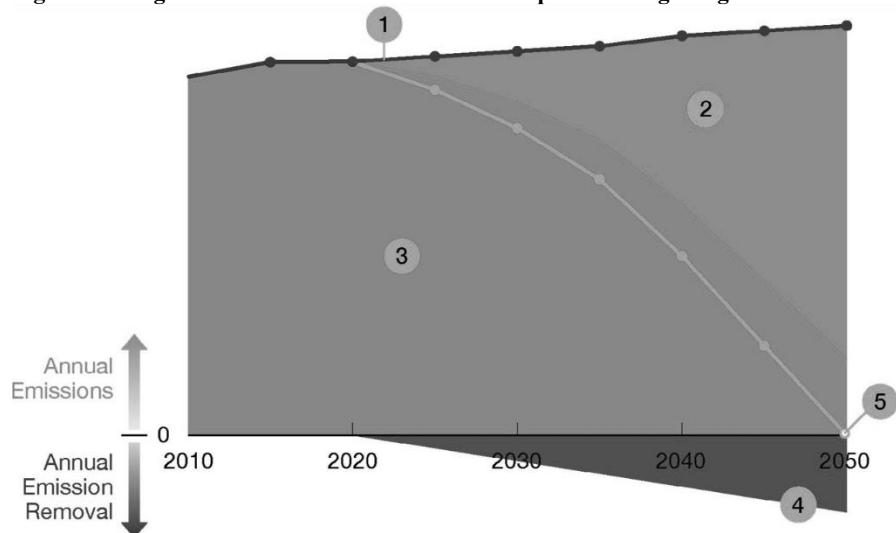
A graph published in *Canada's Energy Future 2020* ("CER Report")<sup>2</sup> explains the basic "net-zero" concept. It appears as Figure NZ.1, under the title "Illustrative Example, the GHG Emissions Remaining after Mitigation and Emissions Removal". We reproduce it here as Figure A. In the report, a brief paragraph adjacent to the graph tells us only this:

*Reaching net-zero emissions does not necessarily require eliminating all emissions everywhere. Instead, residual emissions can be balanced by enhanced biological sinks and negative emissions technologies.*

— CER Report, page 67 (emphasis added)

The vertical axis measures the level of annual emissions, depicted as starting to decline in 2020. But there is no scale or actual numbers to tell us what the reduced level of Canada's emissions is supposed to be by 2050 or, in the terminology of this plan, what the projected amount of "residual emissions" might be in 2050. It is not a plan. It is just a sketch of a concept.

Figure A: Diagram described as “Illustrative Example” showing mitigation and residual emissions



Source: *Canada's Energy Future 2020*, November 24, 2020, Figure NZ.1 at p.67

The text of the document tells us that numeral “3” on the diagram represents what the amount of “remaining emissions” (the same thing as “residual emissions”) will be in 2050. As can be seen on the far right-hand side of the diagram, by 2050 a substantial but *unspecified* volume of emissions is still being released into the atmosphere. Hypothetically offsetting that volume of remaining emissions, an equivalent volume of “emissions removals” (represented by numeral “4”) is assumed to be achieved in 2050 to ensure that the overall result for that year will be “net-zero”. Numeral “5” is said to represent “net emissions”, because it assumes that “removals” by 2050 will balance remaining emissions.

Therefore, the sketch envisions that if we fail to adopt new policies within the next thirty years to achieve the needed deep reductions by 2050 (i.e., mitigation policies that allow us to massively reduce our emissions by ending our dependence on coal, oil, and natural gas) or if we choose not to do so, we can halt any further increases in the cumulative amount of CO<sub>2</sub> in the earth’s atmosphere by deploying new technologies that will have the capacity to actually *remove* CO<sub>2</sub> from the atmosphere.

The concept assumes, or promises, that massive installations of CCUS technology (“Carbon Capture, Utilization, and Storage”)<sup>3</sup> and other future technologies will allow us to declare, by 2050, that we have ceased “net additions” to the cumulative amount of carbon in the atmosphere. Meeting that promise, of course, is left to the world’s children and they will bear the economic burden of that. CCUS, which has already been adopted at a limited number of sites around the world including two installations in Alberta, has the capability to capture and separate CO<sub>2</sub> from the flue gases at large industrial facilities (but it is not a “direct air removal” technology and therefore its application is limited to industrial sources at fixed sites). It has not yet proven to be economically viable for large-scale deployment. Other proposed future technologies, referred to generically as CDR technologies (Carbon Dioxide Removal) or “engineered negative emissions solutions” envision methods that will allow CO<sub>2</sub> to be directly removed from the atmosphere

(“direct air removal”) and hybrid schemes such as BECCS (bioenergy combined with CCUS). These technologies either do not exist or exist at a very small-scale experimental stage.<sup>4</sup>

A core feature of the “net-zero by 2050” scheme is the concept of “residual” or “remaining” emissions. That refers to the amount of annual CO<sub>2</sub> emissions and other greenhouse gases (i.e., methane and nitrous oxide, etc.) that will continue to be released into the atmosphere in 2050 and that will continue for some decades after that, although the report’s graph suggests that sometime after 2050 a transition to new energy technologies will gradually diminish the size of those ongoing emissions.

In this scheme, the size of the “remaining emissions” by 2050 is a crucial “unknown” that will make the difference between a *possibly* viable outcome (if the remaining emissions are very small) and one that masks a pathway to catastrophic failure (if the remaining emissions are very large and beyond our capacity to remove). The outcome depends on the magnitude of the “remaining emissions” by 2050 and whether the promised technologies by then are viable.

If Canadians are told that their new plan envisions that Canada will still be releasing, for example, 300 Mt a year of “remaining emissions” by 2050, we would at least know exactly what “net-zero” means in this context. It would mean our children (and their children) are going to be responsible for figuring out how to remove 300 Mt of CO<sub>2</sub> from the atmosphere by using CDR technology, and to do that every year until Canada manages to reduce its “remaining emissions” down to zero.

There is another problem. If relying on this vague and uncertain “plan” we continue to allow high levels of emissions for another ten years in Canada, by the time we discover – for example sometime in the early 2030s or later – that needed CDR technologies are not in fact going to be viable, or not viable on the scale required, it will be too late to get our emissions under control.

From the perspective of Canadian citizens, the government’s “net-zero by 2050” plan as it presently exists is meaningless, for the reasons we have stated above. It leaves entirely undefined in quantitative terms the envisioned level of Canada’s “remaining emissions” by 2050.

The government during the past ten years has routinely published detailed projections of Canada’s total emissions to 2030. Many international organizations and scientific bodies publish projections of global emissions to 2040 and 2050. It is entirely within the capability of our government to develop and publicly disclose meaningful projections of what Canada’s total emissions are expected to be by 2050 (that number will be our expected “residual emissions”) including sectoral emissions data showing what the expected level of emission will be for each economic sector by 2050 (i.e., transportation, oil and gas sector, heavy industry, etc.). Those numbers can be developed based on “current policies” (measures already implemented) and alternate scenarios can also be developed based on promised “new policies” (or “new initiatives”) announced but which are not yet implemented. These projections should be published annually or bi-annually, in a format like *Canada’s Fourth Biennial Report*.

In the absence of that kind of disclosure, Canadians will have no means to assess whether actions being taken by their government are consistent with the promised goal of “net-zero by 2050”.

## Recommendation:

- 1.1 Bill C-12 be amended to require that the government annually or bi-annually develop and publicly disclose projections showing the expected level of Canada’s “remaining emissions” in 2050, including sectoral projections showing anticipated emissions for each of Canada’s seven economic sectors.**
- 1.2 That a provision also be included in the amended Bill C-12 requiring the government annually or biannually to prepare and publicly disclose estimates showing the anticipated capacity by 2050 to achieve “emissions removals” in Canada, including particulars showing the types of technology to be relied on (i.e., CCUS, BECCS, and any envisioned “direct air removal” technologies).**

## 2. Canada’s projected oil production: disclosure of emissions data required

The CER Report shows that, under the Reference Case, a small dip in production is expected to occur in 2020 (reflecting a temporary decline of global oil consumption due to the Covid-19 pandemic) but indicates that by 2021 production will pick up and exceed the 2019 total. Thereafter, under the Reference Case, total oil production in Canada continues to increase to 2045. After 2045, a very gradual decline begins. The production data reproduced in Figure B is taken from the data sets that supplement the CER Report:

**Figure B: Reference Case (thousands of barrels per day)**

	<b>2019</b>	<b>2030</b>	<b>2040</b>	<b>2045</b>	<b>2050</b>
Canada’s total oil production	4,928.77	6,224.17	7,056.45	7,152.76	7,077.20
Oil sands share	3,126.07	3,936.29	4,321.99	4,322.55	4,256.14

Source: *Canada’s Energy Future 2020*, November 24, 2020.

In summary, under the Reference Case, total oil production continues to expand for twenty-five more years. Output “peaks” in 2045 at 7.1 million bpd – more than 2.2 million bpd above the 2019 level.

Figure C below shows the projected growth of Canada’s oil production based on an alternative scenario (the Evolving Scenario) which assumes global oil demand will grow more slowly. This new scenario, not previously published by the CER, represents what would happen to Canada’s oil production if global oil demand grows more slowly (reflecting the impact of more stringent policies around the world aimed to limit carbon emissions). More stringent policies will lower oil consumption in other countries and result in oil prices lower than they are under the Reference Case. Lower world oil prices will constrain Canada’s own production:

**Figure C: Evolving Scenario (thousands of barrels per day)**

	<b>2019</b>	<b>2030</b>	<b>2040</b>	<b>2045</b>	<b>2050</b>
Canada's total oil production	4,928.77	5,538.55	5,797.91	5,563.00	5,260.62
Oil sands share	3,125.87	3,716.19	4,002.88	3,872.45	3,708.92

Although the Evolving Scenario envisions a more constrained pace of expansion and an earlier “peak”, there is still by 2050 no absolute reduction in the level of Canada’s total oil production, below 2019. Based on the Evolving Scenario, production keeps growing every year to 2039, when it “peaks” at 5.8 million bpd. By 2050, under this supposedly more climate-friendly scenario, Canada’s oil sands production by 2050 will still be higher than it was in 2019.

Therefore, even under the Evolving Scenario (if it were to reflect the actual pathway of future crude oil production in Canada over the next thirty years), Canada would contribute nothing to any global effort to achieve the very substantial reduction in global oil use required by 2030 – and nothing to achieve the much more massive reduction needed before 2050.

The available evidence is clear that *global* oil production will have to decline rapidly to have any realistic chance of meeting “net-zero” emissions on a global scale. Subject to large-scale deployment of CDR technologies that “remove” CO<sub>2</sub> from the atmosphere, net-zero would require virtually eliminating all releases of carbon dioxide, methane, and nitrous oxide and other greenhouse gases from all industrial activities and land use activities by 2050. At present, emissions from consuming crude oil account for 35% of all emissions in the world from burning fossil fuels. Emissions from coal, oil, and natural gas account for 70% of all CO<sub>2</sub> emissions. No credible study suggests that “net-zero” can be achieved without deep cuts in global oil consumption, substantially below current levels.

Looking forward over the next 10 to 30 years, the important question is: what is a safe level of global oil demand – what level is consistent with a safe climate outcome? The International Energy Agency (IEA) has concluded that to have a 66% probability of keeping the increase in the earth’s average surface temperature to 1.8°C, by 2030 total global oil production must decline by 10 million barrels per day (bpd) below the 2018 level and must decline 30 million bpd below the 2018 level by 2040 (in 2019 world production was 98 million bpd).<sup>5</sup>

In contrast, Canada’s new data published in the CER 2020 Report projects our production will continue to grow until 2045, when it will be 2 million bpd above our 2019 production level.

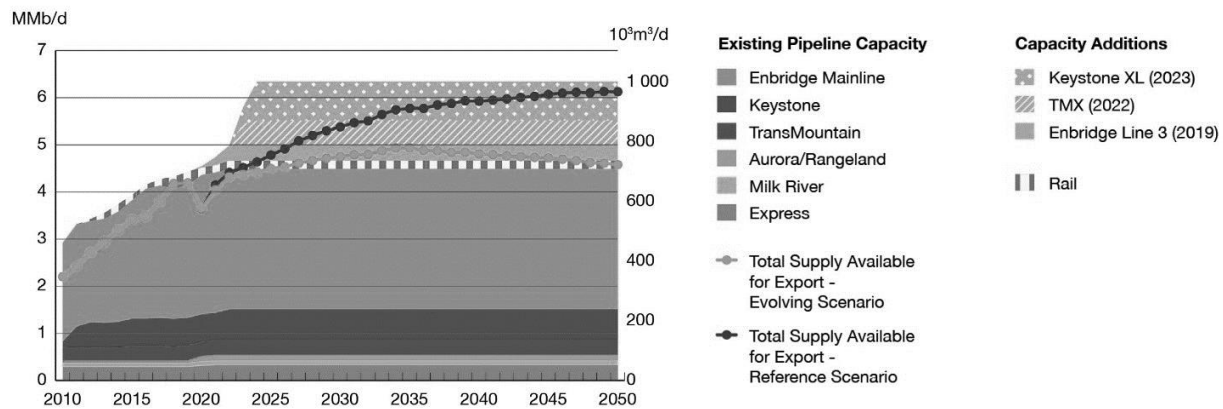
The *Canada’s Energy Future 2020* report is almost completely silent about any need to substantially reduce the level of oil production in Canada (or to curb the current rate of expansion to anything more stringent than the Evolving Scenario) – but not entirely silent. It doesn’t offer any appraisal of whether the rate of growth of oil production in Canada will eventually slow down to something like the Evolving Scenario. Yet, a brief statement towards the end of the document acknowledges that the reduced production level shown in the Evolving Scenario would not be sufficient to meet Canada’s recently announced “net-zero by 2050” goal:

*It is also clear that Canada’s more ambitious goals, such as achieving net-zero by 2050, will require faster transition than we have witnessed historically and faster than is shown in the Evolving Scenario. Recognizing this fact, we have introduced a “Towards Net-zero” section in EF2020.*

— CER Report, page 62 (emphasis added)

Having conceded in that sentence that the Evolving Scenario is insufficient,<sup>6</sup> the report fails to offer any assessment of *how much lower* future output levels over the next thirty years would need to be in order to be consistent with the “more ambitious goals” promised by the government. Figure D shows the difference between the Reference Case and Evolving Scenario:

**Figure D: Planned new pipeline capacity, and projected future oil production to 2050**



Source: *Canada’s Energy Future 2020*, November 24, 2020, Figure R.12 at page 44

Canada exports 80% of its total oil production. Figure D shows the available supply for export under the two scenarios. The Reference Case, shown by the top black dotted line, curves up to just above 6 million bpd of available supply by the mid- and late 2040s – and that level of available supply, according to the CER Report analysis, would utilize all of the currently planned 1.740 million bpd of new pipeline capacity.

But the striking feature of this graph is that it shows, according to the Canada Energy Regulator’s analysis, that if Canada’s oil production is modestly reduced over the coming decades in line with the Evolving Scenario, the proposed new capacity provided by both the Keystone XL and by the Trans Mountain project *would not be required*. The Evolving Scenario is depicted by the lower dotted line, which more gently curves up to about 5 million bpd of available supply in 2035-2040.

Therefore, an accurate and publicly available projection showing the expected level of Canada’s oil production consistent with achieving net-zero global emissions by 2050 is an essential element of the information needed by government to make good policy. For the same reasons, that information is needed so that constituents (the foundation of our Parliamentary democracy) can participate in the political process as informed electors.



What Canadian citizens do not yet have, from either the CER or Environment Canada or any other department of government, is a scenario or projection showing how much lower the level of Canada's crude oil production would have to be (i.e., a production level that we know must be less than the "Evolving Scenario") to be consistent with a "faster transition" to achieve Canada's promised goal of net-zero emissions by 2050.

## **Recommendation:**

**2.1 Bill C-12 be amended to require that the government develop a scenario or projection showing the expected reduced level of Canada's total oil production in 2030, in 2040, and in 2050 if global oil consumption declines during the next 30 years to levels consistent with achieving net-zero global emissions by 2050 and limiting warming to 1.5°C, and that the government disclose that information to the public.**

## **3. Reliance on "emissions removals": CCUS technology and the oil and gas sector**

One of the proposed solutions given prominence in both the CER 2020 report and in *A Healthy Environment and A Healthy Economy*<sup>7</sup> among suggested measures to achieve the government's "more ambitious climate goals" is reliance on large-scale deployment of carbon capture and storage technology (CCUS). The promise is that, in the case of the oil and gas sector (Canada's largest emitting sector), we can achieve what the CER 2020 Report describes as "net-zero oil sands production" (page 79 of the CER Report) by relying on carbon capture, storage, and utilization (CCUS) to effectively lower the amount of CO<sub>2</sub> released into the atmosphere per barrel.

But "net-zero oil sands production" is something entirely different from a global energy system that moves to net-zero by 2050. Even assuming CCUS can be economically viable in large-scale deployment and that it offers an economically viable technological means to significantly limit GHG emissions from the *oil extraction process* in Alberta, CCUS will do nothing (and is not intended to do anything) to curb the expansion of oil sands production in Alberta.

The world must dramatically reduce the annual level of CO<sub>2</sub> and other GHG emissions by 2030. It is essential that global oil production significantly decline by 2030 to meet that goal. Canada is the world's 3<sup>rd</sup> largest oil exporter and 4<sup>th</sup> largest oil producer.

Both the CER Report and *A Healthy Environment* ignore any discussion of the emissions impact of the "downstream" emissions from Canada's growing oil sands, namely the emissions released outside Canada's borders after our bitumen is shipped to the U.S. or elsewhere when the oil is burned as fuel in vehicles and during the refining process. Those account for about 85% of all the emissions from every barrel of oil we extract. The government's promised new plan is focused exclusively on Canada's "upstream" emissions, namely the portion of emissions released during the bitumen extraction process within our borders. They account for less than 15% of total well-to-wheels emissions per barrel.

A plan to achieve "net-zero oil sands production" does not address the need to lower global oil production by at least 30% by 2040. Instead, it accommodates the continued *expansion* of

Canada's oil sands production to 2045. This new scheme to achieve "net-zero oil sands production" promises only that the emissions per barrel (during the extraction process in Alberta) would be reduced. The number of barrels being produced in Canada would continue to grow.

The volume of emissions released by every barrel of our exported oil when it is burned as fuel in vehicles in the U.S. and in other foreign countries is about six times greater than the total amount of emissions released to produce that barrel in Canada.

The Government of Canada has not made any commitment to limit Canada's future oil production, not even to meet the very modest slowdown in future growth outlined in the Evolving Scenario. At present, the future trajectory of Canada's oil production is shown in the Reference Case numbers. It is incompatible with the promised "net-zero by 2050" goal.

### **Recommendation:**

- 3.1 That the government be required to publicly disclose projections showing total annual greenhouse gas emissions that will be released by Canada's expected future levels of oil production to 2030, to 2040, and to 2050, including both "upstream emissions" released within Canada during extraction and processing that occurs in Canada and projections of the "downstream emissions" that are released into the atmosphere after the oil is exported, i.e. emissions from refining and the emissions that occur when the refined oil products are burned as fuel in vehicles.**
- 3.2 In the case of the oil and gas sector, the proposed legislation should explicitly require that the government publicly disclose details of the extent to which projected or promised future reductions of our domestic oil and gas emissions by 2030, 2040, and 2050 are going to be achieved by means of the future deployment of CCUS technology, with details of the projected annual reductions.**

## **4. April 22, 2021 promise to achieve deeper reductions by 2030**

On April 22, 2021, the Liberal Government announced that Canada by 2030 will reduce its emissions 40% to 45% below the 2005 level. But the government has not revealed to Canadians any plan or analysis to explain how these massive additional cuts might be achieved. It merely announced a new number. A 45% reduction will mean that Canada's total emissions must decline to 401 Mt by 2030.

Just four months earlier, on December 11, 2020, the government released a report showing that Canada would reduce its total emissions to 503 Mt by 2030 (representing about a 31% cut below the 2005 level). The 9-page Annex document appended to the *Healthy Environment and Healthy Economy* report provided some details of the amount of the emissions reductions that the government claimed would be achieved in each of Canada's seven economic sectors by 2030 (Table 3 of the Annex document).<sup>8</sup>

Now, given the April announcement, achieving the far deeper 401 Mt target will require obtaining an additional 102 Mt of emissions reductions from among our seven economic sectors, beyond the reductions already promised in December 2020 to meet the 503 Mt target.

Yet our government has offered no explanation identifying which of Canada's sectors have the capacity to contribute any significant part of this additional 102 Mt cut. No evidence has been provided to substantiate this new promise.

Canada's emissions in 2019 were 730 Mt. To meet the newly announced target of 401 Mt by 2030 would require an absolute reduction of 329 Mt (including the additional 102 Mt reduction promised on April 22) within the next nine years. Over the fourteen years since 2005, Canada's total reductions in all sectors combined has been 9 Mt.<sup>9</sup>

### **Recommendation:**

- 4.1 Bill C-12 be amended to require that the government publicly release forthwith, or by December 31, 2021, projections showing the sectoral reductions that it estimates can be achieved by 2030 based on its proposed new policies and measures. The amount of the expected reductions in each of Canada's seven economic sectors must be disclosed, with details of the measures relied on to achieve the cuts in each sector.**
- 4.2 Where any part of expected reductions by 2030 is attributed to the deployment of CCUS technology, in the oil and gas sector or the heavy industry sector, the government should release full particulars of proposed installations and the anticipated amounts of CO<sub>2</sub> that will be sequestered by those installations by 2030.**

## **CONCLUSION**

The promise to increase Canada's domestic emissions reduction target to 45% by 2030, even if it is plausible, will not attenuate a catastrophic outcome in the absence of addressing Canada's plan to expand our oil production to 2045. The salient activity by Canada is our expanding oil production. The promise of "net-zero oil sands production" (which is based on counting only the domestic emissions portion of our massive oil output) is a deception, and unconscionable.

To have a 66% probability of achieving net-zero global emissions by 2050, global emissions need to be cut 50% by 2030.<sup>10</sup> Deep reductions on a global scale will have to be repeated every year for another 20 years after that. That means ongoing absolute reductions in global oil production. Lower by 2030 and lower again by 2040.

The *UN Emissions Gap Report 2017* warned three years ago that the world is presently on a path to warming of 3.2°C.

A plan that accommodates and supports the continued expansion of Canada's oil production to 2045 and that assures Canadians, without evidence, that we can rely on future large-scale deployment of "emissions removal technologies" to offset the rising volumes of CO<sub>2</sub> emissions that will be released by our expanding oil exports to 2045 is not a safe plan.

David Gooderham and Jennifer Nathan

## NOTES

1. *National Inventory Report: Greenhouse Gas Sources and Sinks in Canada 1999-2021* (April 15, 2021), Table 2-12 at page 57.
2. *Canada's Energy Future 2020*, (November 24, 2020), Canada Energy Regulator.
3. CCUS is not a new technology. In the IPCC's *Special Report on Carbon Capture and Storage* (2005), a team of 100 specialists examined the current state of technical knowledge available about the separation of CO<sub>2</sub> in industrial settings. But only a limited number of installations have ever been completed in the world. It has been clear for a decade that the major barrier to any large-scale deployment is the extremely high cost per tonne of removing CO<sub>2</sub> from industrial facilities. An IEA report in June 2013, *Redrawing the Energy-Climate Map – World Energy Outlook Special Report*, noted the absence of any movement towards adopting the technology. In 2008, Alberta initiated an ambitious plan that aimed to be capturing 139 Mt of CO<sub>2</sub> a year by 2050: *Alberta's 2008 Climate Change Strategy*. The plan was abandoned in 2014, and only two installations were ever completed. In a major report, *Technological Prospects for Reducing the Environmental Footprint of Canadian Oil Sands* (May 26, 2015), a panel of experts, the majority from Alberta, concluded that for at least another 10 to 15 years, CCUS would not be economically feasible in the oil sands industry, and expressed doubts that it would ever play a significant role in the industry.
4. The IPCC *Special Report on Global Warming of 1.5°C* (October 2018) in section C3 of the Summary for Policy Makers cautions that CDR (carbon dioxide removal) deployment on any appreciable scale “is subject to multiple feasibility and sustainability constraints”. The environmental impacts of BECCS and bioenergy schemes on land, water, and ecosystems are discussed in C.3.4.
5. International Energy Agency (IEA), *World Energy Outlook 2019*, Table 3.1 p. 132 and Annex A.1 p. 672-673.
6. *Evaluation of the Trans Mountain Expansion Project* (March 9, 2021) School of Resource and Environmental Management, SFU, Gunton, Joseph, and Dale. This analysis finds that the CER's “Evolving Scenario” substantially exceeds future oil production levels consistent with keeping temperature increase to within the 1.5°C warming limit. It confirms the conclusion reached by the CER Report on that point.
7. *A Healthy Environment and a Healthy Economy* (Dec 11, 2020), Environment Canada.
8. Annex, *Modelling and Analysis of a Healthy Environment and a Healthy Economy*, December 11, 2020, Table 3.
9. *National Inventory Report* (April 15, 2021), Table 2-12 at p. 57.
10. IPCC *Special Report* (2018), SPM section C.1 at p. 14. The number used in the report is “about 45% from 2010 levels (40-60%)”. The *UN Emissions Gap Report 2020* (December 9, 2020) reported that global emissions reached 52.4 GtCO<sub>2</sub>eq in 2019 (not including land use emissions) and must be reduced to 25 GtCO<sub>2</sub>eq by 2030 to keep us on a pathway giving a 66% probability to limit warming to 1.5°C.

David Gooderham practiced law in Vancouver for thirty-five years in civil litigation, retiring at the end of 2012. He has contested Canada's climate policy in several forums, including submissions to Environment Canada in June 2016 critiquing the government's draft report *Review of Related Greenhouse Gas Emissions* for the TMX Project and to the Ministerial Panel in August 2016. Jennifer Nathan has a Science degree in biology and a Masters of Education degree. She worked for many years as a biotechnician and interpretive naturalist in Northern B.C. and the Yukon. She subsequently provided professional development training to teachers on experiential science, and was a teacher of high school science in B.C. Both were arrested in 2018 after peacefully disobeying an injunction relating to the construction of the TMX pipeline, raising the common law defence of necessity in a lengthy legal case. Gooderham and Nathan work in collaboration with others seeking to alter the course of climate policy in Canada.