# Oil and Gas Sector Emissions:
# Meeting a Net-Zero Global Emissions Goal by 2050

Canada's proposed climate policy governing oil production,
if limited to a cap on domestic emissions, will be insufficient to protect Canadians
from the gravest impacts of climate breakdown.

*A submission to the Standing Committee on Natural Resources*

*Study of a Greenhouse Gas Emissions Cap for the Oil and Gas Sector*

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Standing Committee on Natural Resources
House of Commons
Sixth Floor, 131 Queen St.
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Re: Study of a Greenhouse Gas Emissions Cap for the Oil and Gas Sector

## INTRODUCTION

The value and purpose of a cap on greenhouse gas emissions for the oil and gas sector is to guide the development of a climate policy that offers Canadians a realistic chance of keeping the increase in average global surface temperature within the 1.5°C warming threshold. In the global context, that requires achieving "net-zero" *global emissions* by 2050. On November 19, 2020, Canada announced the adoption of a net-zero by 2050 goal for its domestic emissions.

Important questions have arisen whether, or to what extent, an emissions cap might impact Canada's oil *production* over the coming years, and whether the design of an emissions cap should consider the climate impact of the downstream emissions from the combustion of our exported oil. Canada is the world's 4$^{th}$ largest oil producer. We account for about 5% of global production and export 80% of our production. Domestic emissions account for about 15% of the total life-cycle emissions from every barrel we produce. The other 85% of the total emissions are released into the atmosphere after the oil is exported. Large-scale deployment of CCUS technology at production sites in Canada, even assuming it would be economically viable, will not reduce that 85% at all. No viable or scalable carbon dioxide removal (CDR) technology exists that can remove $CO_2$ from the atmosphere once the gas is released from vehicles in the form of tailpipe emissions.

The substance of our Submission is that no policy measures directed to Canada's oil production can appreciably mitigate the imminent climate peril (not even stringent measures that substantially reduce "upstream emissions") unless concurrent steps are taken by the government to halt further expansion of Canada's oil production and initiate a plan to begin absolute reductions. Reduction in production levels will be essential to meet the 1.5°C goal.

## CANADA'S PROJECTED OIL PRODUCTION TO 2050

The Canada Energy Regulator's (CER) new "Evolving Policies Scenario"[1], which assumes the world will adopt "steadily more ambitious climate policies", shows Canada's oil production will continue growing until 2032, when it is projected to peak at 5.8 million bpd, about 900,000 bpd above the 2019 level. More than 80% of that expansion (an increase of 793,000 bpd) is expected to occur as early as 2026. The Evolving Scenario shows a slight decline that begins in the years after 2032, but Canada's total production by 2050 will still be at the relatively high level of 4.8 million bpd – only about 2% less than it was in 2019. An alternate scenario, the "Current Policies Scenario", shows Canada's production will continue increasing to 2044 when it peaks at

6.7 million bpd, an increase of 1.8 million bpd above the 2019 level. In short, Canada's oil production shows no significant reduction over the next 30 years, even under the Evolving Policies Scenario. The CER 2021 report gives this succinct summary of the outlook for Canada's oil production between now and 2050:

> *From 2019 to 2032, crude oil production increases 19%. Between 2032 and 2050 production decreases by 19%.*
>
> — *Canada's Energy Future 2021,* December 9, 2021, page 40

An article published on December 14, 2021, by four of Canada's leading experts on energy policy and climate, points to the extraordinary failure by the CER to examine the warming implications of their two scenarios, both of which project rising levels of oil production. Commenting on the CER's new report, they write:

> *Scenarios that anticipate growing Canadian production are associated with higher levels of warming, but CER does not highlight to what degree. The one scenario in the International Energy Agency's (IEA) World Energy Outlook 2021 that roughly aligns with the CER current policies scenario anticipates 2.6°C of warming, far beyond the Paris target."*[2]
>
> — "Canada's Energy Regulator Turns a Blind Eye to dangerous global warming", K. Harrison, M. Jaccard, N. Rivers, and A. Carter, December 14, 2021 (emphasis added)

The authors conclude that the CER's Evolving Policies Scenario "does not align with Canada's new 2030 target and corresponding policy commitments". They summarize their assessment of the CER's work this way: "The CER has simply ignored Canada's legally mandated goal of net-zero by 2050."

## THE IEA'S "NET-ZERO BY 2050 SCENARIO" (MAY 18, 2021)

On May 18, 2021, the International Energy Agency (IEA)[3] warned in its report *Net-Zero by 2050: A Roadmap for the Global Energy Sector* that to have a realistic chance of keeping the increased warming of the earth's atmosphere to less than 1.5°C, global oil consumption must decline 50% below the 2019 level by 2040. That would require cutting oil use worldwide from 98 million bpd (the 2019 level) down to 44 million bpd within the next 20 years. To stay within the 1.5°C temperature threshold, oil consumption worldwide must decline to 24 million bpd by 2050. In a dramatic departure from its past approach, the new IEA study calls for *an immediate halt to any further expansion of global oil production*.

In its most recent annual report *World Energy Outlook 2021*[4] released October 12, 2021, the IEA provides a further comprehensive analysis of the transition that will be required in all sectors of the world economy (transportation, electricity generation, industry, etc.) which at present relies on coal, oil, and natural gas to supply 80% of our primary energy. The top line of Figure A below shows the decline in global oil consumption that will be required to be consistent with limiting the global temperature increase to 1.5°C (with a 50% probability of meeting that goal).

In 2019, world oil production reached 98 million bpd, the highest level ever. As a result of the severe economic impact of the Covid-19 pandemic, oil consumption dropped to 91.3 million bpd in 2020.

The IEA's Stated Policies Scenario ("STEPS") projects the expected future path of oil demand over the next 30 years based *on existing energy policies*. The STEPS scenario counts the benefit of all promised new carbon-reduction measures that have already been announced by governments and this scenario *assumes* all the announced future measures will be fully implemented. With that optimistic assumption, STEPS reflects the pathway we are presently following. Under the STEPS Scenario, global oil demand will move back up to 98 million bpd by 2023 and rise to 103 million bpd by 2030 or soon after and flatline at that level to 2050.

**Figure A: IEA Net-Zero by 2050 Scenario: projections (in millions bpd)**

| | 2019 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|
| Net-Zero by 2050 Scenario | | | 72 | 44 | 24 |
| Stated Policies Scenario | 97.9 | 91.3 | 103.0 | 103.0 | 103.0 |
| Announced Pledges | | | 96.1 | | 76.7 |

**Sources:** ***Net-Zero by 2050: A Roadmap for the Global Energy Sector*****, IEA, May 18, 2021; World Energy Outlook 2021, October 12, 2021, Figure 5.3, p. 214.**

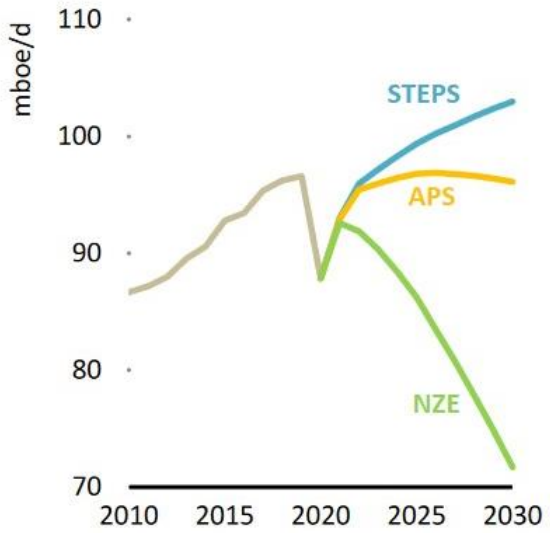
The Announced Pledges Scenario ("APS") takes account of a series of additional reduction commitments very recently made by governments around the world including all NDCs promised under the Paris Agreement and it assumes optimistically that all these commitments *"will be met in full and on time"* (including promised new targets which have not yet been matched by any actual policies).

In sharp contrast to that, the IEA's Net-Zero by 2050 Scenario (NZE) requires that global production decline to 24 million bpd by 2050. Furthermore, to limit the release of any further substantial emissions from burning oil as a transportation fuel, 70% of the remaining 24 million bpd of oil production by 2050 will have to be used in applications where *the fuel is not combusted and so does not result in any direct $CO_2$ emissions* (i.e., used to produce chemical feedstocks, lubricants, and asphalt). By 2050, oil must have very limited use as a transportation fuel except for aviation.

The IEA's "Net-Zero by 2050" Scenario requires that to stay on a pathway to 1.5°C global oil production must decline to 72 million bpd by 2030, a 25% reduction below the 2019 level. Canada plans to continue *increasing* our oil production to 2032 (a projected 19% increase),

The complete divide between the present intentions of our governments and what human beings need to do within the next nine years is depicted in Figure B. It shows the path of oil demand under each of the IEA's three Scenarios:

**Figure B: Projected Oil Demand to 2050**




**Source: *World Energy Outlook 2021*, October 12, 2021, Figure 5.3, page 214.**

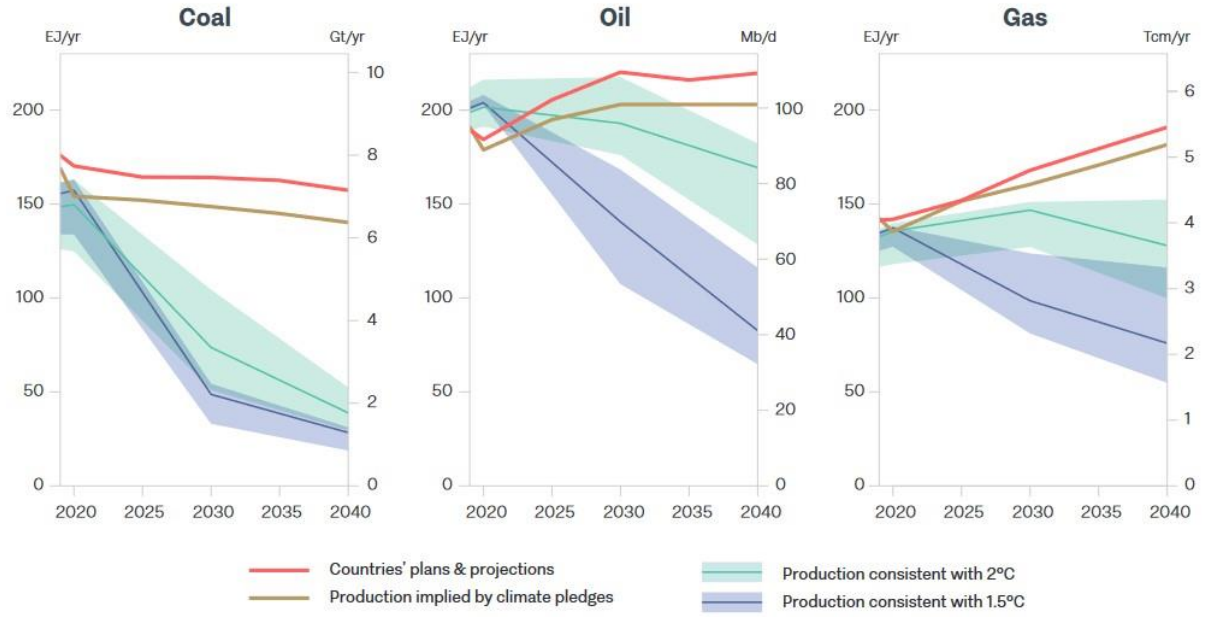
The top blue line of the above graph ("STEPS") depicts the IEA's most recent projection indicating the rising pathway of global oil production between now and 2030, based on the current plans of Canada and the world's other oil producing countries. The sharply declining green line ("NZE") shows the magnitude of the cuts in overall world oil production needed by 2030 to give us a 50-50 chance of being able to limit global heating to less than 1.5°C.

## UN PRODUCTION GAP REPORT (OCTOBER 20, 2021)

On October 20, 2021, the UN Environmental Programme and the Stockholm Environmental Institute released their *Production Gap Report 2021*,[5] which confirms the tragic disconnect between the existing plans of the world's major oil producing countries (including Canada) to continue the expansion of global oil production and the desperate need to start reductions. The world's 15 largest oil producers are still planning to substantially expand their oil production to 2030. The stated purpose of the report is "*to quantify the discrepancy between the global levels of fossil fuel production implied by governments' plans and projections and the levels consistent with the Paris Agreement goals (namely limiting warming to well below 2°C and pursuing efforts to limit the temperature increase to 1.5°C).*"

The report covers coal, oil, and natural gas production plans in 15 major producer countries, which in the aggregate account for 75% of all global fossil fuel extraction (including the U.S., Saudi Arabia, UAE, Canada, Brazil, Norway, UK, and Russia). It the case of oil production, the center graph in Figure C below shows that based on producing countries' current plans (including Canada's plans described in the CER 2020 report[6]) between now and 2030 the gap will widen between the deep production decline required to be consistent with the 1.5°C pathway (the bottom diagonal line) and the current expansionary pathway (the top red line).

**Figure C: Projected coal, oil, and gas use to 2050**




**Source: *Production Gap Report,* October 20, 2021, Figure 2.2 at page 16.**

In the case of Canada, the *Production Gap Report* specifically relies on the *Canada's Energy Outlook 2020* report released November 24, 2020. The report's overall conclusion is that "the world's governments plan to produce more than twice the amount of fossil fuels in 2030 than would be consistent with limiting warming to 1.5°C". In the specific case of oil production, it states:

> *Nations are, in aggregate, planning on producing around 40 million barrels per day (Mb/d) more oil than would be consistent with the median 1.5°C pathway in 2030 (with a range of 26-56 Mb/d). This excess is roughly equivalent to half of current global oil production.*
>
> — *Production Gap Report*, October 20, 2021, p. 15-16

## AN UNFORGIVING DEADLINE FOR EMISSIONS REDUCTIONS

The *UN Emissions Gap Report 2021*[7] released on October 26, 2021, confronts us with the reality that, with only nine years remaining, the world's largest emitting countries are not remotely on track to achieve the very deep emissions reductions that are required by 2030 to avoid the gravest impacts of climate breakdown.

It was not until December 2015, when the Paris Agreement was negotiated, that countries, including Canada, agreed "*to pursue efforts to limit the temperature increase to 1.5°C."* Recognizing that the newly stated 1.5°C goal would require much deeper and faster changes in energy policy, the parties to the Paris Agreement in 2015 requested that the IPCC prepare a Special Report on the impacts of warming to 1.5°C and on the measures needed to meet that

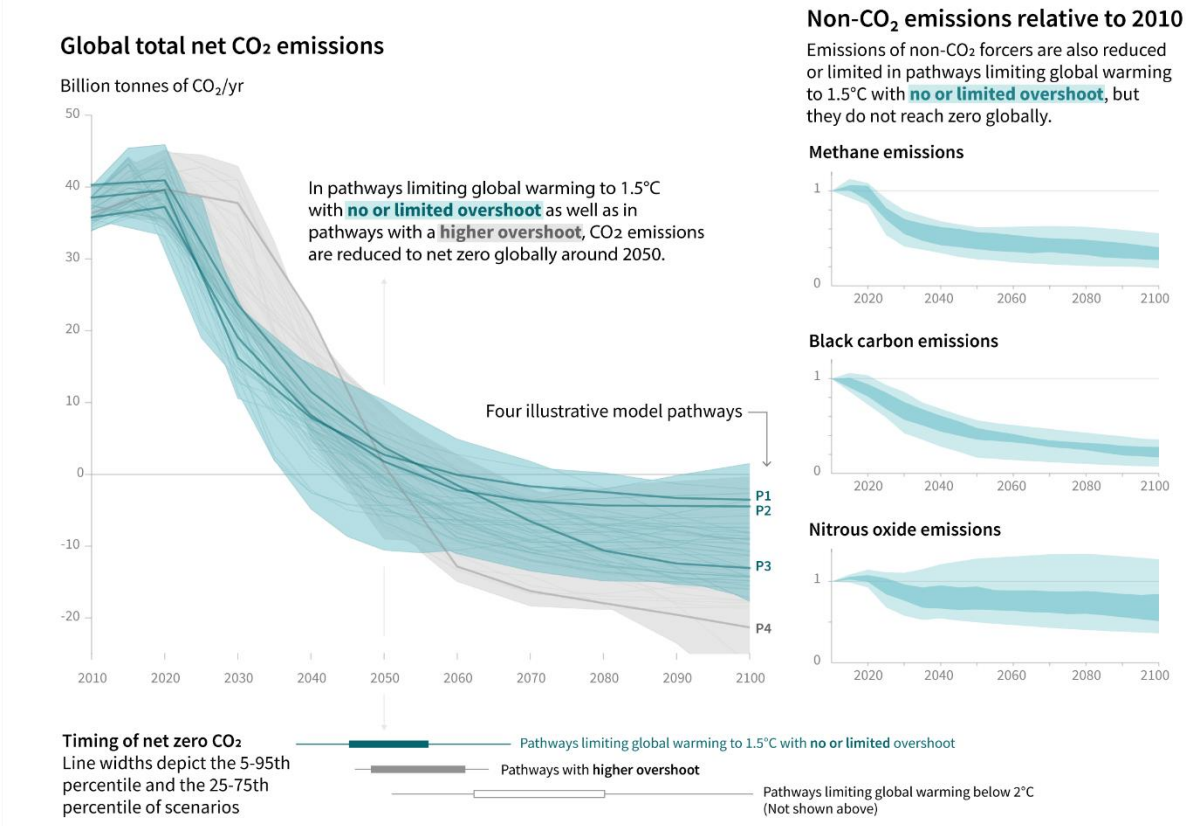
goal. Three years later, on October 7, 2018, the *IPCC Special Report on Global Warming to 1.5°C* was published.[8] It provided the results of comprehensive research about the magnitude of the emissions reductions that would be required to keep the warming increase to 1.5°C. The Canadian government expressly approved the language of the report's *Summary for Policy Makers* when the document was publicly released.

## IPCC Special Report on Global Warming to 1.5°C

One core finding reported in the *Special Report* was that all releases of $CO_2$ into the atmosphere must reach "net-zero" by 2050 to give us a 66% chance of reaching the 1.5°C goal. "Net-zero" means that, beyond 2050, no additional $CO_2$ can be safely added to the *cumulative* amount of $CO_2$ that by then will already have been released into the atmosphere. It is the cumulative emissions that are driving the heating of the earth.

A second core finding was that to give us a realistic chance to achieve the goal of net-zero by 2050, the annual level of global emissions must be reduced 50% below the 2018 level by 2030. The *Summary for Policy Makers* sets out the main findings of the report. It includes this helpful graph, which depicts the massive cuts required to avoid a catastrophic outcome:

**Figure D: Global emissions pathways**




**Source: IPCC Special Report on Global Warming of 1.5°C, figure SPM.3a.**

The total annual level of global emissions is given on the vertical axis of the graph, measured in billions of tonnes of carbon dioxide per year ($GtCO_2$). The total shown for 2020 is a little over 40 $GtCO_2$. The details provided in the *Summary* reported that total annual global $CO_2$ emissions in fact reached 42 $GtCO_2$ in 2018. Only carbon dioxide ($CO_2$) emissions are represented on the above graph. Non-$CO_2$ emissions are depicted separately on the right-hand side.

Total greenhouse gas emissions in 2019 were 51.5 $GtCO_2eq$. $CO_2$ accounts for most of human caused emissions, more than 70% of the total (the other approximate 30% of human caused emissions comprise methane and other GHGs). The $CO_2$ emissions are of paramount concern not only because of their scale, but because, unlike methane and some of the other GHGs, once $CO_2$ is released into the atmosphere it remains there for centuries. For that reason, in terms of what is in our power to control, the rising $CO_2$ atmospheric concentration is irreversible.

Four mitigation pathways are highlighted, which are identified as P.1, P.2, P.3. and P.4. Each offers a different combination of energy policy, technologies, and land use strategies to achieve the hoped-for "net-zero" outcome by 2050. Importantly, each of the depicted pathways relies on deploying Carbon Dioxide Removal methods (CDR) to a different degree. And while all four Pathways project an eventual decline in fossil fuel consumption, they envision markedly different rates of decline.

P.1 is described in the report as a mitigation plan aimed to reach "net-zero" by 2050 with minimal reliance on CDR technology. The *Summary Report* says this about the P.1 pathway: "Afforestation is the only CDR considered; neither fossil fuels with CCS nor BECCS are used" (emphasis added). "Afforestation" refers to very large-scale projects that plant new forests and expand existing forest cover, and includes other changes to land use, restoration of wetlands, and changes in agriculture that would enhance the natural capacity of the earth's surface to absorb carbon from the atmosphere. P.1 does not depend on future large-scale deployment of other envisioned future CDR technologies, such as BECCS or other direct air removal schemes. And it does not contemplate that CCS (Carbon Capture and Storage) will be relied on to enable the ongoing use of fossil fuels.

If we fail to meet the 2030 target, or choose not to, our last resort will be to attempt later to use CDR technologies on a very large scale to remove the accumulated "residual emissions" from the atmosphere. But CDR technologies that have the capacity to remove $CO_2$ from the atmosphere ("direct air removal") do not yet exist, or exist only in very small-scale experimental forms. The viability of these envisioned CDR technologies 20 or 30 years in the future is unknown, and it is a conjecture. Under climate policies that propose to rely heavily on future "carbon removal" technologies, all of the risk and loss and suffering will be shifted to the world's children, in return for our own immediate financial gain.

## The significance of the atmospheric carbon concentration level

The *atmospheric carbon concentration level* is the metric that explains why the timeline to arrest the further expansion of oil production – and to achieve deep cuts in our consumption of oil, coal, and natural gas – is brief and unforgiving. It measures the rising concentration of $CO_2$ and other GHGs in the upper atmosphere that are driving the heating of the earth's atmosphere. The

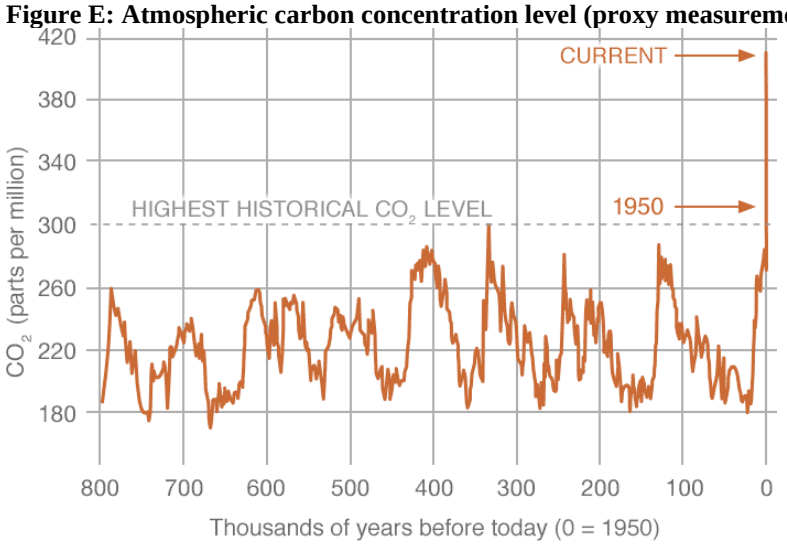
accumulating concentration of $CO_2$ in the upper atmosphere is measured in parts per million (ppm), indicating the number of $CO_2$ molecules per million molecules of other gases.

The most recent measurements of the atmospheric carbon concentration level warn us of the unforgiving timeline we face. Each year the atmospheric $CO_2$ concentration follows a cycle. April and May are the high points of the year, September the low. *But the annual averages are moving up every year*. On May 9, 2013, the Mauna Loa Observatory in Hawaii recorded for the first time a daily average reading showing that the amount of carbon dioxide in the atmosphere had exceeded 400 ppm, for a single day. The annual average for that year was 395.3 ppm. The next year, in April 2014, Mauna Loa recorded a monthly average that exceeded 400 ppm. By 2016 the average for the entire year was above 400 ppm.

The annual average for 2020 was 413.2 ppm $CO_2$. In May 2021, the monthly average recorded at Mauna Loa reached 419 ppm. The daily and monthly averages in April and May are a harbinger of where we are going.

Figure E below represents the long-term record for the atmospheric carbon concentration over the past 800,000 years. It places our predicament in context. A concentration level above 400 ppm is entirely unprecedented over the time of human life on earth.

**Figure E: Atmospheric carbon concentration level (proxy measurements)**




**Source: US National Aeronautics and Space Administration (NASA).**

During the past 12,000 years from the end of the last Ice Age until the advent of the industrial age, the atmospheric carbon concentration was stable at about 280 ppm. By 1958, it was 315 ppm. Since then, it has risen by another 97.8 ppm. When the NEB in 2014 began its two-year Trans Mountain pipeline expansion inquiry which ultimately recommended approval of the project, the atmospheric carbon concentration level was 397.2 ppm. By 2020, as we have noted above, it had increased to 413.2 ppm.

The rate of annual increase has been accelerating, reflecting the persistent annual growth in the volume of global emissions from burning coal, oil, and natural gas. In the 1960s, the rate of

growth of the atmospheric carbon concentration level was about 0.6 ppm per year. Just a decade ago in 2008 and 2009 the annual increases ranged between 1.59 ppm and 2.02 ppm. It is now rising at an average of 2.5 ppm every year. Even in 2020, a year when the extraordinary economic impact of COVID-19 temporarily reduced the annual level of emissions by about 5% to 6% worldwide, the concentration level increased by 2.3 ppm.

The scientific evidence establishes that to stay within the 2°C warming threshold, the atmospheric carbon concentration level must be kept below 450 ppm. The threshold for 1.5°C is 430 ppm. At the present rate of increase, which is now about 2.5 ppm every year, the atmospheric carbon concentration level will exceed 450 ppm $CO_2$ by about 2035. It is on track to rise above the 430 ppm level by the end of this decade, by about 2028.

The growth during the past 30 years in the size of the annual incremental increases in the atmospheric carbon concentration has been driven by the growth in the annual level of emissions from industrial economies. Despite the solemn commitments by Canada and other industrial nations at Copenhagen in 2009 and again in Paris in 2015 to reduce their emissions, total global emissions continued from 2010 up to 2019 to expand at an annual rate of 1.3%.

The evidence shows that even if deep emissions reductions were to be implemented on a vast scale starting in 2022, and if the annual level of global emissions could be massively reduced by 2030 (say by 50% or some substantial amount below the present level), our predicament is that additional $CO_2$ emissions, albeit in gradually declining amounts, will continue to be released every year for another 30 or 40 years after that – until the world's energy systems altogether cease to be overwhelmingly dependent on carbon-based fuels. Once we start deep cuts in global emissions, the *magnitude* of the annual increases in the carbon concentration level (now about 2.5 ppm every year) will start to decline. But the annual increases each year, although diminishing in size, will continue for another three decades at least.

That explains why emissions must be cut 50% by 2030. We are in a race to reduce the magnitude of the annual increases in the atmospheric carbon concentration. If we do not act now, it will continue to rise about 2.5 ppm every year for another nine years, and on into the next decade. Only massive reductions in the annual level of $CO_2$ emissions between 2022 and 2030 will allow us to dramatically slow down the rate at which the atmospheric carbon concentration is rising. If we can successfully achieve a 50% cut of global emissions within the next nine years – or even if we can attain a substantial share of the needed reductions by 2030 – that would avoid, or at least vastly reduce, the terrible burden of future "emissions removals" that we are bequeathing to the world's children after 2050.

The dilemma we face is that the annual increases in the concentration of $CO_2$ now occurring in the upper atmosphere are irreversible, unless CDR technologies (including direct air removal technologies) are developed in future that give us the capability to remove $CO_2$ from the atmosphere on a massive scale. Every month, and every additional year we delay the start of deep cuts in oil production we are worsening humanity's fateful dependence on the future viability of these vast technology schemes which at present do not exist.

Over the past twelve months, studies by leading Canadian scholars[9] have shown that the continued growth of Canada's oil production, as projected more than a year ago by the CER in

its *Canada's Energy Outlook 2020* report (November 24, 2020), makes achieving Canada's emissions reduction commitments impossible. The IEA's Net-Zero by 2050 study released on May18, 2021, shows that the massive overall emissions reductions required on a global scale by 2030 cannot be achieved without deep cuts in global oil production within this decade.

## CONCLUSION

The ongoing expansion of Canada's oil production for another 10 years and continued high levels of production to 2050 is *incompatible with retaining any chance to avoid a world of catastrophic climate change.* It is no answer to say that we must keep doing this because if we reduce Canada's oil production, other countries will increase their production. That is essentially a treadmill argument. We are on a treadmill and cannot get off. If we decrease our oil production, other countries will increase theirs, we are told. So, we must keep increasing oil production in Canada.

The severe time constraint that limits our remaining options for policy choices is indicated by the fact that the atmospheric carbon concentration level reached 413.2 ppm $CO_2$ in 2020. It is on track to exceed 450 ppm $CO_2$ by about 2035.

The "carbon leakage" argument might have had some merit twenty years ago, when there remained time to attempt to persuade all the major oil producing countries to act together. But that did not happen. Instead, Canada moved aggressively to increase its own oil production from 2.6 million bpd in 2005 to 4.9 million bpd by 2019. There is now no prospect at all, no plausible chance, of any immediate or early commitment by all the world's large oil producers to jointly agree to reduce their production levels. In several oil producing jurisdictions (Norway and the UK, and some states in the U.S.) there does exist some serious political support advocating that their countries impose curbs on their own production. Other policy tools are available to act against recalcitrant producers, including tariffs or carbon prices imposed on oil imports from non-cooperating states. But there is no time left to wait for others to act.

We urge the Committee in its study of a proposed cap on oil and gas sector emissions to give the deepest consideration to the fundamental problem we face: the currently planned expansion of Canada's oil production to 2032 and continued high levels of production to 2050 are incompatible with any realistic chance to limit catastrophic climate breakdown. A cap on emissions alone will be a fatally insufficient policy.

We are now down to a handful of years left to avert a terrible outcome. Every six months counts now. Continuing along the present path, frozen into inaction by the "carbon leakage" argument, is a pathway to monumental self-destruction.

David Gooderham Jennifer Nathan

## NOTES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7. *UN Emissions Gap Report 2021*, October 26, 2021: https://www.unep.org/resources/emissions-gap-report-2021

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9. "Correcting Canada's "one eye shut" climate policy: meeting Canada's climate commitments requires ending support for, and beginning the gradual phase out of, oil and gas production," Angela Carter and T. Dordi, Cascade Institute, University of Waterloo, April 16, 2021: https://cascadeinstitute.org/wp-content/uploads/2021/04/Carter-Dordi-Canadas-one-eye-shut-climate-policy-1.1-April-16.pdf; "Canada's Energy sector: status, evolution, revenue, employment, production forecasts, emissions and implications for emissions reductions", David Hughes, June 2021: https://www.policyalternatives.ca/sites/default/files/uploads/publications/BC%20Office/2021/06/REPORT_ccpa-bc-cmp_canadas-energy-sector.pdf