



The Carbon Capture and Storage Trap

For taxpayers.

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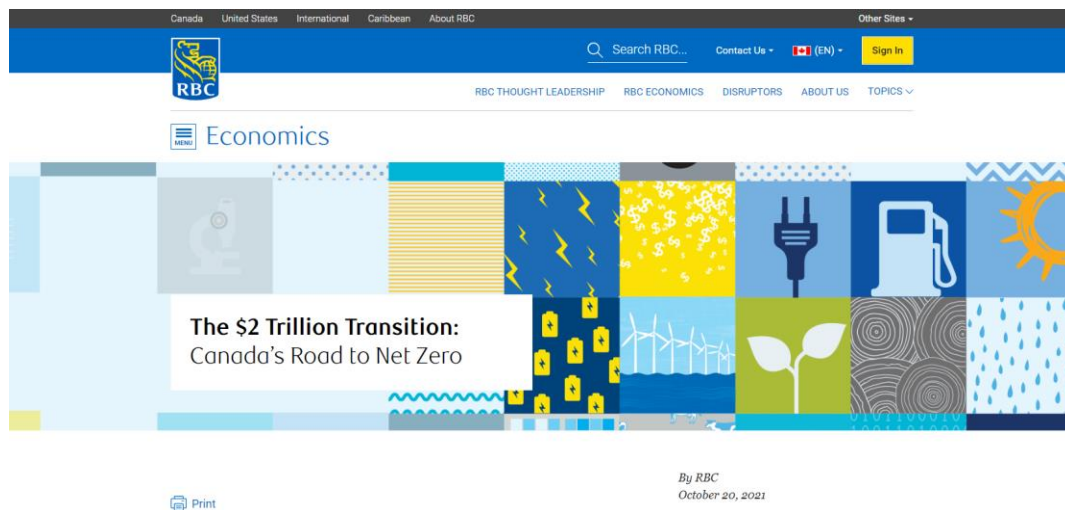
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THE CARBON CAPTURE AND STORAGE TRAP

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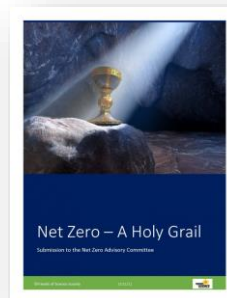
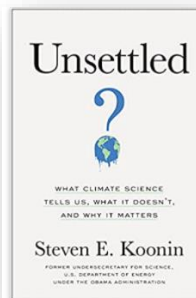
In the latest of a series of the [Royal Bank of Canada's Economics and Thought Leadership](#) climate series, it continued to promote the theme that Canada can attain the “Net-Zero” by 2050 greenhouse gas emission reduction goal embraced by the Trudeau government and at the same time continue to expand the development of the oil and natural gas industry. In doing so, the RBC is supporting the claims of many in the Canadian hydrocarbons industry who advocate the widespread adoption of carbon dioxide capture and storage (“CCUS”) technology and of other technologies, allegedly soon to be available, that will reduce the emissions from hydrocarbons production in Canada.



<https://thoughtleadership.rbc.com/the-2-trillion-transition/>

The purpose of this article is to examine the RBC thesis, the related global and Canadian contexts, and the factors most likely to influence investment in CCUS in Canada to 2030 and beyond. It will be argued that the goal of net zero emissions is neither desirable nor attainable and that present and proposed policies to increase CCUS in Canada will, at best, only shift the immense costs of this uneconomic technology from the oil and gas industry to taxpayers and energy consumers. Embracing CCUS and other uneconomic technologies as means to reduce Canada's emissions is a policy trap, especially for the average Canadians who would be forced to pay.

There is by now a large body of evidence that undercuts the scientific thesis that human emissions of greenhouse gases pose a catastrophic threat to the global climate and will cause a series of harmful and extreme weather events. I recommend especially the book *Unsettled* by Steve Koonin¹ or, for a shorter read, the submission of the Friends of Science Society to the government of Canada's Net-Zero Advisory Body.²



Even if one chooses to accept the claims of those who predict climate catastrophe, one cannot ignore the compelling evidence that the countries of the world are not prepared to incur the trillions of dollars in costs and the sacrifice of incomes, lifestyles and freedom that would be required to radically decarbonize the world by 2050. Notably:

- After over 30 years of climate conferences and repeated setting of emissions reductions targets, global GHG emissions have risen by 60% and, with a very few exceptions in Europe, no country has ever met its emissions reduction target;
- Almost all the emissions increases are occurring in the developing countries, which now comprise two-thirds of global emissions.
- **The developing countries have made it clear that they will not commit to emissions reduction measures that will harm their efforts to increase their peoples' incomes and wellbeing unless the measures entailed are financed by the wealthier countries.**
- **At COP26 in Glasgow, the developing countries demanded \$750 billion per year in aid for mitigation and adaptation measures; there is no way that the wealthier countries will be prepared to pay this amount.**

¹ Steve E. Koonin, *Unsettled: What Climate Science Tells Us, What It Doesn't, and Why It Matters*. BenBella Books, Inc. Dallas, 2021

² <https://blog.friendsofscience.org/wp-content/uploads/2021/12/Net-Zero-1.pdf>

- The US Energy Information Administration, the most authoritative source of analysis of global energy supply, demand and emissions, projects that global GHG emissions will grow from about 35 billion tonnes per year now to about 43 billion tonnes annually by 2040, not decline. (Contrary to the incessant media reports, the world is not decarbonizing.)
- Eighty-four per cent of the world's energy-based emissions derive from the combustion of hydrocarbons, as do almost 80% of Canada's energy-based emissions; no energy transition in the past has ever involved so large a change and all significant transitions have taken 50 to 70 years, much longer than the current United Nations schedule for attainment of "Net-Zero".
- Canada's emissions constitute 1.6% of the global total; nothing that Canada does, including ceasing to exist, will make any difference to the trends in global emissions or temperatures.

In effect, the Net-Zero emissions goal for Canada is an exercise in environmental virtue signaling, not practical policy.

Notwithstanding these facts, public support for radical emissions reductions has not received the intense political debate it deserves. The advocates of Net-Zero now enjoy the support all major political parties in Canada. Those parties have embraced the climate catastrophe thesis and notionally, if not practically, support the measures to significantly reduce emissions. Climate campaigners and their allies in some industries essentially argue that the current political support for climate measures, however uninformed, should guide public policy and industry investment plans in Canada. On the other side are aligned those who have already been severely harmed by rising carbon taxes, increasing electricity rates and increasing restrictions on their freedom as to which goods and services they will be allowed by governments to produce and purchase. The rising costs of the present and planned policies may blend with high inflation rates to cause a general reduction in Canadian competitiveness and the loss of investment and employment to other countries. These costs, however, are still not so evident to the majority of the voting public in Canada that they have been persuaded to change their support for the climate measures. **One might credibly argue that the political debate about the desirability of Net-Zero policies is not "settled"; rather, it has barely begun.**



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The RBC report takes it as given that the Net-Zero goal is desirable and a political imperative. Without so stating, it implicitly embraces the climate catastrophe thesis.

Somewhat surprisingly, the RBC report also takes as given the likelihood that Canadian oil producers will continue to increase future production in accordance with the scenarios developed by the Canada Energy Regulator. That is, domestic production led by the oil sands will continue to grow unconstrained by pipeline capacity limits and will peak at 5.8 million barrels per day by 2032 before falling to 4.8 million barrels per day in 2050. In spite of continuing improvements in the emissions-intensity of production, production-related emissions would grow. RBC expects oil prices to remain high (this is unexplained, but the obvious implication is that global oil demand will continue to rise as fast as, or faster than, demand).

The RBC report notes that the federal government's Emissions Reduction Plan targets 42% emissions reduction in the oil and gas sector, 40% of which would allegedly come from the oil sands. The oil and gas sector now emits about 70 million tonnes of CO₂ equivalent per year, so 42% of that would be around 28 million tonnes.

The report offers a somewhat confusing set of comments concerning whether and how these emissions reductions will occur. RBC estimates that two-thirds of conventional oil emissions and 40% of upstream natural gas emissions come from methane emissions and leaks, and states that *"These are slated for a 75% reduction by 2030 via widespread leak detection and the vapour recovery units, making up the entirety contribution of cuts in the ERP."* This is a reference to a proposed federal regulation which is now at the discussion paper stage and therefore will not be finalized for at least two years; in effect, the 75% reduction in methane emissions is not a definite set of regulations and measures.

The RBC report treats the anticipated reduction in methane emissions as a welcome sign that reducing emissions reduction from the oil sands to meet the 2030 target may be less challenging. Emissions intensity per oil sands barrel, according to RBC, will decline by 6 to 7 % by 2030. The rest of the required emissions reductions will come from CCUS and "breakthrough technologies". CCUS is portrayed as the key technology for emissions reduction in the oil and gas sector after 2030.

RBC estimates that full “decarbonization” of the oil sands could cost between \$6 and \$14 per barrel for mined bitumen and \$17 and \$23 per barrel for in situ bitumen. It further estimates that oil prices per barrel (WTI) would have to average about US\$50 over the life of the project “to meet investor expectations”. Given these relatively high (and perhaps under-estimated) abatement costs, RBC recommends that Canadian producers take a slower approach, “*deploying investments gradually through the 2020s and 2030s to allow for cost efficiencies and leave room for future technologies to potentially lower costs*”. RBC acknowledges that this advice runs counter to the political goal of achieving deep decarbonization cuts this decade. It does not explain why, given the substantially lower netbacks that oil producers would receive from oil sands in Canada than in other oil producing regions, oil companies would continue to invest their money here at all.

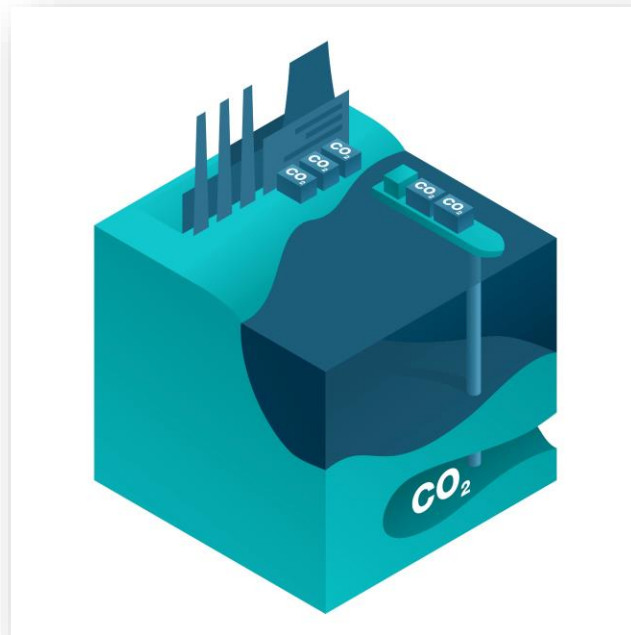


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RBC acknowledges that there are some flies in the CCUS ointment.

“But the technology is not without significant drawbacks: it’s pricey, slow to build, adds costs, relies on complex engineering, and sometimes fails to capture or store emissions effectively. The technology also needs to be tested in large-scale settings. As yet, there are no major plants that capture CO2 from the combustion of natural gas, which is the primary application for the oil sands. And with just 40 million tonnes of existing capacity globally, a near-term buildout of 20 to 30 million tonnes in Canada appears ambitious.”

What's more, CCUS projects don't inherently have financial returns. The product they make, CO2, has minimal market value, so returns need to be engineering from government policy, the carbon pricing or fuel standards. And in many cases, the avoided taxes or regulatory payments are highly uncertain."

Allow me to translate those two paragraphs into clearer terms. **Carbon dioxide capture and storage is hopelessly uneconomic without massive government (i.e., taxpayer) subsidies. It has mainly been used to capture CO2 from fertilizer production, oil refining, and coal combustion, not natural gas combustion, which has a much lower carbon dioxide content. There are only 40 million tonnes of existing projects in the world, so there is limited experience with the technology. Expecting Canada alone to add 20 to 30 million tonnes of capacity by 2030 is unrealistic. CCUS projects do not make money for the project owners. The main large scale commercial use of the technology, especially in North America, is to enhance oil production from nearly depleted fields, but the proposed Canadian federal tax subsidies for CCUS investments prohibit such applications. So, the incentives to investors in CCUS projects must be "engineered from government policy", an award-winning euphemism for "stolen from taxpayers' and consumers' pockets" through higher carbon taxes and regulations or "donated to oil companies through tax credits, exemptions and direct grants". Further, there is a risk that future governments, more attuned to taxpayers' and consumers' interests, might withdraw these subsidies.**

RBC observes that:

"More efforts from the provinces will be needed. This could include a top-up on the credit, but also improvements in the non-financial parts of CCUS projects like permitting, liability and storage rights. The government's commitment to explore carbon pricing certainty could also help develop cash flows from CCUS projects."

It is difficult to know whether RBC is speculating about the future policy environment or revealing inside information about the content of recent discussions among oil industry and provincial government politicians and officials. The implications are surprising, to say the least. **The RBC is implying that, in addition to the federal investment tax credit, the government of Alberta would provide its own tax credit or grant (10%, 20%, more?), grant exemptions from environmental and other land use permitting processes for oil sands projects, grant taxpayer-backed loan guarantees or other measures to reduce project sponsor liabilities, and provide unnamed privileges with respect to the rights to store CO2.**

Readers should recall that none of the measures already announced or contemplated by RBC would be needed at all in the absence of current climate policy, and especially the hysteria-driven political commitment to Net-Zero emissions by 2030. The current policy framework includes over 300 climate policy measures taken by federal and provincial governments, including most notably the federal commitment to imposing carbon dioxide taxes rising from \$50 per tonne today to at least \$170 per tonne by 2030. **The establishment of this framework has vastly altered the energy investment context for energy producers and consumers. Investments that used to be economic depending on the supply and demand conditions in free competitive markets no longer are, and every year Canada moves farther from this market-driven standard.**

The oil industry essentially is seeking a means by which to achieve multiple financial goals – to avoid paying the onerous carbon taxes, to gain carbon “credits” for reduced consumption that it can sell in international markets, to gain large taxpayer subsidies for investment in CCUS projects, to gain other regulatory advantages not granted to other resource or manufacturing industries, and to go on operating the oil production facilities in the hope/expectation that international oil prices will continue to stay high and rising. If achieved, this would mark a complete reversal of the demonization that the industry has experienced over the last decade or more. Whether it will succeed in all these goals remains to be seen. It depends, in part, on whether taxpayers and consumers, including investors in other emissions-intensive industries in Canada, will acquiesce in the large transfers of income involved.

THE EFFECTS OF THE FEDERAL TAX CREDIT

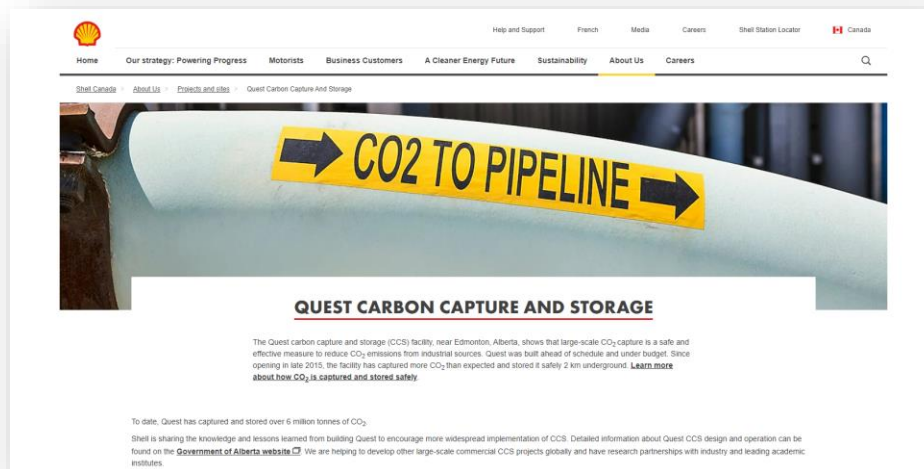
The Canadian government, in Budget 2022, announced a tax credit totaling a little less than 50% of project costs (with eligible costs to be defined in regulations) by 2030, and with reduced credits after that. The tax credits will be refundable, meaning that the companies will receive the benefits even if they have no taxable income. Government modelling (i.e., a collaboration between Finance Canada and Environment and Climate Change Canada) implies some 15 to 18 million tonnes of installed capacity by 2030. The Oil Sands Pathways Initiative, a Canadian industry group aimed at getting the oil sands to Net-Zero, is more ambitious, targeting 22 million tonnes in emissions cuts by 2030.

How will this affect the economic viability of investments in CCUS projects, and the magnitude of emissions capture and storage by 2030?

The International Energy Agency issued a report in February 2021³ in which they stated that the cost of carbon capture can vary greatly by source, from a range of US\$15-25 for industrial processes producing “pure”, or highly concentrated, CO₂ streams (such as ethanol production or natural gas processing) to US \$40-120 per tonne for processes with “dilute” gas streams, such as cement production, oil sands production and power generation. To illustrate, the IEA estimated the levelized cost of CO₂ capture in 2019 to range from US \$40-80 per tonne from power generation and from US \$40 to \$100 per tonne from iron and steel production.

The investment tax credit announced in the 2022 federal Budget is for 50% of the capital expenditures in a carbon dioxide capture and storage project available up to 2030 and at a reduced rate after that. The stated purpose of the new tax credit is to accelerate the construction of new CCUS projects in Canada, with a focus on the pre-2030 period.

As a possible benchmark of the cost of CCUS in the oil sands, we have the Shell Quest project. It was proposed in 2012, had rapid government approvals (including Alberta and federal subsidies covering about three quarters of the capital costs) and was completed by 2015. It cost \$1.35 billion and will have operating costs of \$41 million per year. It will earn \$27 million a year in revenues, but there is no indication of the expected life of the project, so one might assume 20 years.



https://www.shell.ca/en_ca/about-us/projects-and-sites/quest-carbon-capture-and-storage-project.html

³ Adam Baylin-Stern and Niels Berghout, *Is Carbon Capture Too Expensive?* International Energy Agency, February 17, 2021

The proponents claim that the project will capture and store 35% of the CO₂ emissions from the Scotford Upgrader, or "up to" 1.2 million tonnes per year. Recent estimates are that it is capturing and storing less than one million tonnes per year.

The project's revenues are estimated by Shell to be about \$27 million per year, so with operating costs of \$41 million per year, the operating losses could average about

\$14 million per year. A capital cost of \$1.35 billion plus 20 years of annual operating losses (\$280 million) totals \$1.63 billion. With 20 million tonnes captured and stored, that works out to \$82 per tonne. This cost does not include the cost of transporting the carbon dioxide to the storage site.

The Budget estimate is that the investment tax credit will cost the treasury \$2.6 billion over the first five years. That means the government estimates that the qualifying capital expenditures will be \$5.2 billion over the next five years (i.e., 2022 to 2027). This is clearly far below the level of expenditure needed to meet government and industry emissions reductions targets by 2030.

The granting of such immense subsidies may give rise to similar demands from other emissions-intensive industries for comparable aid.

The longer-term costs to taxpayers of federal and provincial subsidies to CCUS projects in Canada are very difficult to predict, as so little is known about the likely number of projects, their capital and operating costs, and the share of those costs that would be paid in subsidies. **RBC estimates that meeting the government's goal of 15 to 18 million tonnes of installed CCUS capacity by 2030 would require between \$45 billion and \$65 billion in total capital spending between 2024 and 2030.** This is far above the government estimates of what will actually be spent.

Expenditures at those levels would depart sharply from past industry trends. According to the Canadian Association of Petroleum Producers, the Canadian oil and gas industry's total capital spending over the five-year period 2017 to 2021 was \$67.7 billion, or an annual average of about \$13.5 billion per year. ***Spending on CCUS at the level RBC estimates to be necessary to meet government goals would require the industry to increase its overall capital spending by at least two thirds and to spend on investments that, apart from subsidies, yield little or no return.***

Assuming conservatively that half of these expenditures would be funded by federal and provincial governments, their total cost to taxpayers by 2030 would range from \$22.5 billion to \$32.5 billion.

Stressed by other financial pressures, governments are unlikely to source these funds from expenditure reductions elsewhere or from new taxes, although that is possible. More likely, they would tap into the large and growing flood of revenues from carbon taxes, diverting funds otherwise committed to taxpayer rebates.

CONCLUSION

At \$82 per tonne, the financial cost of capturing and storing 18 million tonnes in 2030 would be almost \$1.5 billion per year. It would reduce Canada's GHG emissions by 2.6% from current levels and have a negligible impact on global emissions.

One can certainly understand the desire of the Canadian oil and gas industry to find a technological solution that would allow it to continue developing and producing the immense resources of the oil sands, and of provincial governments to find a political and financial "compromise" that would allow this to happen. Whatever its technical merits, carbon dioxide capture and storage remains fundamentally a money-losing option that can only be made viable through the transfer of immense subsidies from taxpayers and energy consumers to the oil producing industry. It is a bad solution to the non-problem of impending climate emergency. It is imperative to expose the non-problem for what it is – an economy-destroying trap, and instead to abandon the Net-Zero goal.



ABOUT THE AUTHOR

ROBERT LYMAN is an economist with 27 years' experience as an analyst, policy advisor and manager in the Canadian federal government, primarily in the areas of energy, transportation, and environmental policy. He was also a diplomat for 10 years. Subsequently he has worked as a private consultant conducting policy research and analysis on energy and transportation issues as a principal for Entrans Policy Research Group. He is a frequent contributor of articles and reports for Friends of Science, a Calgary-based independent organization concerned about climate change-related issues. He resides in Ottawa, Canada. [Full bio.](#)

ABOUT FRIENDS OF SCIENCE SOCIETY

Friends of Science Society is an independent group of earth, atmospheric and solar scientists, engineers, and citizens that is celebrating its 20th year of offering climate science insights. After a thorough review of a broad spectrum of literature on climate change, Friends of Science Society has concluded that the sun is the main driver of climate change, not carbon dioxide (CO₂).

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