Resources and People

Act or be Acted Upon: The Case for Phasing Out Alberta's Sands

Green Paper prepared for the Alberta Institute of Agrologists

Presented at the Annual Conference
Alberta Institute of Agrologists
Banff, Alberta
March 16, 2017

ALBERTA INSTITUTE OF AGROLOGISTS

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Green Paper prepared by Dr. Gordon Laxer for the Alberta Institute of Agrologists

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Contents

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About the Author iii

Executive Summary 1

Section 1. Will the Market or the Government Phase Out the Sands? 5

1. Introduction 5
The fossil-fuel belt? 7
Gargantuan reserves 7
Climate commitments and plans 8
The timeline for phase-out 10

2. Will the Market Phase Out the Sands? 14
Peak demand 16
Conventional supplies and the price of oil 17
Break-even prices and the Sands 19
Postponements and cancellations 20
Divestment 21
Stranded assets 23

3.The Need for Government Action in Canada 27
Climate plans in Canada 31
The pipeline problem 35

Section 2. Lessons from Other Energy Phase-outs 37
The international context of a coal phase-out 37
Canadian action on coal 39
Ontario's phase-out of coal-fired electricity 40
Alberta's plan to phase out coal 44
Lessons from coal's phase-out 48

Section 3. Phasing Out the Sands 51
Steps to phase out the Sands 52
Staging the phase-out 54
Principles for a just transition 55

Conclusion 57

Endnotes and References 59

Figures

Figure 1. *Cumulative CO_2 emissions, 1850–2011 (% of world total)* 28
Figure 2. *Annual emissions of top 10 emitters in 2011* 28
Figure 3. *Emissions by province, 1990 and 2013* 29
Figure 4. *Percentage change in emissions by province, 1990 to 2013* 30
Figure 5. *Canada's emission projections in 2020 and 2030 (Mt CO_2 equivalent)* 31
Figure 6. *Canada's greenhouse gas emissions by sector, 1990–2014, and projections to 2030* 33
Figure 7. *Phase-out schedule of coal units in Alberta* 45
Figure 8. *NEB forecast of daily production of bitumen (thousands of barrels), 2015-2019* 53
Figure 9. *Capping production of bitumen (thousands of barrels) at 1 billion barrels/year starting in 2018* 53

About the Author

Dr. Gordon Laxer is a political economist and professor emeritus at the University of Alberta. He is the founding director and former head of Parkland Institute at the University of Alberta in Edmonton. He is also author or editor of six books, including his most recent, *After the Sands: Energy and Ecological Security for Canadians* (Douglas & McIntyre), and *Open for Business: The Roots of Foreign Ownership in Canada* (Oxford University Press), which received the John Porter Award for best book written about Canada. Gordon is on the advisory board of the SSHRC-funded Corporate Mapping Project, which is researching the structure and influence of fossil fuel corporations in Western Canada. Gordon was the Principal Investigator of a $1.9 million research project, Neoliberal Globalism and its Challengers: Reclaiming the Commons in the Semi-periphery (2000-2006).

Executive Summary

The Alberta bitumen Sands are Canada's fastest growing and largest single source of greenhouse gases (GHGs). This paper investigates the questions: Can Canada reach its Paris and G8 climate targets if it allows Sands output and emissions to grow substantially? Should the Sands be phased out? What can we learn from other energy phase-outs, specifically the ending of coal-fired electricity in Ontario and Alberta's plans to do the same by 2030? The paper concludes with the steps of a planned Sands phase-out and principles for a just transition for Sands workers.

Canada holds the third largest proven oil reserves in the world, largely because of the Sands. Many climate scientists think we cannot extract and burn all of the Sands reserves and still keep the world within the Paris climate target of 2°C above pre-industrial levels.

Justin Trudeau recognizes this, and has stated that we need to phase-out the Sands to manage the transition off fossil fuels. Christopher McGlade and Paul Ekins, economists at the University of London, have stated that most of the world's carbon fuels must stay in the ground to avoid catastrophic warming. "No more than *7.5 billion barrels* of oil from the [Alberta] oil sands can be produced by 2050," they wrote. This paper takes 2040 as the date for cessation of Sands production and emissions.

Justin Trudeau and Rachel Notley contend that their climate change initiatives will help develop the Sands by making them environmentally palatable. Their premise is dubious. Economist Jeff Rubin argues that it is the Sands' costs, not their carbon trail, which jeopardizes further development.

The Sands have always been a high cost, marginal source of oil. Prospects for their success depend on:

1) falling world supply of conventional oil,
2) growing global demand for oil,
3) little serious international action to limit greenhouse gases, and
4) a high world oil price.

Oversupplied oil in the world led to a price crash from over $100 a barrel in the summer of 2014 to a low of $30 by autumn. At that price, Sands oil producers lost money on every barrel pumped. Seventeen major Sands projects were cancelled or put on hold in the following

two years. A combination of factors will likely reduce world oil demand in the medium term. Instead of peak oil supply, experts now point to peak oil demand, and weak demand leads to a weak oil price.

Because of their high breakeven price and carbon intensity, the Sands also face head-winds from divestment and stranded assets pressures. When they reach a tipping point, divestment can lower share prices, raise the cost of funding new carbon fuel projects, and lead to lower output and greenhouse gases. Influential economists warn that fossil fuel investments, especially the high cost and most carbon polluting ones, are becoming stranded assets.

Whatever the future breakeven price will be for Sands projects though, we cannot rely on a low international oil price to cap and phase-out the Sands. Those measures would help, but would not be enough to keep the temperature rise below 2°C.

That puts an onus on Canada to act. Canada ranks 38th in the world by population but ninth by absolute emissions, and with just 0.5% of the world's population, Canada currently emits 1.6% of global GHGs.

Only effective government plans can map out a route to a low-carbon future; one that that should include stopping new carbon fuel extraction projects and pipelines, and provide retraining and alternative jobs for Sands workers.

The 2016 pan-Canadian climate plan allows oil and gas production to emit carbon almost at will and instead goes after the smaller fish, including electricity generated from coal, emissions from buildings, and transportation, through carbon taxes and cap-and-trade plans.

The Sands emitted 68 Mt in 2014, and Alberta's climate plan allows them to grow to 100 Mt by 2030. Growing emissions from the production of oil and will entirely cancel out Alberta's reductions in electricity, vehicles, and methane by 2030. Allowing Sands GHGs to grow that much will almost certainly prevent Canada from reaching its 2030 Paris Agreement targets.

The second part of the paper examines coal energy phase-outs to draw lessons for phasing out the Sands. Momentum has been building globally to end coal-fired power, and Canada and seven European countries have lately announced target dates to go coal-free.

Ontario's experience with phasing out coal is a problematic success story. The campaign to make Ontario coal-free was started in 1997 by the Ontario Clean Air Alliance (OCAA), which led a diverse coalition that campaigned around issues of health, acid rain, and mercury contamination caused by coal plants.

After Ontario's Opposition Liberals won the 2003 provincial election by promising to quickly phase-out remaining coal plants, Ontario replaced them with natural gas-fired power plants—ending coal did not end carbon emissions from power generation. It is arguable that Ontario could have gone from "coal to clean" by using a combination of renewables, stronger conservation measures, and importing hydro-electricity from Quebec.

In many ways, Alberta's plan to phase-out coal by 2030 is more challenging than it was in Ontario. In contrast to Alberta, resources play second fiddle to manufacturing in Ontario, which also imported rather than produced coal, meaning that there were no local coal mine owners, mine workers, or communities dependent on coal mining to contend with as there are in Alberta.

In November 2015 Alberta announced its climate plan. Its most prominent features were a broad-based carbon tax that starting in 2017, reducing methane emissions by 45% by 2025, and advancing the closing of all of Alberta's coal power units by 2030.

The Alberta-based environmental think thank Pembina Institute allied with Alberta doctors to frame the case for closing coal plants mainly around health issues, by showing that air pollution from coal led to premature deaths and illnesses in Alberta.

The NDP government's accelerated coal phase-out has been used to justify the continuation and growth of the Sands. Alberta's NDP government allied with four of the province's largest oil corporations and environmental groups on the climate plan.

The economic realities of 2017 in Alberta make it the ideal point to start a Sands phase-out. Tens of thousands of workers have been laid off in the Sands and related sectors, including construction, manufacturing, and professional business services. Rather than pray for another oil boom, it is better to stop further investment in the Sands today to spare massive write-offs tomorrow.

This paper proposed three steps to meet the target of ending Sands production by 2040:

1) Place a permanent moratorium on new Sands production.
2) Give a closing time for Sands projects and units of projects that long ago paid off the capital costs, starting with the initial Suncor and Syncrude units, which are over 50 years old.
3) Require each Sands project to lower its emissions annually by 3–4% per year (2–3 Mt) starting in 2018. Projects that fail to meet GHG reduction targets must be fined at a level higher than the costs to comply.

A just transition for Sands workers will require research, thought, and consultations with impacted, workers and communities.

It's important to note that government research and planning from as far back as the 1920s launched the Sands into becoming a feasible industry. Now as the age of oil is coming to an end, the Alberta and Canadian governments must launch a similarly committed research plan for a just transition off it.

The Alberta and Canadian governments have to choose between allowing the market to determine the timeline of a Sands phase-out and managing the transition off the Sands so that its workers are retrained to help build renewable energy and conservation projects.

In other words, we must act so that we are not acted upon.

Section 1 Will the Market or the Government Phase Out the Sands?

"You can't be producing more oil and reducing emissions—it's a fundamental contradiction."

Mark Campanale,
founder and executive director, Carbon Tracker[1]

1. Introduction

At a March 2006 news conference in Edmonton organized to launch the new report, *Fuelling Fortress America. A Report on the Athabasca Tar Sands and U.S. Demands for Canada's Energy,*[2] author Hugh McCullum and I called for a five-year moratorium on new development in the Alberta Sands.*

The call for a moratorium clearly struck a nerve, and similar calls—with demands ranging from a complete halt to expansion of the Sands pending environmental, economic, social, health, and community impacts, to calls for a slowing the pace of Sands development—were soon being made by many organizations and prominent individuals in Alberta and across Canada.

Calls came from First Nations in Alberta and the Northwest Territories, social organizations, and unions—including the Alberta Federation of Labour and the Canadian Labour Congress—many of Canada's main churches and environmental groups, and the Alberta New Democratic Party,[3] which was then an opposition party. Prominent individuals included Alberta's former premier Peter Lougheed, Fort McMurray Mayor Melissa Blake, and prominent University of Alberta water scientist David Schindler.

Motivating such calls were concerns about the Sands' harmful impacts on Alberta's north, the trampling of Indigenous rights, and the Sands' growing part in fuelling climate change.

* The terms "oil sands" and "tar sands," once used interchangeably in Alberta's oil industry, have become loaded expressions. They instantly pigeonhole the user as either for or against Alberta's bitumen. To avoid this, the term "the Sands" is used throughout this paper.

Calls to curb or close down the Sands have continued since 2006, but some of those who urged a slowdown or temporary halt to new Sands projects a decade ago do not make similar calls now. With the international oil price crash of 2014 resulting in a slowdown in Sands growth and increased unemployment in the oil patch, some, like the now-governing Alberta NDP and Alberta Federation of Labour have since become champions of renewed growth in the Sands.

Since 2006, Alberta's Sands have also become much better known by the international community, and have become for some the poster child of all that is wrong with the hell-bent drive of "Big Oil" to produce some of the earth's dirtiest oil. Meanwhile, the 2015 Paris Agreement of the United Nations Framework Convention on Climate Change has given calls to phase-out the Sands even more urgency than they had in 2006.

The evidence of rising climate disruptions is now much clearer , with 2016 breaking world temperature records, as had 2015 and 2014.[4] Drought and famine plagued parts of Africa, rising sea levels endangered coastal regions, Arctic temperatures of 10–15°C above normal caused unmatched melting of sea ice, and extreme weather events occurred more often.

More frequent forest fires and floods in Alberta and other parts of Canada have been at least partly attributed to climate change. These include more fires in Canada's boreal forests.[5] Insurance payouts resulting from extreme weather, including destructive floods like the ones that hit Calgary and Toronto in 2013, have more than doubled every five to 10 years since the 1980s, according to a 2015 report by the Insurance Bureau of Canada.[6]

The fossil-fuel belt?

The Alberta Sands are a very high-cost, marginal supplier of oil in the world, whose growth has depended on a high world oil price. They are also Canada's fastest growing and largest single source of greenhouse gas emissions (GHGs).

Can Canada reach the targets it has committed to in international agreements on climate change if it allows Sands output and emissions to grow substantially, or should the Sands be phased out?

As part of its Climate Leadership Plan, the government of Alberta plans to phase-out coal-fired power generation in the province by 2030. Alberta's Environment Minister Shannon Phillips justified the phase-out by saying, "There are two choices: we can either act on a made-in-Alberta plan or wait for policy to be imposed on us."[7]

Does Alberta face a similar choice when it comes to the Sands? Do the Sands run the risk of becoming a fossil-fuel belt similar to the rust belt in the US Midwest? Will the market close the Sands abruptly, or will the Alberta and federal governments manage a transition to ensure a soft landing?

Gargantuan reserves

Alberta's Sands are the largest stores of crude bitumen in the world. The Athabasca reservoir is by far the largest, but there are two others: the Peace River and Cold Lake deposits. The three deposits hold a combined 1.7 trillion barrels of oil.[8]

Only 166 billion barrels—about 10%—of the Sands reserves are deemed viable with current technology and prices.[9] But that 10% is still enormous, making Canada holder of the third-largest proven oil reserves in the world, and accounting for 97% of Canada's total oil reserves.

If we extract and burn all the proven reserves, can we still keep the world within the Paris Agreement climate target of 2°C—and preferably 1.5°C—above pre-industrial levels? Many climate scientists think not.[10]

Climate commitments and plans

In 2009, six years before the Paris Agreement of 2015 was reached, the G8 countries committed to cut their GHG emissions by 80% below 1990 levels by 2050. Canada, led by then-prime minister Stephen Harper, agreed to this target, along with the other seven members. There was a certain irony in Harper's G8 commitment because they were the very same targets he rejected when then-NDP leader Jack Layton moved them in the House of Commons the previous year.

For Canada to meet its 2009 G8 promise, Canada's annual emissions would have to fall from the 1990 level of 613 megatonnes (Mt) level 123 Mt by 2050. It's good to remember that 123 Mt national target; as we shall see it is only 23 Mt above the cap of 100 Mt that the Notley government in Alberta placed on Sands emissions in its climate action plan announced just before the December 2015 international climate negotiations in Paris.

In Paris, 195 countries agreed to an ambitious plan to keep the world's climate below a 2°C rise above pre-industrial levels. It was an historic agreement because both China and the United States, the world's number one and two carbon polluters, respectively, were brought into an international agreement to cut greenhouse gases considerably.

China was party to the 1997 Kyoto Protocol, the earlier international climate deal, but it and other developing countries were not obliged to lower emissions, based on the tenet of "common but differentiated responsibilities." Kyoto committed industrialized countries to reduce emissions because they had historically caused the current levels of GHGs in the atmosphere. The US signed the Kyoto deal, but never ratified it.

However, instead of global emissions falling from 1990 levels, as was the Kyoto Protocol's goal, the world's CO_2 emissions rose by 11.3 Gigatonnes (Gt) by 2011. China was responsible for 64% of the world's rise in those years (7.2 Gt).[11]

The government of Jean Chrétien committed Canada to the Kyoto Protocol, but the Harper government withdrew from it in 2012. Just before it withdrew, Canada topped the list of Kyoto signatories with the largest increase in carbon emissions relative to 1990 levels. Instead of Canada's Kyoto pledge to reduce emissions 6% below its 1990 level by 2012, Canada's emissions had grown by 18%.[12]

At the 2015 Paris negotiations, small island countries, in danger of being washed over by rising ocean levels, pushed hard for a more ambitious target: to keep average world temperatures below a 1.5°C rise above the pre-industrial level. The new Liberal government of Justin Trudeau, elected only six weeks earlier, was eager to throw off the image of Canada as an international climate villain. In Paris, Mr. Trudeau proclaimed that "Canada is back," and his new Environment Minister, Catherine McKenna, backed the small island countries' 1.5°C target.

It would take very strong and immediate action to limit the world to a 1.5°C rise because global average temperatures have already risen about 1.2°C above the pre-industrial level.[13] It will be hard even to meet the 2°C target, above which many climate scientists predict that potentially runaway warming would occur as natural "feedbacks" kick in. When the emission reduction targets of all countries party to the Paris Agreement are combined, it is calculated that they will lead to a global temperature rise of 2.6–3.1°C.[14]

The Paris Agreement was strong on aspirations, but very weak on delivery. To meet its Paris commitments, each country must find its own unique road map. A year after Paris, Canada had its national plan, called the Pan-Canadian Framework on Clean Growth and Climate Change, to which Ottawa and the provinces and territories agreed, with Saskatchewan as the lone holdout.

The framework puts a price on carbon pollution either through carbon taxes or cap-and-trade, depending on the province. The carbon price will start in 2018 at $10 a tonne and rise to $50 a tonne in 2022. That will add about 11 cents a litre at the gas pumps. Coal-fired electricity will be phased out by 2030. Other measures include building new electricity transmission lines between provinces, developing net-zero energy building codes for new buildings and retrofitting existing buildings to be more fuel efficient, raising emissions standards for vehicles and investing in electric vehicle infrastructure, and using regulations to reduce methane emissions by 40–45% by 2025.[15]

The pan-Canadian framework is not ambitious. While he was still prime minister, Stephen Harper submitted Canada's emissions reductions target to the Conference of the Parties in preparation for the Paris climate talks, pledging to reduce Canadian carbon emissions by 30% from 2005 levels by 2030. If achieved, it would cut the country's total emissions to 524 Mt, or only 11% below the 576 Mt pledge Canada made in Kyoto a decade-and-a-half earlier. The Liberal government initially promised to go beyond the Harper targets, but then decided to stick with them. Canada's Paris pledge to reduce carbon emissions by 1.7% a year until 2030 is also puny compared to European Union and US commitments of cuts of 2.8% a year.[16]

The federal-provincial climate framework follows and incorporates Alberta's plan to shut down its coal-fired power plants by 2030, adopting the same target as the date to end coal-generated power across the country. Alberta's climate plan will curb some of the province's GHG emissions, but will not reduce them overall by 2030.[17] Its most prominent features are a broad-based carbon tax that went into effect on January 1, 2017; reducing methane emissions by 45% by 2025; accelerating the phase-out of Alberta's coal power units to 2030 (to be replaced mainly by natural gas generation); and a 100 Mt cap on total emissions from the Sands—a 47% increase from the 2014 level.

The timeline for phase-out

Former prime minister Stephen Harper was a forceful champion of the Sands and their growth. He cut off funding to climate scientists, muzzled federal government scientists, and tried to water down Canada's GHG reduction targets at international climate summits. But even Mr. Harper was reluctantly brought around by German Chancellor Angela Merkel to endorsing the 2015 G7 agreement to decarbonize the economy in this century.[18]

By doing so, Mr. Harper implicitly acknowledged that the Sands—and all other carbon fuels—have a shelf life in Canada of no more than 85 years. He later tried to soften his commitment by saying it would require serious technological transformation and was an "aspirational target."

If phasing out the Sands is a must, can we really afford to wait 85 years? No. There is remarkable agreement from a variety of sources that we cannot wait beyond 2040.

Most of the world's carbon fuels must stay in the ground to avoid catastrophic warming, caution University of London economists Christopher McGlade and Paul Ekins, who wrote a study published in the scientific journal *Nature* in 2015.[19] There is, they wrote, "no point in continuing to explore for new deposits of oil and gas anywhere in the world, since we cannot afford to extract what has already been discovered."[20]

McGlade and Ekins studied which fossil fuels must remain unused to limit global warming to 2°C above pre-industrial levels,[21] and calculate, for example, that 88% of global coal reserves must remain unburned. If carbon capture and storage (CCS) technology develops significantly, this proportion only drops to 82% of global coal reserves.

When it comes to oil, the authors conclude that even with widespread CCS after 2025, over 430 billion barrels of the world's oil must remain unburned. With 260 billion barrels, the Middle East holds over half the world's oil that must remain in the ground. Canada holds a fair amount as well, most of it in the Sands. "For the world to have a reasonable prospect of meeting the [2°C] target," they write, "no more than 7.5 billion barrels of oil from the [Alberta] oil sands can be produced by 2050." If CCS is not available, they conclude that all Sands oil production must cease by 2040.

The World Wildlife Fund-UK found that CCS is not viable in the Sands because the sources of emissions are too diffuse to capture effectively. Even the most optimistic estimates from industry experts claim that CCS reductions from the Sands upstream operations will be 10–30% in the medium term (and only for the more favourable sites) and 30–50% in the long term, the WWF report states.[22] Reductions of around 85% are required to make the Sands emissions comparable with the average for conventional oil production.

Some oil executives also see a reckoning by 2040. In 2011, Clive Mather, former CEO of Shell Canada, warned that 30 years out (by 2041), "we won't be burning hydrocarbons the way we do today. Our enemies may not be at the door yet, but they are beginning to circle around Alberta."[23]

A council appointed in 2011 by Ed Stelmach, Progressive Conservative premier of Alberta from 2006 to 2011, also called for a plan to displace Alberta's Sands by 2040. Stelmach tasked the council with advising him on how to secure Alberta's long-term prosperity, asking, "What will it take to make the Alberta of 2040 the place for creative and committed citizens to live, work, raise families, contribute to and enjoy society?"

The Stelmach-appointed Premier's Council for Economic Strategy urged Alberta to start immediately on creating a post-Sands economy, warning:

> We must plan for the eventuality that oil sands production will almost certainly be displaced at some point in the future by lower-cost and/or lower-emission alternatives. We may have heavy oil to sell, but few or no profitable markets wishing to buy. … We can choose to wait until circumstances change and then react as best we can—hoping it's not too late. Or we can be proactive, making strategic investments to shape the Alberta we want.[24]

The council's advice was forthright and bold: "The creation of an affordable, environmentally friendly alternative to oil would be a great thing for the world. It could be economically devastating for Alberta if, when it happens, we are still heavily dependent on oil exports." If steps are not taken, the council warned, there is a "real risk" that by 2040 "Albertans will find ourselves watching the global economic game from the sidelines."[25]

Stelmach's council included David Emerson, trade minister in Stephen Harper's first government; David Dodge, former Governor of the Bank of Canada; Anne McLellan, justice minister and deputy prime minister under Jean Chretien; and Clive Mather, formerly of Shell Canada. You cannot get a more pedigree panel than that, but despite its eminence, the council's sage advice has fallen on deaf ears in the province.

The reality of the need for a managed transition off of fossil fuels was most recently acknowledged by Prime Minister Justin Trudeau at a January 2016 town hall meeting in Peterborough, Ontario:

> You can't make a choice between what's good for the environment and what's good for the economy. We can't shut down the oilsands tomorrow. We need to phase them out. We need to manage the transition off of our dependence on fossil fuels. That is going to take time. And in the meantime, we have to manage that transition.[26]

After his comments caused a political storm in Alberta, Trudeau backtracked somewhat, but reiterated that Canada must eventually wean itself off fossil fuels.[27]

This paper takes off from Mr. Trudeau's remarks on the need for a phase-out, and takes 2040 as the target date for a managed reduction and cessation of Sands production and emissions.

The next part of the paper looks at a planned transition off the Sands in the context of several market developments, including projected decreases in global oil demand; the unlikelihood that the international oil price will rise above the break-even level needed to spark new Sands projects over the next 25 years; the strength of the movement to divest from the Sands and the "stranded assets" case for withdrawing from Sands investments; and Canada's and Alberta's climate plans and support for new oil-exporting pipeline capacity.

Phasing out the Sands will be a very challenging undertaking, so it is useful to look at examples of other energy phase-outs. The second half of the paper discusses the cases of ending coal-fired electricity in Ontario by 2014 and Alberta's plans to do the same by 2030 to identify lessons from those examples that can be applied to a managed transition off the Sands.

The paper concludes with an outline of steps and stages of a Sands phase-out, and the principles needed for a just transition for workers in the Sands and related industries.

2. Will the Market Phase Out the Sands?

En route to his first G8 meeting in 2006, Stephen Harper stopped in London, England and pinned his economic strategy on the Sands catapulting Canada into what he called "energy superpower" status. Harper's bold assertion was a dramatic departure from the modest, middle-power claims of most previous Canadian prime ministers.

Digging the bitumen out of the ground "requires vast amounts of capital, Brobdingnagian technology, and an army of skilled workers," Mr. Harper stated. "It is an enterprise of epic proportions, akin to the building of the pyramids or China's Great Wall. Only bigger."[28]

It has been more than a decade since Mr. Harper's boast. Have the Sands made Canada into the energy superpower of his dreams? Are they likely to in future?

As a high-cost, marginal source of oil, prospects for the success of the Sands depends on several things happening simultaneously:

1) A flat or falling world supply of conventional oil[29]
2) A growing global demand for oil
3) Little serious action to limit greenhouse gases by governments, corporations, and citizens
4) A high world oil price

The first three factors determine price, the crucial one.

When one of these conditions falters, the Sands are on shaky ground. When all four do, they're in real trouble.

In 2006, all cylinders of the engine were firing, and within the confines of Calgary's oil patch—Mr. Harper's home base—prospects for exponential growth of Alberta's Sands seemed good. They had to be, or else corporations wouldn't lay down billions on a project that would take five to seven years to produce its first drop. You had to have faith that the bitumen or synthetic oil would readily find a market for decades. How else could you pay off the enormous capital costs before you reaped the rich reward?

While Mr. Harper's comments in London were over the top even in 2006, they at least seemed plausible. With global conventional oil supplies peaking and the appetite for oil among the BRICS (Brazil, Russia, India, China, and South Africa) seemingly unquenchable, global demand for oil was rising sharply, as was the world oil price. There was much talk of peak oil supply, and little of peak oil demand.

The Sands were projected to produce as many as 8 million barrels per day (bpd) by 2035.[30] Conventional oil and natural gas liquids were forecast to add more than 1 million bpd to that. Combined, oil output would top 9 million bpd and make Canada an oil superpower.

By 2015, the Sands engine was sputtering, but long lead times and already-sunk capital provided some momentum, as several corporations that started projects before the world oil price crashed in 2014 were still completing them. These companies had already laid down a lot of cash and could lose more by walking away from half-built sites.

The National Energy Board (NEB) still forecasts steady growth in bitumen production until 2019 as a result of projects started before the 2014 price slump. The roughly five-year time lag from investment to production in the Sands means the effects of the deferrals and cancellations made during the price bust will appear from 2019 to 2022 as flatlining Sands production.[31] The NEB predicts that output will grow again in the mid- to late 2020s.

Economist Jeff Rubin doubts such rosy growth predictions for the Sands, not because of climate policies, but because the economics aren't there. While both Prime Minister Trudeau and Alberta Premier Rachel Notley have argued that their climate change initiatives will help develop the Sands by making them environmentally palatable, Rubin argues their premise that the future of the Sands is critically linked to lower Canadian greenhouse gases is dubious. "It is the oil sands' costs, not their carbon trail, that jeopardizes further development of the resource in an emissions-constrained world."[32]

The Sands are one of the most expensive sources of oil in the world, Rubin contends, rendering them marginal producers in the world supply chain. Lowering their carbon emissions—or that of Canada as a whole—won't remedy that vulnerability.

From the vantage point of 2017, it is worth looking at each of the factors mentioned above that drove Sands growth from 2002 to 2008. The next part of the paper will address market forces of global oil demand, conventional oil supplies, global oil prices, and the related issues of divestment and stranded assets, before turning to the issue of the impact of government climate action on prospects for the Sands.

Peak demand

A combination of factors will likely reduce world oil demand in the near future. They include rising fuel efficiency standards for vehicles, growing gasoline carbon taxes, the rise in gasoline prices in OPEC countries that can no longer afford to subsidize domestic pump prices, and cheaper batteries that facilitate a shift to plug-in electric vehicles. Instead of peak oil supply, experts now point to peak demand.

The World Economic Forum in 2016 released white papers on global demand for oil by Amy Jaffe and Jeroen van der Veer. Three of the authors' four scenarios predict that world oil use will fall below 80 million bpd by 2040, a drop of 20% from today's 97 million bpd. The authors argue that demand will drop because of the post-Paris Agreement push for cleaner energy and the falling price of batteries that power electric vehicles,[33] which should lead to electric vehicles steadily replacing gasoline-powered ones.

Other observers predict growing demand for oil in the medium term. In its latest report, the International Energy Agency (IEA), known for its optimistic forecasts, predicts that global oil demand will continue to grow until 2040 despite expected falls in demand from passenger cars due to improved efficiency and electric vehicles. The IEA reasons that overall oil demand growth will come mainly from road freight, aviation, and petrochemicals, because they lack easy alternatives to oil.[34]

Oil and gas corporation BP concurs with the IEA's assessment. In its latest Energy Outlook report, BP forecasts that world demand for oil will rise by an average of 0.7% a year over the next 20 years, about half the growth rate of the past 20 years.[35] But in a gloomy note for Sands producers, BP predicts that the Middle East, Russia, and the US will gain market share at the expense of higher-cost rivals.

Big Oil corporations usually forecast decades of growing oil demand, in the hope that rosy forecasts will boost share value. The comments of Royal Dutch Shell CFO Simon Henry, then, came then as a bombshell. Peak demand for oil, Henry said in November 2016, "may be somewhere between 5 and 15 years hence."[36]

Alastair Syme, an oil analyst at Citigroup, agrees: "For the first time, oil companies have to think seriously about the future." Drillers that even a couple of years ago believed "every molecule of oil we produce will have a market" have come to realize they "can afford to bring on only the most competitive assets."[37] Syme believes only low-cost oil will have a future.

Where does such an assessment leave the Sands, which has one of the highest production costs on the planet?

Conventional supplies and the price of oil

As proponents of peak oil had predicted, the output of conventional oil in the world peaked in May 2005 and then stayed flat.[38] Depletion of old conventional wells often exceeded production from new finds, and global production seemed ready to flatten and then fall.

In reality, the opposite happened: world oil output rose, with more than 80% of the rise coming from outside the OPEC nations.[39] This was partly driven by growth in natural gas liquids and unconventional oil, including bitumen and deep ocean reserves, but the biggest factor was the rise of the shale oil industry in the US, driven by new extraction techniques including hydraulic fracturing (fracking) and horizontal drilling.

Once the world's greatest oil producer, by 2008 the US seemed to be in terminal decline, with crude oil production falling to half (52%) of its 1970 peak of 9.6 million bpd. But the fracking and shale oil revolution quickly reversed the decline, and US oil output rocketed back to 9.4 million bpd in 2015, almost reaching its 1970 height.[40]

As mentioned, growth in Sands output also helped drive up global oil supply, but to a much smaller extent, with gains in Sands output of 1.2 million bpd compared to the 4 million bpd growth in US shale oil.[41]

Oversupplied oil in the world led to a price crash from over $100 a barrel in the summer of 2014 to a low of $30 by autumn. At that price, US shale and Canadian Sands oil producers lost money on every barrel pumped.

Western media often blamed OPEC for refusing to reduce production, but as Jeff Rubin perceptively observed, North American oil producers were the architects of their own demise. "It is the huge production gains from shale formations and oil sands that are primarily responsible for the supply glut and the subsequent collapse in oil prices that now threatens their commercial viability."[42]

Led by Saudi Arabia, OPEC became alarmed in 2014 about losing long-time markets to unconventional US and Canadian oil producers. For the first time, the Saudis realized that oil left in the ground might be worth less in future than it is now.[43] If that is true, it is better to pump the oil now, even at a low price, than to wait.

So, in 2014 OPEC countries flooded the international market with cheap oil, and the international oil price crashed. OPEC's attack on shale oil worked in the short term, and high-cost shale oil producers had to shutter many sites. By December 2016, US shale oil output was down 19%, or more than 1 million bpd, from its March 2015 peak.[44]

However, OPEC's war against shale oil turned into a pyrrhic victory of winning the battle but losing the war as government debts in OPEC countries skyrocketed as oil revenues plunged. In December 2016, 26 months after it started the oil supply war, OPEC threw in the towel. Finding allies in several non-OPEC oil producers, including Russia, OPEC announced important cuts to oil production, with the aim of gradually ending the global oil glut.

By early 2017, the international oil price had responded to the expectation that OPEC countries would adhere to their individual lower-oil-output targets. The West Texas Intermediate (WTI) price rose significantly to the low- to mid-US$50 range. While still only half the price prior the 2014 price crash, it was high enough to again raise US shale oil production, and the International Energy Agency (IEA) expects shale production to climb by a little over half a million barrels per day, recovering half of the production lost since March 2015.[45]

Alberta's Sands were a secondary target in OPEC's war against US shale oil, but got sideswiped anyway. Seventeen major Sands projects were cancelled or put on hold, and even the somewhat-recovered price of US$55 a barrel for WTI is still too low to spark major investments in new Sands projects.[46]

Sands producers face several uncertainties that hinder investment. Will the world's oil price rise above their breakeven levels?[47] If it does, how long will it stay up? And what will happen to global oil demand?

Break-even prices and the Sands

Events outside Canada have already greatly slowed the expansion of the Sands. The oil price crash of 2014 caused the cancellation of 17 major Sands projects, almost half of the shelved oil projects in the world. Peter Tertzakian, a prominent Calgary-based oil analyst argues that most of the cancelled projects will not likely be resurrected even if the international oil price rises substantially.[48]

Jeff Rubin concurs: "Hanging over the oil sands industry like the Sword of Damocles is the fact that they are haemorrhaging red ink. At today's prices, the oil sands are not commercially viable."[49] Planned expansion of the Sands "have no economic context," Rubin asserted in March 2016, nine months before OPEC promised to cut oil production, and "could not be funded by any financial institution in Canada."[50]

IHS, a London UK company that does analysis for businesses, calculated that based on "full cycle" costs a new greenfield Sands mine required a West Texas Intermediate (WTI) price of between US$85 and US$95 per barrel in 2015 to break even. That's without an upgrader. In situ projects, which use steam-assisted gravity drainage (SAGD) to reach deposits too deep to mine economically, would break even at a lower WTI price of US$55 to US$65 a barrel. Expansion of existing SAGD facilities have a slightly lower break-even of about US$50 to US$60 per barrel.[51]

In January 2017, the WTI price was trading in the range of US$51 to US$55,[52] prices too low to start most new Sands projects, even SAGD projects. To make matters bleaker for the Sands, IEA Executive Director Fatih Birol warned of "greater oil price volatility" in the immediate future.[53]

David Hughes, a prominent Canadian earth scientist, estimates higher break-even costs, pegging new in-situ projects at US$68 to US$85 a barrel, and mine projects at US$96 to US$100 a barrel.[54]

London-based independent financial think tank Carbon Tracker's estimates are similar. It found that 92% of Sands projects require a market price of US$80 to break even. That does not allow for contingencies or profits. A price above US$90 is needed for most new Sands projects to get the go-ahead.[55]

It's true that some existing Sands projects are expanding; at the end of 2016 and the beginning of 2017, three oil corporations announced the first Sands expansions since the 2014 oil price slump. MEG will raise its output at Christina Lake by 20,000 bpd, or about 25%. Cenovus will expand its own Christina Lake project by 50,000 bpd and Canadian Natural will add 40,000 pbd to its Kirby North facility. The combined gains of 110,000 bpd, however, are small in the context of total Sands output in 2017 of about 2.85 million bpd.[56]

But no new Sands projects have been announced and several major oil corporations have pulled out.

Postponements and cancellations

Total ASA, the fourth-largest international oil and gas corporation, shelved its Joslyn North Sands project in 2014, citing concerns about operating costs. Two years later, Total added climate as a reason for pulling out. To align its business strategy with international efforts to keep world temperatures from rising no more than 2°C above pre-industrial levels, Total's 2016 climate report recognizes that part of the world's fossil fuels cannot be developed. In light of this, Total stated that it would focus on moderately priced production and assets that meet the highest environmental standards and "On that basis … we decided to reduce our exposure in Canada's oil sands."[58]

Total has, however, not completely left Alberta's Sands and still maintains a joint venture with ConocoPhillips in the Surmont bitumen project and still holds 29% ownership in the Fort Hills project after it sold a 10% slice of it to Suncor in September 2015.[59]

Royal Dutch Shell scrapped its Carmon Creek Sands project in 2015, citing lack of pipeline capacity to coastal waters as a major reason.[60] Shell still has a major stake in the Sands, specifically in the Athabasca Oil Sands Project (bitumen production, upgrader and carbon capture) it operates with Chevron and Marathon.

In December 2016, Koch Oil Sands Operating ULC asked the Alberta Energy Regulator to cancel approval for its 10,000 bpd Muskwa in situ project, a small project by Sands standards. Koch Industries did not believe the economic environment in Alberta would enable it to turn a profit, and objected specifically to Alberta's Climate Leadership Plan, citing the carbon tax and emissions cap.[61]

Despite its pull out from Muskwa and its criticisms of Alberta's government, Koch, "an American energy conglomerate owned by two powerful billionaire brothers who help fund the Tea Party and climate change denial movements in the U.S.,"[62] has invested in the Sands since the 1960s and still has huge bitumen assets of at least 1.1 million acres of Alberta's Sands and other investments.

The Sands face other related headwinds: the movement to divest and the rising credibility of the case for stranded assets are two of the greatest challenges.

Divestment

Divestment means getting rid of stocks and bonds in what you deem to be ethically reprehensible activities that give you income. When they reach a tipping point, divestments can lower share and bond prices, raise the cost of capital to fund new carbon fuel projects, and lead to less output and greenhouse gases.[63] Divestment can also succeed politically by focussing enough media and public attention on targets so that governments restrict the target's activities.

Drawing inspiration from divestment initiatives that helped topple apartheid in South Africa and turn tobacco corporations into pariahs, an international movement to divest from fossil fuel corporations began in the 1990s, and started to have substantial impacts in 2015.

A movement to divest from fossil fuels began on US campuses in 2011 as a moral campaign to get investors to withdraw funds from corporations that produce carbon emissions and impact the biosphere. The ethically-driven divestment movement has since spread to 688 institutions in 76 countries and moved to faith-based organizations, large insurers, pension funds, and banks—the latest being Laval University in Quebec City, which on February 16, 2017 became the first Canadian University to divest.[64]

There were other precursors to today's divestments from carbon fuels. In 1992, the UK-based Co-operative Bank, which is part of the Co-operative Group, a family of cooperative UK investment institutions, launched an ethical policy that set out where it would and would not invest its customers' money. Refraining from funding carbon-producing industries was part of the bank's ethical investing philosophy.

In 2008, the Co-operative Asset Management, then a $6 billion investment fund, pulled all its investments out of Alberta's Sands, reasoning in the management fund's 2008 reports:

> Expanding oil sand capacity is capital intensive – up to 20 times more so than conventional oil. When there are cheaper conventional resources available, which are sufficient for maximum possible exploitation in a carbon constrained economy, this lavish capital expenditure may produce stranded assets in the more carbon constrained world to come. … An investor with an eye to the future must consider that large-scale expansion of oil sands – at least without some magic bullet to solve the emissions problem – will provoke regulatory shocks down the line.[65]

One example of a successful divestment campaign came out of Norway. Ever since Statoil—which is 67% owned by Norway's government and is therefore vulnerable to political pressure—started investing in the Sands in 2007, Norwegian opposition to its involvement in the Sands was strong for environmental reasons.

In 2012, the Church of Norway sold its Statoil shares in protest against the company's Sands project. Several Norwegian political parties called on Statoil to pull out of Alberta's Sands, as did the indigenous Sami Peoples Parliament as part of a civil society coalition that also included concerned scientists and grandparents, as well as Greenpeace and WWF.

Statoil pulled out of the Sands altogether in December 2016, citing cutting costs and emissions as reasons for the withdrawal. The company was going to build a $10 billion Sands project, but accepted an unsolicited bid for its assets in December 2016, losing about $500–$550 million in the pullout.[67] Statoil is staying in Canada though, focusing on its discoveries in offshore Newfoundland.

Stranded assets

Assets can become stranded in several ways.

Climate regulations to curb greenhouse gases by a target date can shorten the asset's life, as was the case when the phase-out of coal-generated electricity in Ontario led to stranded coal assets, a case addressed in Section 2 of this paper.

Low international prices, like the 2014 oil price crash, can at least temporarily strand high-cost oil assets such as those in the Sands and shale oil. If the goal is to steadily reduce GHGs, it is not good to rely exclusively on price stranding, which can be reversed if and when the international price rises above break-even levels.

A major risk for carbon fuel stranding comes from innovations that reduce oil demand, such as those that improve energy efficiency, increase sales of hybrid and electric cars, increase battery storage capacity at affordable prices, and advances in renewable energy.

As outlined above, stranded assets can also result from movements pushing investors to exit from carbon fuels for ethical and environmental reasons. The fossil fuel divestment movement continues to expand quickly, but its impact grew exponentially when it was joined by financially-driven divestments from the stranded assets of firms complicit in climate change.

Christiana Figueres, former UN climate chief, said in 2015 that "the risk of stranded assets is no longer an academic discussion, but a shareholder reality."[68] She singled out the "tar sands, deepwater and Arctic projects" as being priced out of the market by the fall in international oil prices.

Carbon Tracker started to target climate-related stranded assets in 2011. In a 2015 report,[69] the financial think tank did a stress test on the amounts and kinds of oil, coal, and natural gas that must be shuttered to keep the world on track to meet the Paris Agreement target of keeping temperatures from rising more than 2°C above pre-industrial levels. To reach this goal, Carbon Tracker estimates that over $2 trillion in capital expenditures (capex) must not be approved. Stopping approvals would purge 156 gigatons of carbon emissions. "Production will not stop overnight," the 2015 report argues, but "planning for the transition is required."

Chinese coal production, the report notes, is the world's biggest climate risk and most in need of curbing. From 2000 to 2012, China increased its coal use, but the good news is that China's thermal coal output has already peaked.

Natural gas is a low carbon risk, according to the report, but it may underestimate the GHGs released from fracked gas (particularly because of damaging and rarely counted attendant fugitive methane emissions),[70] which can equal or even exceed those from coal.[71]

Carbon Tracker's report insists that many oil investments also must not proceed. Output in existing oil wells, the report explains, declines over time and new investments are required just to keep output flat. The majority of existing oil production is needed and fits within the 2°C carbon stress test, but many capital expenditures on oil must halt in the next decade. The report warns specifically of "US shale oil, Canadian oil sands, Russian conventional oil and Arctic oil" as traps, along with Mexico and Kazakstan.[72] In Canada's case, the report shows, the great majority of the capital expenditures to be avoided are in Alberta's Sands.

In a breakthrough speech in September 2015, Bank of England Governor Mark Carney warned about the risks to financial stability from potential drops in the value of oil, natural gas, and coal corporations, whose reserves may become stranded. The adjustment toward a lower-carbon economy poses transition risks, Carney argued, and shifts in our climate and changes in policy, technology, and physical risks can prompt a reassessment of the value of a large range of assets, with profound implications for insurers, financial stability, and the economy.[73]

In light of these risks, Carney said, companies need "to develop consistent, comparable, reliable and clear disclosure around the carbon intensity of different assets." They should disclose not only what they release today, but how they plan to transition to the future net-zero world.

The call for divesting from stranded, carbon-fuel assets got an enormous push when ministers in the G20 countries asked the Financial Stability Board (FSB), which is chaired by Mark Carney, to report on how the financial sector should quantify and make public the risks climate change poses to companies, sectors and economies.

The report of the FSB task force, which was chaired by Michael Bloomberg, former Mayor of New York City and the world's eighth-richest person, states that global warming caused by greenhouse gases poses serious economic risks. It is imperative, that investors "know which companies are most vulnerable to climate change, which are best prepared, and which are taking action" so that the financial impacts of climate change are correctly priced. What gets measured better gets managed better, Bloomberg argued.[74]

HSBC, the world's sixth-largest bank by total assets, also warned that Alberta Sands investments were in danger of becoming stranded assets. "While expensive deepwater, US shale and risky Arctic ventures may be mothballed or abandoned, oil sands face the greatest stranding risks, in our view, given the combination of high breakeven price and higher carbon intensity of production."[75]

When fossil fuel divestment reaches a tipping point, it can have a positive impact on the climate if it reduces investments in carbon fuel production, giving more time to implement policy, invest in low-carbon energy infrastructure and develop technologies and social solutions that boost a faster transition to a low carbon future.[76]

That's where governments must come in to take the lead.

3. The Need for Government Action in Canada

Predictions of a low international oil price in the future, divestment movements, and the reality of stranded assets have successively scaled back the Canadian Association of Petroleum Producers' (CAPP) growth forecasts for the Sands.

CAPP in June 2016 forecast the Sands output would grow from 2.7 million bpd to 3.7 million bpd by 2030. Canada's total oil production of 3.9 million bpd is forecast to rise to 4.9 million bpd over the same period. That's way below Stephen Harper's 2006 dream of Canadian energy superstardom whereby Canada would join the league of the world's top three producers, Saudi Arabia, the US, and Russia, which currently produce 11.7 million bpd, 11.1 million bpd, and 10.4 million bpd, respectively.[78]

That is good, but it is not pointing to a phase-out. Whatever the break-even price will be for Sands oil projects between now and 2040, we cannot rely on a low international oil price to cap and phase-out the Sands when scores of big oil corporations have sunk tens of billions into them. They will do their utmost to lower costs, influence governments and find ways to move and sell their oil so they don't lose their investments.

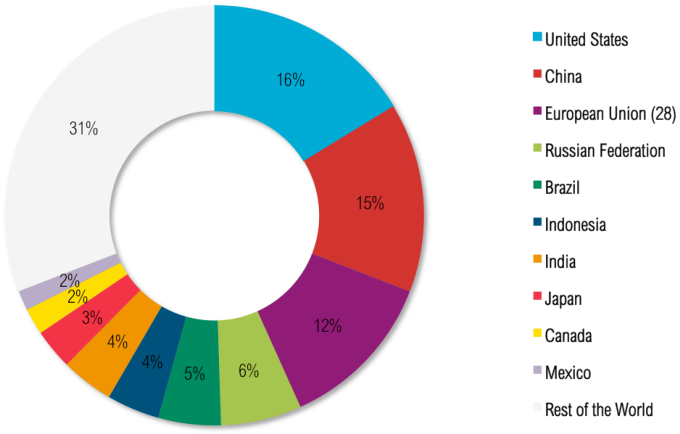
Only effective government plans can guarantee a managed phase-out of the Sands, and do it in ways that provide retraining, including income replacement, and alternative jobs for Sands workers.

In September 2016, Oil Change International, an advocacy organization based in Washington DC, published a compelling report entitled *The Sky's Limit*. It outlines the need for governments to map out national routes to their low-carbon futures.[79] "Increased extraction leads directly to higher emissions," the report argues, adding there is "a hard limit to how much fossil fuel can be extracted, which can be implemented only by governments."

The first step outlined in the report is for governments to stop the building of new carbon fuel extraction projects and pipelines, but even that would not be enough to meet the goals of the Paris Agreement. "Some early closure of existing operations will be required. Every country should do its fair share."

The industrialized countries, the report contends, have the financial resources for effective climate action, as well as the greatest responsibility. "With just 18% of the world's population, industrialized countries have accounted for over 60% of emissions to date." This disparity is illustrated in Figure 1, from the World Resources Institute.

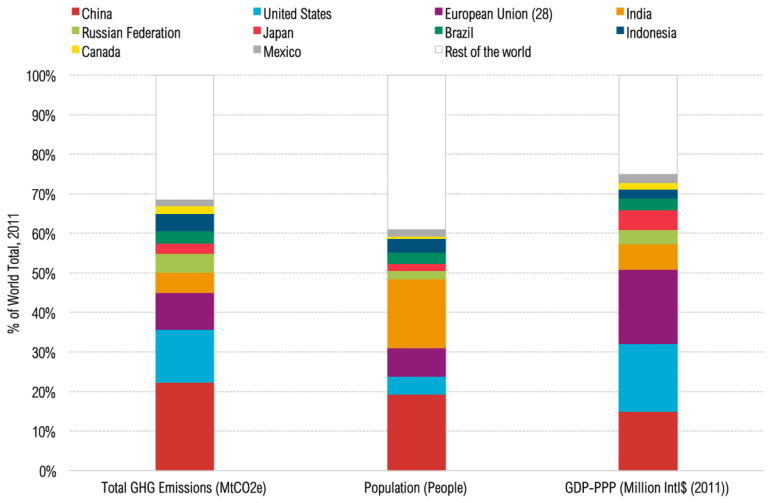
Figure 1: Cumulative CO_2 emissions, 1850–2011 (% of world total)



Source: World Resources Institute, www.wri.org/blog/2014/11/6-graphs-explain-world's-top-10-emitters

That puts an onus to act on Canada, which ranks 38th in the world by population but ninth by absolute emissions. With just 0.5% of the world's people, Canada has historically released two percent of global GHGs (see Figure 1) and currently emits 1.6% (Figure 2).[80]

Figure 2: Annual emissions of top 10 emitters in 2011

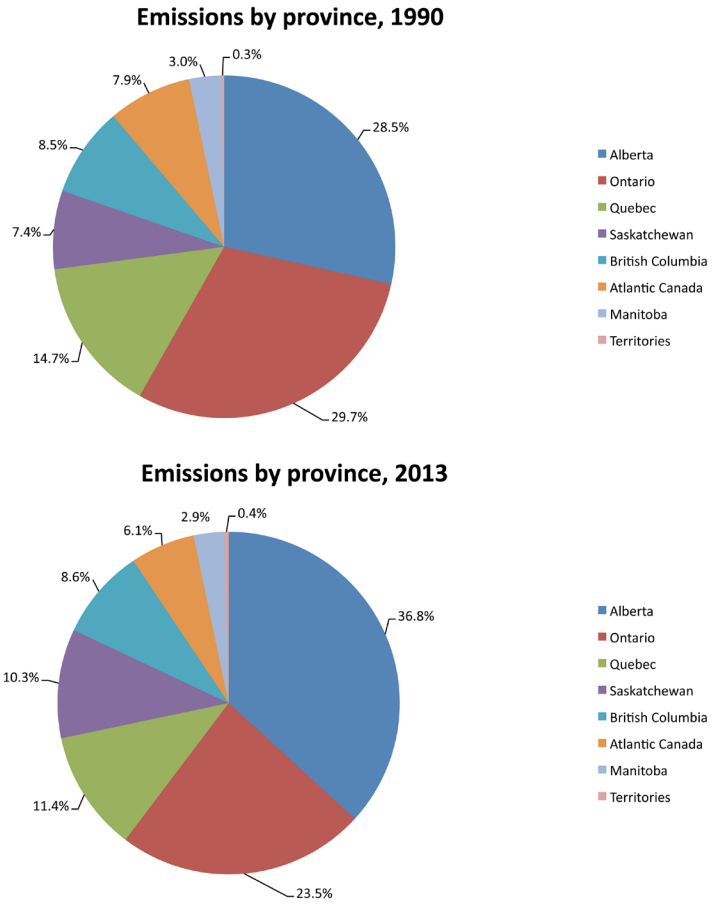


Source: World Resources Institute, www.wri.org/blog/2014/11/6-graphs-explain-world's-top-10-emitters

What gives Canada the right to foul humanity's common atmosphere at three times the global per capita average? To get Canada's releases down to its 0.5% fair share of emissions, the federal and provincial governments need to go well beyond the pan-Canadian climate framework agreed to in December 2016. There's no good reason for Canadians' per capita CO_2 emissions to be 14.7 tons, a level 25% higher than Norway's 11.7 tons per capita, despite the fact that Norway produces three-and-a-half times as much oil per person as Canada.[81] Canada's per capita emissions are likewise 262% above Sweden's 5.6 tons. Like Canada, both Nordic countries are cold, sparsely populated and have a high standard of living.[82]

There is also differential responsibility for emissions within Canada. Alberta had 12% percent of Canada's population but accounted for 37% of its GHGs in 2014, and its share of emissions has been growing (see Figure 3).

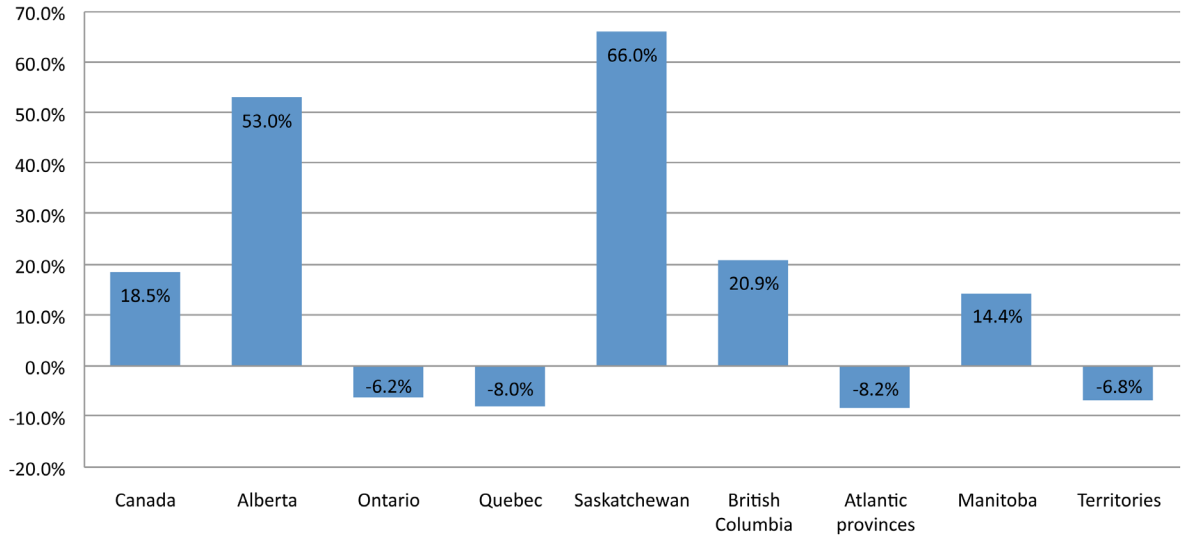
Figure 3: Emissions by province, 1990 and 2013



Source: Environment Canada, Canada's Greenhouse Gas Inventory, www.ec.gc.ca/ges-ghg

While total carbon emissions were wrestled down by 8% in Quebec and Atlantic Canada, and 6% in Ontario from 1990 to 2013, they've grown by 53% in Alberta and 66% in Saskatchewan in that period. They rose by smaller amounts in BC (21%) and Manitoba (14%).[83] As a net result, Canada's total GHGs rose 18% from 1990 to 2013 (see Figure 4).

Figure 4: Percentage change in emissions by province, 1990 to 2013



Source: Climate Change Connection, climatechangeconnection.org/emissions/ghg-emissions-canada/canada-ghg-by-province

It's not that westerners drive too much, but that they're home to most of Canada's oil and natural gas output. The astonishing impact of the Sands and other carbon fuel production in Alberta can be seen in the following comparison, which uses 2014 data: with 4.2 million people, Alberta produces 8% more GHGs than Ontario and Quebec with a combined population of 22 million (274 Mt to 253 Mt).[84] In other words, Alberta's emissions are almost six times as much per capita.

The production of natural gas and oil in Canada, including from the Sands, is Canada's largest source of emissions, comprising 26% (192 Mt) of the total (732 Mt) in 2014.[85] Those GHGs surpass those from all forms of transport 23% (171 Mt).[86] The Sands are Canada's largest single emissions source and its fastest growing one, rising more than fourfold since 1990[87] and rising from 34 Mt in 2005 to 68 Mt in 2014.[88]

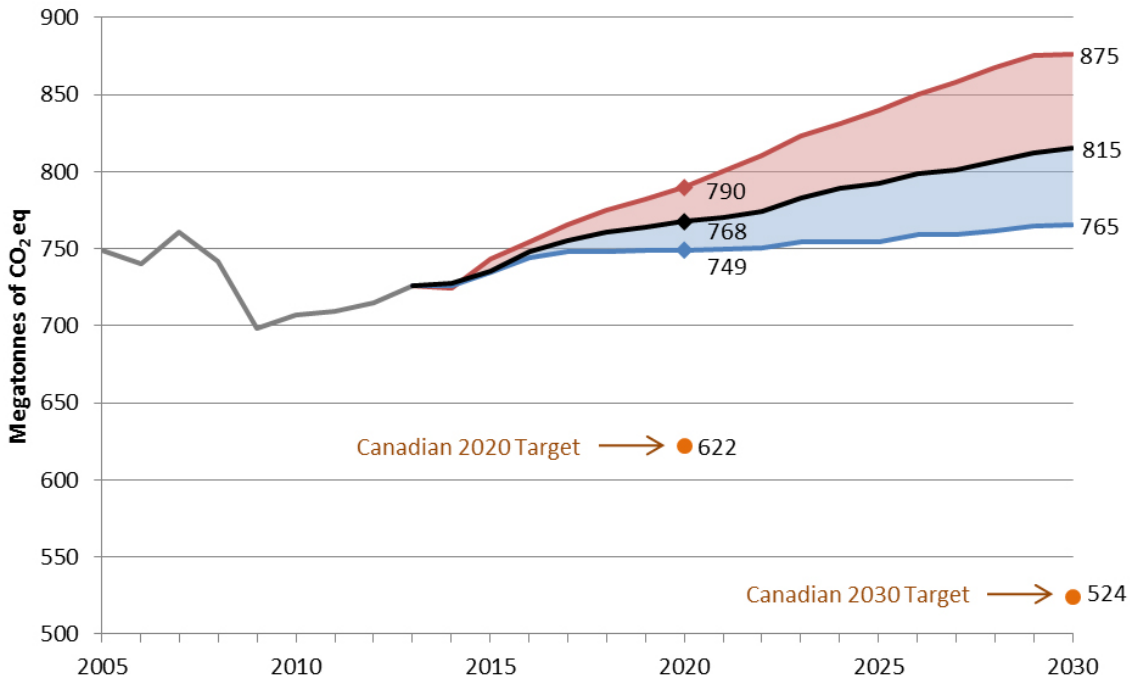
Climate plans in Canada

As outlined in the introduction, Canada's response to the challenge of climate change has not been credible in the past, and the new pan-Canadian framework is not credible either.

Canada ratified the international Kyoto Protocol in 2002, pledging to cut Canada's greenhouse gases by 6% from 1990 levels by 2012 (from 613 Mt to 576 Mt). Instead, emissions rose by 18%, to 715 Mt.

Canada's pre-Paris pledge, made by then-prime minister Stephen Harper and subsequently adopted by Prime Minister Justin Trudeau, committed to reduce Canada's 2005 emissions level of 749 Mt to 622 Mt by 2020 and to 524 Mt by 2030, representing a 30% reduction. In January 2016, however, Environment Canada projected that "with current measures" actual emissions will increase by 5% by 2020 and by 11% compared to 2014. This means Canada's emissions are projected to be 55% above Canada's COP21 commitments by 2030 (see Figure 5).

Figure 5: Canada's emission projections in 2020 and 2030 (Mt CO_2 equivalent)



Source: Environment Canada, ec.gc.ca/ges-ghg/default.asp?lang=En&xml=8BAAFCC5-A4F8-4056-94B1-B2799D9A2EE0

The problem with the 2016 pan-Canadian plan is that it allows production from big, mainly foreign oil, to release carbon almost at will. To allow for that expansion, the plan goes after the smaller fish—electricity generated from coal (11%), and emissions from buildings (12%). It also very lightly slaps the wrist of transportation (23%) through carbon taxes (BC and Alberta), and cap-and-trade (Ontario and Quebec).[89] Those measures will take six years to add a meagre 11 cents a litre at the pumps.[90] Three years ago gasoline prices were 20 to 30 cents a litre more than today, yet those prices did little to curb GHGs. Why should we expect that adding 11 cents a litre will do much?

On the eve of the 2015 Paris climate talks, Alberta Premier Rachel Notley announced the province's climate plan. The CEOs of four Sands oil corporations stood with Premier Notley.

Alberta's "climate leadership plan" received widespread applause. It should not have, as it will likely prevent Canada from reaching its Paris climate promises. Alberta's plan targets the 28% of Alberta's greenhouse gases that come from coal, mainly from coal-generated electricity (17%), and transportation (11%). It leaves almost scot-free the 46% of releases from the production of oil and natural gas. Alberta's climate plan also allows oil sands emissions to grow to 100 Mt, or by 47% from current levels.[91]

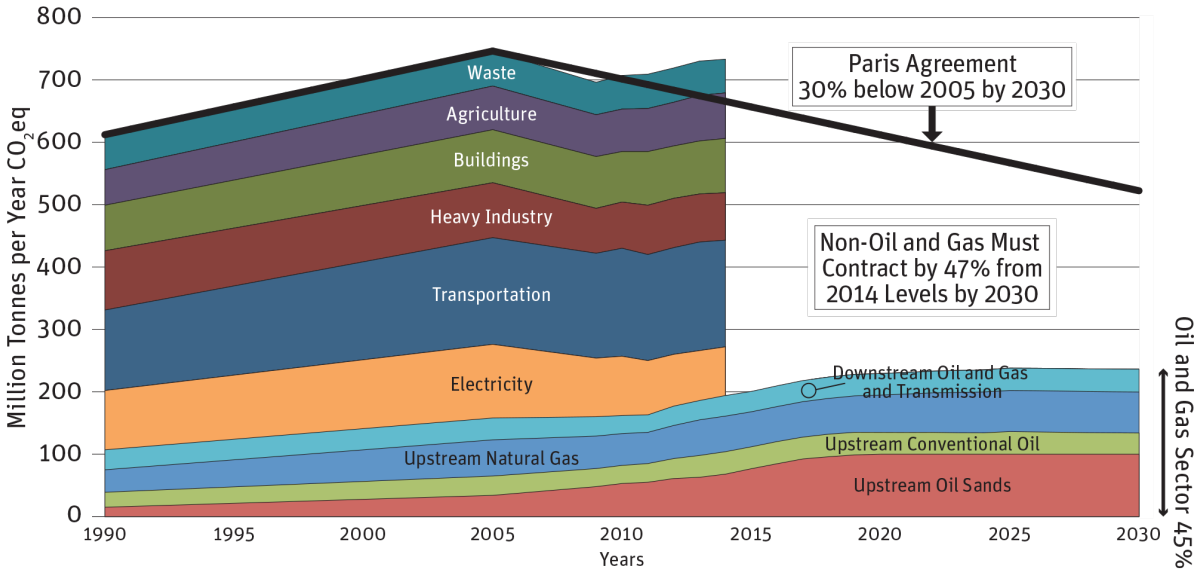
Growing emissions from the production of oil and gas will entirely cancel out Alberta's reductions in electrical power, vehicles, and methane over the next 10 to 15 years.[92] Alberta's emissions cap is more like a licence to continue to carbon pollute.

The plan also kills former federal NDP leader Jack Layton's dream. In 2008 and 2010, the House of Commons passed the Layton-sponsored Climate Change Accountability Act, to cut carbon emissions by 80% from Canada's 1990 level by 2050. Unelected Conservative senators ultimately defeated the bill, but it still had great international influence. In 2009 all G8 countries, including Canada, then led by prime minister Harper, adopted Layton's emissions target. Ontario's current climate plan also uses it.

Cutting Canada's 1990 emissions level by 80% by 2050 would leave total emissions at 123 Mt, only 23 Mt above the Sands cap of 100 Mt laid out in the Notley government's plan. If allowed to rise and stay that high, Alberta's Sands would take up 81% of the level of Canada's emissions envisioned by Layton's act in 2050. All other carbon energy uses including driving and heating homes would have to just about shut down.

If Canada is to meet the less-ambitious Harper/Trudeau Paris target of 524 Mt by 2030, and Sands emissions are allowed to rise to 100 Mt a year by then, the Sands will be responsible for almost one-fifth of the country's total GHGs, and the total oil and gas sector will account for 44% of emissions. As illustrated in Figure 6,[93] the rest of the economy would have to cut emissions by almost half—47% in less than 13 years. That clearly won't happen.

Figure 6: Canada's greenhouse gas emissions by sector, 1990–2014, and projections to 2030



Source: J. David Hughes, *Can Canada Expand Oil and Gas Production, Build Pipelines and Keep Its Climate Change Commitments?*, based on National Energy Board (2016) reference case, a 100 Mt/year emissions cap on Sands and one (of five proposed) liquefied natural gas terminals in BC (the NEB reference case), www.parklandinstitute.ca/can_canada_expand

Yet, rather than cap Sands oil output at current levels and then steadily reduce them, the federal-provincial climate framework, adopted and folded the Alberta plan into the pan-Canadian one.

Regional tension is an additional problem for the pan-Canadian climate framework. A nasty East-West political battle is brewing, made worse by the recent election of Donald Trump as US President. His opposition to climate action emboldens climate deniers and opponents of restrictions on oil production, especially in Alberta and Saskatchewan, to oppose carbon taxes and demand Trumpian style deregulation.

The danger with this imbalance is that Eastern Canadians, as well as drivers and homeowners everywhere, will get angry and ask why they should cut their vehicle and home heating usage, through carbon taxes or cap-and-trade, so Big Oil can raise its output, emissions, and profits.

Federal and provincial Conservatives are already demanding that Canada roll back its climate plan and adopt Trump-like policies so that Canada remains competitive with the US, its largest trading partner.

Alberta could help reduce this simmering regional tension if it adopts a plan to phase-out the Sands. They must not let the market, carbon fuel corporations, or Donald Trump deter humanity's fight against climate change disruption.

Allowing Sands GHGs to grow that much will almost certainly prevent Canada from reaching its 2030 Paris target, unless it buys costly carbon credits from abroad. While Ottawa and the provinces frequently repeat high-sounding aspirational goals to curb GHGs, their plans are far too modest.

The pipeline problem

But worse than merely being insufficient, Ottawa's actions are actually making things worse. The Trudeau government is facilitating oil and pipeline corporations by approving major expansions of two major bitumen-exporting pipelines: Kinder Morgan's Trans Mountain and Enbridge's Line 3. If the lines are built, they will further encourage the growth of Sands output, as will President Trump's approval of TransCanada's Keystone XL line to the US Gulf coast which Barack Obama killed in 2015.

If all these proposed projects are completed, Canada's carbon emissions will grow, not contract. It will also lead to further encroachment on, and damage to, Indigenous lands.

Sands producers have recently been complaining about feeling the pinch of lack of takeaway pipeline capacity. Some bitumen has been removed by rail, a costly option; it costs up to $20 a barrel to move by rail and half that—$8–$12 a barrel—to move by pipeline. With international oil prices in the US$50 to US$55 a barrel range and the price of WCS (Western Canada Select) of around US$32, the extra $10 a barrel to move by rail can be the difference between oil corporations operating at a profit or loss,[94] and the difference between deciding to develop new capacity in the Sands and halting or divesting from them.

If all three pipelines are built or expanded, however, an opposite problem may occur: there may be too much pipeline capacity. That is not good for several reasons.

The Trans Mountain expansion would add capacity of 590,000 bpd, Line 3 would add another 370,000 bbd, while Keystone XL would boost capacity by 830,000 bpd. In total, the three lines would increase Canada's oil export capacity by 1.79 million bpd, or by about 50%. Current Western oil output—including all forms of conventional oil and bitumen—is about 3.7 million bpd.

If, despite enormous opposition, all three pipelines are built, they could drive a stake through the heart of Canada's climate ambitions. The lines would take as much as three decades, until about 2050, to pay off their initial capital costs. The pipeline companies—TransCanada, Kinder Morgan and Enbridge—would want to keep those lines full of mainly Sands oil until then and pressure the Canadian and US governments to allow them to do so. Would Ottawa cave into such pressure? Would Alberta's 100 Mt cap limit the amount of Sands oil that could be produced? If the corporations got their way, and the world oil price was high, Sands output could continue undiminished until mid-century. If they did, how could Canada possibly fulfil its promises to decarbonize by 80% by 2050?

Overbuilt pipelines are a bad idea for other reasons. When lines are half full, shipping costs can rise substantially because pipeline companies want to generate the same revenue from smaller volumes. If the forecasts of a drop in global oil demand are right, the new pipelines will likely become white elephants or stranded assets. The pipeline corporations could go bankrupt, and Canadian governments have a history of rescuing failed transportation companies, and leaving taxpayers to pick up the tab.

A century ago, three transcontinental rail lines were built that duplicated the already established Canadian Pacific Railway. Too many rail lines chased too few customers, and the newer lines took on a lot of debt and went bankrupt. The federal government assumed their debt and then took them over. They and several other government rail lines were merged between 1919 and 1922 to become the Canadian National Railway. In the end, it took half-a-century for federal taxpayers to pay off the debt. Could pipeline overbuilding repeat that kind of history?[95] There are risks to overbuilding.

Facing risks to overbuilding or being too heavily invested in sunset industries, I now turn to the case of coal phase-outs to explore what insights might be gleaned on how an industry phase-out can be responsibly managed.

Section 2 Lessons from Other Energy Phase-outs

Phasing out polluting, sunset industries is difficult and wrenching for the workers and communities that depend on them. But for something urgently necessary, like the coming of climate change disasters, it can and must be done.

This section looks at what lessons can be learned from the phase-outs of coal-generated power, and their applicability to a plan for Alberta to go bitumen-free. Ontario successfully phased out coal, and numerous jurisdictions around the world—including Alberta—have committed to do the same. While the comparisons between coal and the Sands are not analogous, are there lessons we can learn from phase-outs of coal-generated power that can be applied to a plan for Alberta to go bitumen-free?

The international context of a coal phase-out

Many countries and regions intend to eventually end the use of coal power, knowing they need to do so for compelling environmental and health reasons. While corporate and popular resistance have usually hindered progress, there has recently been a momentum building to end coal-fired power.

Canada and seven European countries—Austria, Finland, France, Germany, the Netherlands, Portugal, and the UK—have announced target dates to go coal-free. They will join the already-coal-free nations of Belgium, Cyprus, Malta, Luxembourg, Estonia, Latvia, Lithuania, and Scotland.[96] The target dates for ending coal are as follows: Portugal by 2020; France by 2023; Austria, Britain, and probably the Netherlands by 2025; Canada, Finland, and half of German coal by 2030; and the rest of Germany by 2050.[97]

Seven old coal power plants were closed in France in 2015, and easy move given that coal now generates only 3% of its electricity.[98] Parliamentarians in the Netherlands voted to close its five old coal power plants and its three brand new ones by 2025. The decision is hotly contested and could be overturned. In a textbook case of stranded assets, the three Dutch coal plants that opened in 2015 are

losing billions of Euros. As Megan Darby explains, they didn't "foresee a rapid rise in renewable power generation, falling demand and calls for a coal phase-out to meet climate goals."[99] Although Germany seems to be the laggard—they chose to purge nuclear power before coal—its plan is in some ways the most ambitious because Germany relies on coal to make so much of its electricity, a full 44%.[100]

Donald Trump has vowed to drill more oil, burn more coal, and cancel the US national climate plan. Washington intends to withdraw from the Paris Agreement that has been agreed to by almost 200 countries.[101] Trump's move breaks the international momentum toward stronger climate action. It's not yet clear how much and how fast Trump can slow or reverse the reductions in US emissions, or influence other countries to weaken their climate plans. But early signs of concern are there; Saudi Arabia, Qatar, and other states were obstructionist at the UN climate summit in Marrakech in November 2017 right after Trump's election victory.[102]

However, the world has moved on from US unilateral withdrawal before. When the US pulled out of the Kyoto Protocol, the last international climate treaty, the other countries carried on with Kyoto. Fortunately, climate action is still taking place in the US at the subnational level, with California, Massachusetts, Oregon, and Washington planning to phase-out coal power plants.

It's uncertain whether China will pick up world leadership on climate that the US has dropped. As the world's largest energy consumer, China's actions have global impact. China uses half the world's coal, and while it has no national plan to phase it out, after rapid rises in coal use from 2000 to 2012, China is finally taking major steps to reduce it. China's coal use fell 2.9% in 2014 and 3.7% in 2015, reductions which were largely responsible for the global plateau in GHG emissions in 2014.[103] In a hopeful move, the city of Beijing decided to close the last of its four coal power plants in 2016.[104] China is, however, still building new coal-fired generation by replacing the least-efficient plants with lower emitting ones. Overall, China still a long way to go on coal, but it's starting to make giant strides, with plans to close over 1,000 coal mines in 2016 and not open any new ones in the following three years.[105]

In 2015, nearly 100% of newly installed electrical capacity in China was for renewables— a record investment of $110.5 billion. China's total capacity for wind farms is now 145 gigawatts (GW)—more than Canada's total electrical power from all sources of 131 GW. China added an extraordinary 30.5 GW of new wind power capacity in 2015 and 16.5 GW in solar—a world record— and promises to have 200 GW of wind and 200 GW solar power within four years.[106] Combined, that's enough to power 280 million homes for over half-a-billion people.

We've run out of China excuses.

Canadian action on coal

As outlined in Section 1, the pan-Canadian climate framework is very timid. It sanctions a 47% rise in Sands emissions from 2014 levels and goes after coal-generated power for emissions reductions, setting 2030 as the date to *virtually* get off coal-fired power. Ottawa needed the agreement of the provinces because they have sole jurisdiction over electric power generation.

The federal-provincial framework follows and incorporates Alberta's plan to shut down its coal power plants, and also adopts Alberta's 2030 target as Canada's proclaimed date to end coal. After Ontario shut down coal, Alberta was Canada's biggest remaining user of coal to produce power.

For New Brunswick, Saskatchewan, and Nova Scotia, coal phase-outs by 2030 are a mirage of equivalencies and soft target dates.

New Brunswick's climate plan is confusing. Premier Brian Gallant says the province aims to close the Belledune coal plant by 2030, but that it may not happen before 2040.[107]

Saskatchewan gets 40% of its power from coal, and it will not go off coal, but Ottawa gave it an equivalency credit for its carbon capture and sequestration programs (CCSP). Saskatchewan's Boundary Dam, the world's first commercial-scale CCSP for coal plants, can capture and sequester up to 90% of its GHG emissions.[108] Saskatchewan Premier Brad Wall opposes taking serious climate action and was the only premier to refuse to sign the pan-Canadian climate framework.

Nova Scotia won't quite get off coal by 2030 either. It got Ottawa's OK to continue to use some coal after 2030 during winter months, when power demand is high. This will enable Nova Scotia to go straight "from coal to clean," that is to renewable energy, rather than replace coal with natural gas. The other provinces that go coal-free will switch to gas power plants.[109] Ontario built 17 new natural gas power plants to replace the closed coal ones,[110] a move that is problematic because it will likely lock in the use of natural gas to generate electricity for decades. When burned, conventional natural gas emits about half the GHGs of coal, but if the natural gas is fracked—as it increasingly is—as many GHGs can be released as with coal. Although Nova Scotia's plan to go straight from coal to renewables is better, Nova Scotia has yet to set a date to go coal free.

Manitoba is not part of Canada's off-coal plan, but its sole coal power station in Brandon had already been scheduled to close in 2019.[111] After that, the province will be coal-free.

We will examine Alberta's plan to go off coal in depth, but will first look at how Ontario went off coal.

Ontario's phase-out of coal-fired electricity

Ontario's coal phase-out was Canada's biggest successful step so far in reducing GHGs, with the 30 Mt a year cut overshadowing the remaining GHGs that can be wrung out of the four provinces that still have coal power plants.[112] When Alberta goes coal-free in 2030, emissions are expected to fall by at least 14 Mt a year. But Ontario's policy was also problematic since it made electricity too expensive and sparked popular opposition to further provincial initiatives to curb carbon pollution.

In 2000, coal provided 28% of Ontario's electricity and Ontario Hydro/Ontario Power Generation opposed going coal-free, as did the Association of Major Power Consumers of Ontario, and the Power Workers' Union. The Nanticoke station in southern Ontario was the largest coal power plant on the continent, and was also Canada's biggest single air polluter. The Lakeview coal plant, located on the western edge of Toronto was very large too, and it was likewise the Greater Toronto Area's biggest source of air pollution.[113]

The campaign to go coal-free was started in 1997 by Jack Gibbons and Sara Bjorkquist in the midst of a heated debate over the initiative of Conservative Premier Mike Harris to privatize Ontario Hydro, the giant company that had provided cheap power to Ontarians since 1906.

The campaign was led by the Ontario Clean Air Alliance (OCAA), a tiny organization backed by member groups that eventually represented as many as six million Ontarians. The founding groups were the Canadian Institute for Environmental Law and Policy, the Sierra Club of Canada, the Ontario Lung Association, the Canadian Association of Physicians for the Environment, the Consumers Association of Canada (Ontario Chapter), and Pollution Probe. These groups were later joined by the City of Toronto, 10 other municipalities, public health organizations, faith groups, community organizations, and unions,[114] creating a broad and diverse coalition.

Climate change didn't register high in public consciousness in Ontario in the late 1990s, so the OCAA campaigned around health concerns, acid rain, and the mercury contamination caused by coal plants. The OCAA built a strong alliance with the Ontario Medical Association, which called air pollution and the growing number of smog days "a public health crisis."

The OCAA campaign "used powerful imagery—billowing smokestacks, children using puffers, and lumps of coal—to get its message across," associating "dirty" with "coal" and portraying coal as an outdated, backward technology.[115]

The campaign against Ontario's coal power plants was aided by simultaneous negotiations to revise the bilateral Canada-US Air Quality Agreement to add a new "Ozone Annex," under which Ontario would have to reduce nitrogen oxide (NO_x) and volatile organic compound (VOC) emissions by 45% from 1990 levels. The province couldn't meet that target if it kept its coal power plants.

New York State Attorney General Eliot Spitzer also joined in, demanding that the federal government enforce its environmental laws against Ontario Power Generation that caused the release of mercury into the air and impacted those downwind, notably Quebec, the Maritime provinces, Connecticut, Rhode Island, and New York State.[116] Such skirmishes kept health issues at the forefront of the campaign to phase-out coal.

Politics and timing

When the public is engaged enough, politicians notice and try to claim leadership, which is what happened in Ontario. The opposition Liberals, led by Dalton McGuinty, were first to pick up the coal issue as a health concern, to show they were better champions of cleaner air than the governing Progressive Conservatives, led by Mike Harris.

McGuinty's 1999 call to replace coal with cleaner burning natural gas led to an ongoing duel with the PCs that advanced the cause of Ontario going coal-free. The Conservative government responded to McGuinty's call by promising to close the Lakeview power plant on Toronto's western border in 2001. The following year, McGuinty's Liberals promised to phase-out the remaining four coal plants by 2007. Ernie Eves, the new Conservative premier countered with a pledge to close them by 2015. Ultimately, McGuinty's Liberals won the 2003 provincial election, partly on the strength of their faster phase-out timetable.

Coal use was not ultimately ended in 2007, but its use dwindled to minor levels by 2011 and the last, small coal plant closed in 2014. "The 2007 deadline was ambitious," said Garry McKeever, director of energy supply for Ontario's Ministry of Energy. "When the new government got into office it ran up against the mechanics of how to get this done. Communities worried about job losses. Industries worried about having enough power. It takes time to build replacement generation."[117]

While many circumstances facilitated Ontario's move to go coal-free, one of the most important factors was that Ontario imported rather than produced coal, which meant there were no local coal mine owners, mine workers, or communities dependent on coal mining to contend with. As Keith Schneider noted in a Yale University publication, "Unlike the U.S., where miners, producers, truckers, railroads, and utilities form strong regional coal alliances, coal-fired power in Ontario had no other influential political constituencies."[118]

Being publicly owned also made it easier to shutdown Ontario's coal power plants, because unlike private owners, the province was able to absorb the shutdown costs.[119] That caused problems later in the form of escalating hydro (electricity) bills, but it muted criticism at the time.

Timing was also a favourable factor in Ontario's phase-out, as provincial demand for electricity fell while Ontario was in the process of closing the coal power plants, due in large part to the decline in electricity use by auto and other manufacturing industries following the recession that began in 2008.

Overbuilding power capacity

It is arguable that Ontario could have gone from "coal to clean" by using a combination of renewables, conservation measures, and importing cheap hydro-electricity from neighbouring Quebec. Instead, Ontario built 17 new natural gas power plants, producing 10,000 MW of capacity, to replace lost capacity from the closed coal plants.

In hindsight, the gas plants were unnecessary. By 2014, when the last coal plant closed, Ontario had 30,203 MW of power but used only a little over half (15,959 MW) of that on average days. Peak use was only 22,774 MW, or 75% of capacity.[120] Ontario could have done without any new gas plants, and instead imported power from Quebec for the brief times that demand spiked beyond that capacity.[121]

Power generation experts were so concerned with ensuring reliability and meeting demand spikes that they massively overbuilt capacity. They did not trust the intermittency of renewable supply or the effectiveness of conservation measures to reduce demand, and were so stuck in the mentality of ensuring provincial control over electricity.

The massive cost related to the new gas plants led to increased power costs for Ontarians, and increased opposition to the province's green initiatives such as cap-and-trade.

Alberta's Plan to phase out coal

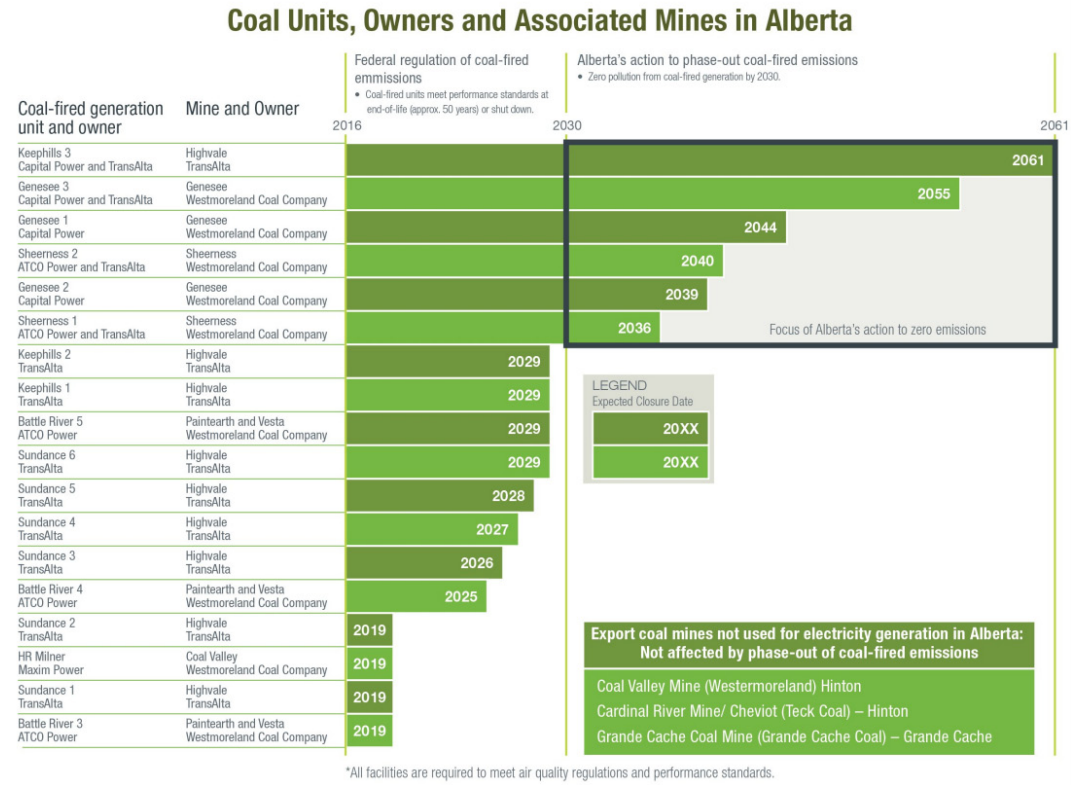
In many ways it's been more of a challenge to get Alberta off coal-fired power than it was in Ontario, in part because resources play second fiddle to manufacturing in Ontario, and the province had no coal supplies of its own. As a result, coal was never a dominant industry in Ontario, and at its zenith it fired only 28% of the province's power.

In contrast, energy resources are central to Alberta's economy and identity. While oil has been the dominant energy resource since shortly after the Leduc discovery in 1947, coal mining has deep roots in Alberta and a longer history, and mine owners, workers, and several communities still depend on it. Alberta has also long used coal as the main way to generate electricity in the province, and as recently as 2012, 64% of Alberta's power came from coal.[122]

Despite these challenges, one element of Alberta's climate plan (outlined in greater detail in Section 1) is the closing of all of Alberta's coal power units by 2030. Natural gas is slated to replace 70% of the coal-fired power and renewables the remaining 30%.[123] It's worth noting that Alberta's climate plan is not to close all coal mines, but to eliminate the use of subbituminous coal in generating power in Alberta. Bituminous coal, on the other hand, is exported for steel and other purposes and three of Alberta's eight coal mines produce this type of coal and will not be affected by phasing out coal-fired power plants.[124]

Phasing out coal-fired power is a major step forward for Alberta, but it sounds bolder than it actually is. Twelve of Alberta's 18 coal power units (in six power plants) were already going to be shut down before 2030, as regulations introduced by Stephen Harper's government in 2012 required all coal stations in Canada to retire after 50 years of operation.[125] But that would have meant Alberta's last coal power unit would not have closed until 2061. As Figure 7 shows, the NDP Alberta climate plan advances the closing dates of six coal-fired units to 2030 from the original closing dates of 2036, 2039, 2040, 2044, 2055, and 2061.

Figure 7: Phase-out schedule of coal units in Alberta



Source: Government of Alberta, https://www.alberta.ca/climate-coal-electricity.aspx#toc-2

The approach of Alberta's plan is a reflection of the reality that while coal has strong roots in the province, the industry does not wield the influence of the oil and gas industry in the province. The NDP plan for power plants to go coal-free earlier than had been intended was a way to protect oil—especially Sands oil—from detrimental actions by Ottawa, governments in countries that import Sands oil, and those that Sands corporations see as potential new markets.

With its Climate Leadership Plan, the NDP government made an alliance with four of the largest oil corporations in Alberta and a range of environmental groups on a plan that would speed up the phasing out of coal power plants. The essence of the deal between Big Oil and the left-of-centre NDP government was to eliminate enough emissions from coal-generated power and other measures, so that corporate owners of Sands projects could raise their collective GHGs by 47% by 2030.[127]

As in Ontario, citizen groups led the push to phase-out Alberta's coal power plants, and presented the case mainly around health issues.

Pembina Institute, Alberta's foremost environmental think tank which works closely with business, governments, and citizens groups, has been a driving force behind greening Alberta's electrical grid.[128] Pembina's role has similarities to the role of the Ontario Clean Air Alliance.

Teaming up with health practitioners in Alberta to demand a rapid phase-out of coal-fired power, it published several reports outlining why and how Alberta should free the grid from coal generated power.[129]

A 2013 report, *A Costly Diagnosis*,[130] which effectively highlighted the health costs associated with coal-fired power, moved public opinion in Alberta more than any other message. The report estimated that pollution from Alberta's coal plants caused 700 annual visits to Alberta's emergency departments, 80 hospital admissions, over 4,800 asthma symptom days, and contributed to the premature deaths of more than 100 Albertans a year.[131]

The next year, Pembina released *Power to Change*, a report on how to transition Alberta off a grid powered by fossil fuels.[132] Getting off coal was part of it, but the vision and roadmap outlined how to move Alberta onto mostly clean, renewable energy within 20 years. As in Nova Scotia's plan to go from "coal to clean," the Pembina plan would largely bypass using natural gas as a stepping stone that could become a long-term impediment to Alberta going carbon free. "A large-scale shift to renewable power would reduce the electricity sector's carbon pollution by 69 per cent relative to the wide-scale switch to natural gas power generation expected under business as usual," the report argued.[133]

While the accelerated phase-out of coal power is a positive step, the NDP government plan does not go far enough in greening the grid. Instead of going from coal to clean, it mainly goes from coal to natural gas. It does this to enable Alberta's Sands to hugely raise its output, emissions, and profits.

Utilities often overestimate future demand for electricity. The Alberta Electric System Operator (AESO) forecast that demand for electricity would almost double by 2032, growing almost 13,000 MW[134] on a 14,000 MW base to rise to about 27,000 MW. The latter is more capacity than Ontario's peak demand (22,000 MW). Alberta has 4.25 million people, or fewer than a third of Ontario's 13.93 million.[135] Alberta needs so much more power per person than Ontario because, as Pembina's *Power to Change* report states, "Alberta's appetite for electricity will grow in lockstep with its oilsands sector."[136]

Terry Boston, the retired power executive hired by the Alberta NDP government to guide the province's transition off coal, estimated that it "will require $20–$30 billion in investment in new gas-fired generation and renewables,"[137] most of which will be for natural gas.

The Alberta government was negligent in not stopping the building of new coal power plants after agreeing to the Kyoto Accord in 1997. If Alberta had done so, it could have saved taxpayer money to compensate owners of coal power plants who built new plants after 1997. "It's disingenuous to argue that after the Kyoto Accord, owners of coal-fired power plants didn't know that building new coal units was a bad investment," argues Dr. Joe Vipond. "They should have known their assets would be stranded."[138]

It's important to learn from past mistakes, so as not to repeat them. If Alberta caps Sands production at its 2017 level (a recommendation I make in the next section of this paper), power demand could be met by current capacity, especially if it was joined by an effective conservation plan to lower power usage. That would save billions in new investments in natural-gas-generated power plants that will have to be phased out in 10 to 20 years anyway as the world gets more serious about the climate. It simply does not make sense to waste billions on assets that will quickly become stranded.

Lessons from coal's phase-out

Coal has been sacrificed so Alberta's Sands can grow, a trade-off that helps the NDP government phase-out coal-fired power, but harms Alberta in the long run. If big oil manages to expand Sands oil output in the next few years despite growing risks of stranded assets, the bigger will be its fall later. When that happens, Alberta's government and people will likely be left to clean up the mess and pay the costs.

A better alternative is for Alberta to follow up on its excellent example of making the decision to go coal-free by looking at what lessons can be applied to a phase-out of the Sands. What wedge issues worked best to motivate activists, a sufficient number of voters, and governments to push for coal-free power, and more importantly, would these issues work well in a campaign to phase-out the Sands?

At least for now, climate change is widely seen by Albertans and other Canadians as a slowly escalating crisis, not an immediate threat. Since GHGs are released everywhere in the world, it's difficult to convince people that action by their province or country will make a difference. It's called the free-rider problem: what if one jurisdiction cuts back and suffer the consequences, but another does not? Or if they take up the carbon emission that was vacated?

The effects of coal on people's health was the driving force behind Ontario's phase-out of coal, and also played a key role in. The Sands also have negative health effects, which could potentially be a motivator for Albertans to support phasing out the Sands.

Most Albertans have heard news reports about the high incidence of rare cancers among Indigenous people in Fort Chipewyan, who live downstream from Fort McMurray's Sands. Dr. John O'Connor, a physician in Fort Chipewyan, raised national and international awareness about the cancers, and was fired for his whistleblowing efforts.[139] Less well known are health effects from the Sands on residents and workers in the areas around Fort McMurray and the Peace River country. That's because Alberta doctors "would not diagnose a relationship between bitumen exposures and chronic symptoms," according to Dr. Margaret Sears, an Ottawa-based toxicologist, in a report to the Alberta Energy Regulator. "Physicians are quite frankly afraid to diagnose health conditions linked to the oil and gas industry," she added.[140]

The trouble with using health concerns to mobilize Albertans on phasing out the Sands is that health problems are mainly confined to northern parts of the province where few people live. Except for those who commute to Fort McMurray to work, it doesn't much affect the health of Calgarians, Edmontonians and others in central and southern Alberta, where most voters live.

Alternately, could the rising frequency and intensity of major natural disasters in Alberta become the wedge issue that health proved to be in motivating support for the coal phase-out? Southern Alberta saw horrendous floods in 2013, in which four people drowned and 100,000 residents were driven from their homes. Until the Fort McMurray wildfire, those floods were Canada's costliest natural disaster ever.[141] While billed as a one-in-a-hundred-year event, with climate change, devastating floods are predicted to happen more often.

The beast of a fire that engulfed Fort McMurray in May 2016 gripped all Albertans. The 90,000 inhabitants who had to flee for their lives along highways lined with shooting flames, were billeted all over the province and received an outpouring of financial and material support from their fellow Albertans. But the fire sparked little media talk of climate change,[142] and was presented more as an act of God than as the result of global warming. Now that the evacuation of Fort McMurray is over and rebuilding is well underway, can the issue of global warming increasing the risk of future fires be effectively used to motivate Albertans to go Sands-free?

No single fire, like the one that devastated Fort McMurray in May 2016, can be attributed to a warming planet, but the latter greatly raises its likelihood. The burn areas of forest fires in Canada have doubled since the 1970s. They will likely double or triple again in future decades. For every 1°C degree of warming, there needs to be 15% more precipitation to keep fine combustible fuels on the ground amply moist.[143] If temperatures rise by 3°C by 2100, we'll need 45% more rain, and that's not predicted to happen. The Winnipeg-based Prairie Climate Centre projects that the number of hot days—those above 30°C—will rise in Fort McMurray from an average of three days a year to 20 days by 2051–2080.[144] It is imperative to inform Albertans of these dangers and their links to climate change.

Most residents returned to Fort McMurray after the fire. They are rebuilding the community. Is there a better way forward for them than trying to stretch out the age of oil and a pray for a new oil boom? Is it not better to take the 17 major shuttered Sands projects as the start of phasing out the Sands?

Section 3 Phasing Out the Sands

"Bending the curve on Alberta's GHGs" is the narrow ambition of the Alberta government's climate plan. Bending the curve means that instead of the province's GHGs rising sharply higher the way they would have done under a business-as-usual scenario, they will finally stop growing by 2030.

Given that Alberta already spews over five times as many GHGs per capita than all other provinces except Saskatchewan, it's not good enough. Alberta must get with the rest of Canada and most countries in the world and take steps to substantially reduce GHGs by 2030. Put simply, it can't do this while allowing the Sands to rapidly expand its output and emissions.

Praying for another oil boom has been Albertans' mantra for decades, but in 2017 it is folly. With rising US oil production filling more of the US market, Alberta is looking for offshore markets for Sands oil. That's the reason behind the frantic push for more pipeline exporting capacity. But Alberta is very vulnerable to foreign markets rejecting Sands oil because it will not meet rising carbon emission standards.[145]

As one of the world's highest-cost oil producers, Alberta is also very vulnerable to cheap oil. We saw in the first section that global oil demand will likely peak and then fall significantly between now 2040, driving down international oil prices and making new investments in the Sands unfeasible. In the near future, these arguments will likely find little traction because of Donald Trump's election and the initial success of OPEC's agreement with Russia and other non-OPEC countries to reduce oil production. But, both events could easily and quickly reverse.

Higher oil prices sow the seeds of their own demise. Currently, oil prices are about 20% higher than before OPEC's agreement in November, which has meant rapid growth in US shale oil production. Its rise is cancelling out much of OPEC's output cuts, and if US shale oil output continues to grow, it will likely drive down international oil prices again. And, as explained previously, low prices mean no revival of the Sands.

This is the ideal point to start transitioning off the Sands. Tens of thousands of workers have already been laid off in the Sands and related sectors, including construction, manufacturing, and professional business services. As Jeff Rubin argues, "investment cutbacks today spare potentially massive writedowns tomorrow."[146] It's much more difficult for governments to stop an expanding industry and throw people out of work than it is to help already-displaced workers and communities get off a sunset industry.

Canada's economy can actually benefit from capping the Sands production and then phasing them out. Such an announcement by the Alberta government would lead to a drop in the value of the Canadian dollar, but the drop would likely not exceed its fall when international oil prices crashed in the autumn of 2014. A lower Canadian dollar has drawbacks, but also many upsides, especially during a period of very low inflation.[147] A lower dollar could, for example, help Canada weather the storms unleashed by the unpredictable Donald Trump.

Steps to phase out the Sands

In the first section of this report we identified that the closing time for the last Sands projects should be 2040. That timeline will seem too fast for the workers and communities affected, but too slow for those who see the urgency of saving the planet from the immense harm associated with absorbing rising Sands output.

Nor would full production followed by an abrupt end for all Sands projects at once be good for workers, their families, or Alberta's economy. The transition off the Sands needs to begin now and stretch out until 2040.

As we saw earlier, a report by Christopher McGlade and Paul Ekins noted that to give the world a reasonable prospect of meeting the 2°C target, no more than 7.5 billion barrels of Sands oil can be produced by 2050 (their starting date was 2015). In reality, it's almost impossible to meet their timetable, which, as Figure 8 shows, would mean the Sands would have to shutdown entirely by December 2021.

Figure 8: NEB forecast of daily production of bitumen (thousands of barrels), 2015-2019

Year	Mined	In situ	Total	Annual
2015	1,151.4	1,364.2	2,515.6	918,194
2016	1,235.9	1,419.3	2,655.2	969,148
2017	1,301.2	1,550.3	2,851.5	1,040,798
2018	1,413.2	1,608.1	3,021.3	1,102,775
2019	1,549.4	1,617.6	3,167.0	1,155,955
2020	1581.5	1637.8	3,219.3	1,175,045
2021	1590.4	1668.2	3,258.6	1,189389
Total 2015-2021				7,551,303

Source: National Energy Board, Canada's Energy Future 2016 Update, https://www.neb-one.gc.ca/nrg/ntgrtd/ftr/2016updt/2016updt-eng.pdf

If, on the other hand, Alberta caps Sands production at the 2017 level of approximately 1 billion barrels a year beginning in January 2018, the whole budget would be blown in 7.2 years, by mid-March 2025, after which Sands output would fully cease (see Figure 9).

Figure 9: Capping production of bitumen (thousands of barrels) at 1 billion barrels/year starting in 2018

Year	Mined	In situ	Total	Annual
2018	1,301.2	1,550.3	3,021.3	1,040,798
2019	1,301.2	1,550.3	3,021.3	1,040,798
2020	1,301.2	1,550.3	3,021.3	1,040,798
2021	1,301.2	1,550.3	3,021.3	1,040,798
2022	1,301.2	1,550.3	3,021.3	1,040,798
2023	1,301.2	1,550.3	3,021.3	1,040,798
2024	1,301.2	1,550.3	3,021.3	1,040,798
Total 2018-2024				7,285,586

Source: National Energy Board, Canada's Energy Future 2016 Update, https://www.neb-one.gc.ca/nrg/ntgrtd/ftr/2016updt/2016updt-eng.pdf

It doesn't make sense to allow Sands production to rise and for workers to build their lives around employment in the Sands and then suddenly shut it all down in 2025. A gradual landing is much better than an abrupt fall.

The first step is to follow the widespread calls made in 2006 to place a moratorium on new Sands projects. And it must be a *permanent moratorium* this time. The second step is to give a closing time for Sands projects that have long since paid off their capital costs, starting with the initial Suncor and Syncrude units that are over 50 years old (they began in the 1960s and early 1970s, respectively). The third step is to apply an *annually lowering GHG ceiling* on all remaining Sands projects until they collectively reach zero by 2040.

Staging the phase-out

When Alberta announces that it will go Sands-free, it will inevitably face the wrath of Big Oil. Worse, the giant corporate owners of the Sands will demand exorbitant—and probably unpayable—compensation for the early closures. Alberta's compensation payments to coal power plants set a bad precedent, and Sands oil owners will almost certainly demand the same treatment. Is there a better, cheaper way?

South of the border, the Republican government of Gerald Ford brought in CAFE regulations in the US in 1975, which required auto companies to raise the mean fuel economy of their fleet of vehicles each year. Under the rules, vehicles must get better mileage each year or pay hefty fines. While it would require a full study to adapt such an approach to emission reductions in the Sands and other carbon fuel sectors, it's a good model that has worked well to lower vehicle emissions and fuel costs, and a variation of it should be applied to the Sands.

To sidestep exorbitant compensation claims, the Alberta government should reverse its plan to allow Sands emissions to rise to 100 Mt per year. Instead, it should cap the emissions at the current (2014) 68 Mt level and then require each Sands project to lower its emissions annually by 3–4% per year (2–3 Mt) starting in 2018. Coupled with the retirement of Sands projects that are over 50 years old, such a move could reduce Sands emissions to zero by 2040. Projects that fail to meet GHG reduction targets must be fined at a level higher than the costs to comply, as the US does under CAFE.

If the Alberta government brought in such a plan and showed that it meant business, the value of existing Sands assets would plummet. That would greatly drive down the value of compensation payments the Alberta government and taxpayers would have to pay in the future.

Principles for a just transition

It's vital that phasing out the Sands be accompanied by a well-thought-out plan to provide workers and communities in the Sands with alternative work and retraining. It is beyond the scope of this paper to go into the just transition in depth, but below I outline some principles and major steps such a transition needs to accomplish.

A just transition is the right thing to do, but it is also needed because if workers involved in the Sands don't see a sure-fire alternative, they will fight hard to hang on to the Sands jobs they currently have, which will hamper the changes Alberta and Canada need to make.

Canada's oil and gas sector is not a good direct or indirect job creator because it is so capital intensive. In other words, for each unit of production, it employs very few workers. Of 107 industry categories in Alberta, oil and gas extraction is tied for last place in jobs per unit of GDP. Construction and manufacturing create several times more jobs per unit of GDP,[148] meaning the building phase of new Sands projects generates many jobs in Alberta but the operation of those projects employs far fewer. Statistics don't allow us to separate Sands construction from general construction jobs in Alberta, but during the Sands boom from 2002 to 2012, total construction added 80,000 jobs in Alberta, a boost of 57%. The Sands undoubtedly created many of these gains.

After Alberta announces a plan to cap and then phase-out the Sands, there would be no new projects, and as a result the majority of construction jobs in the Fort McMurray area would likely vanish. That's when the province, hopefully in conjunction with Ottawa, needs to have a plan to take care of the workers, their families, and their communities.

A just transition will require a tremendous amount of research and thought, as well as broad consultation with the workers and communities involved. That's the import of the United Nations recent paper on a just transition,[149] which focuses on countries designing their own roadmap to create "decent work and quality jobs." The principles detailed in the report include the following:

- Develop skills and retraining for green jobs
- Develop green enterprises
- Promote government programmes to help the unemployed find work
- Provide social protection
- Minimize hardship for workers and address their needs
- Consult all stakeholders to plan for a just transition

Fortunately, a Canadian plan of deep conservation and renewable energy can generate more jobs than Canada's current, failed focus on carbon fuel exports. More jobs are created by saving a unit of carbon energy than in digging up, burning, and emitting one. Manufacturing creates many more jobs per million dollars invested than the petroleum industry, as does construction. New construction jobs should be green jobs, including those that retrofit all buildings, and build high-speed LRT and subways, high-speed inter-city trains, district heating, wind, tidal, geothermal, and solar power.

David Thompson, a Victoria-based researcher, makes a crucial point.[150] Long before the Sands became commercially feasible, the federal and Alberta governments put a great deal of research money over several decades into developing the Sands. The government scientists, including the legendary Dr. Karl Clark, "solved the riddle of the tar sands."[151] Without their crucial work, the Sands would not have been developed, and giant oil corporations have reaped and are still reaping enormous dividends from that publicly-paid-for research.

The same governments now need to devote as much research money in today's dollars to plan useful employment for Sands workers necessitated by the shift to a low-carbon future. Research and planning by the Alberta and Canadian governments launched the Sands, now they must launch a transition off them.

Conclusion

The greater intensity and frequency of extreme weather events and the growing negative impacts of global warming are increasingly impelling countries to take serious action to curb carbon emissions. The momentum to transition off carbon fuels is building and will not be stopped by temporary setbacks such as Donald Trump's presidency. By the middle of the 21st century the age of oil will be over, in the sense that it will no longer be the world's dominant form of energy, around which military strategies are shaped and wars fought.

That does not mean that all oil use will cease, any more than that radio disappeared when television and the Internet pushed aside its former dominance. Radio is still with us, but gone are the days everyone huddled around the family's sole radio to hear fireside chats or weekly radio dramas. Oil's fate will be similar: it will continue to be produced and used at much lower levels, such as to make plastics, but renewable energy and conservation will be dominant.

If global oil demand falls substantially by mid-century, where will the diminished supply likely come from? Will it be from low-cost, low-carbon-intense conventional sources that will still be plentiful in the Middle East, or from high-cost, carbon-intense sources including Alberta's Sands? The answer to this question is readily apparent, meaning the long-term prospects for Alberta's Sands are not good. Their continued development depends on the combination of a high world oil price and sufficient buyers from outside Alberta willing to overlook the irreducibly higher carbon emissions from their production. That combination appears unlikely.

We are already seeing the beginnings of a move away from the Sands. They are the target of a growing divestment movement, and more importantly, they are increasingly seen by major financial institutions as stranded assets and poor investment prospects. Today's lower world oil price has already postponed the expansion of some Sands projects and shuttered others.

Prime Minister Trudeau recognizes that the Sands must be phased out in due course, as did the thoughtful advisors appointed by former Alberta premier Ed Stelmach in 2011. Governments must finally take the lead in doing this. Their challenge is to engage Albertans and other Canadians in discussing the best ways to phase-out the Sands, and this paper was written to help launch this important conversation.

The Alberta and Canadian governments could ignore the Sands long-term prospects and allow the market to determine the speed and ways they are shut down. Governments could let Sands workers and communities fend for themselves when the inevitable occurs. But a far better alternative is for Alberta and Ottawa to manage the transition off the Sands so that its workers are retrained to help build renewable energy and conservation projects. This paper recommends and outlines the steps necessary to ensure this managed transition.

In other words, we must act so that we are not acted upon.

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