

CIGI Papers No. 177 – June 2018

An Ironic Outcome

The United States – Even under Trump – Is Closer to Meeting Its Emission Targets Than Canada

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CIGI Masthead

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About the Author

Jeff Rubin is a CIGI senior fellow. A Canadian economist and bestselling author, Jeff is a world-leading energy expert and former chief economist and chief strategist at CIBC World Markets.

In his first research mandate at CIGI, Jeff explored the future of Canada's oil sands in an emissions-constrained world, the case for a national carbon tax, as well as that for divestment from Canadian fossil fuels, and the opportunities that climate change itself might bring to the Canadian economy.

Jeff is currently researching the implications of shifting US trade, energy and environmental policies on the Canadian economy under the Trump administration, including a critical assessment of how Canada's auto industry has performed relative to its NAFTA trading partners, an exploration of whether globalization has left Canadian workers behind and an examination of whether shifts in US energy and environmental policies will have a discernible impact on the future of Canada's fossil fuel industries.

Jeff began his career in 1982 at the Ontario Ministry of Treasury and Economics, where he rose to become the senior policy advisor for the Macroeconomic Forecasting and Analysis Group. In 1988, Jeff left the Ontario government to join the brokerage firm Wood Gundy as their senior economist. In 1991, he was appointed chief economist and managing director at the investment bank CIBC World Markets, where he served for two decades. During that time, he received 10 number one citations from Brendan Wood International as the top-ranked economist in Canadian financial markets. In 2007, Jeff was appointed as the firm's chief equity strategist in addition to his responsibilities as chief economist.

Jeff resigned from CIBC World Markets in 2009 to pursue a career as an author. His first book, *Why Your World Is About to Get a Whole Lot Smaller*, was an international bestseller, and was favourably reviewed in both *Time* and *Newsweek*. The book was the number-one-selling non-fiction book in Canada and won the National Business Book Award, as well as being long-listed for the Financial Times and Goldman Sachs Business Book of the Year Award. Since then, he has written two other bestsellers, *The End of Growth* and *The Carbon Bubble*.

About the Global Economy Program

Addressing limitations in the ways nations tackle shared economic challenges, the Global Economy Program at CIGI strives to inform and guide policy debates through world-leading research and sustained stakeholder engagement.

With experts from academia, national agencies, international institutions and the private sector, the Global Economy Program supports research in the following areas: management of severe sovereign debt crises; central banking and international financial regulation; China's role in the global economy; governance and policies of the Bretton Woods institutions; the Group of Twenty; global, plurilateral and regional trade agreements; and financing sustainable development. Each year, the Global Economy Program hosts, co-hosts and participates in many events worldwide, working with trusted international partners, which allows the program to disseminate policy recommendations to an international audience of policy makers.

Through its research, collaboration and publications, the Global Economy Program informs decision makers, fosters dialogue and debate on policy-relevant ideas and strengthens multilateral responses to the most pressing international governance issues.

Executive Summary

Even though US President Donald Trump has pulled the United States out of the Paris Agreement, the country remains much closer to hitting the 2020 emission targets pledged by the previous administration of Barack Obama than Canada is of meeting the targets originally proposed by the government of Stephen Harper. The significant difference in emission performance is the result of the very different trajectories of energy-related emissions in the two countries. In the United States, such emissions have fallen steadily over the last decade as natural gas has usurped coal's once dominant role in the US power sector. North of the border, oil sands emissions continue to be the fastest-growing source of emissions in Canada as emission-intensive in situ oil sands production continues to increase despite unfavourable economics.

Introduction

This paper compares Canadian and US emission performance relative to both countries' near-term emission reduction targets. The comparison focuses on the energy sector, which has been a premier source of carbon emissions in both countries. It then investigates why energy sector emissions have continued to rise in Canada while they have fallen steadily in the United States. In doing so, the paper considers the impact of policy measures, changing market conditions and technological change. Lastly, the paper looks at the critical role that Vancouver's Westshore Terminals has played in facilitating US thermal coal exports to Asia and considers whether this practice is consistent with the province's other carbon fuel policies, including those relating to pipelines.

Outcomes in Both Countries Defy Very Different Government Objectives

Prime Minister Justin Trudeau reaffirmed Canada's commitment to future emission reduction at the twenty-first session of the Conference of the Parties (COP 21) to the United Nations Framework Convention on Climate Change, while President Trump has pulled the United States out of the Paris Agreement and implemented a series of domestic policies aimed at stimulating growth in America's fossil fuel industries, in particular its beleaguered coal industry, with little regard for the consequences for future emission growth in the US economy. Yet, despite President Trump's best efforts to stimulate his country's coal industry, US energy sector emissions continue to fall on the back of declining use of coal-fired power. Meanwhile — despite the change a little over two years ago to a Liberal government that seeks to be at the vanguard of international efforts to curb fossil fuel combustion and resulting climate change — Canadian emissions continue to run well above the targets set by the previous Harper government, which, like the current Trump administration, was highly skeptical of climate change. While large and sustained reductions in coal-fired emissions have led to an overall decline in emissions from the US energy sector, continued growth in emission-intensive in situ oil sands production is driving energy sector emissions in Canada ever higher and seriously jeopardizing the achievement of both its near-term (2020) and longer-term (2030) emission targets.

It is an ironic outcome from the perspective of both governments. For the publicly climate-change-conscious Trudeau government, which seeks to eradicate widespread international perceptions of Canada as a climate change laggard, the country's recent emission performance is no better than during the previous Harper government, which was ignominiously awarded a "Lifetime Unachievement" Fossil award at the UN climate change conference in Warsaw in 2013 (Climate Action Network 2013). The government has effectively conceded that the country's near-term commitment — made

by the previous Harper government at the Copenhagen climate change conference in 2009 — to reduce emissions 17 percent below 2005 levels by 2020 — is no longer in reach.

But at the same time, the tale told by the steady decline in coal-fired emissions is an equally disappointing outcome for the Trump administration, which has pledged to revitalize an imploding US coal industry. A decline in domestic coal consumption lasting more than a decade is the principal source of US emission reductions. And it is undoubtedly ironic that while the White House remains powerless to unlock more shipments of American Midwest coal to booming Asian coal markets, Canada's busiest port, Vancouver, has provided a much-needed conduit for US coal exports.

Evolution of Canadian and US Emission Targets

Widespread skepticism of Canadian emission targets reflects the fact that the country's past record of hitting such targets is one of the worst in the world and the country continues to sport one of the highest levels of per capita emissions. That has not stopped some Canadian governments, including the one currently in power, from very vocally supporting global efforts to mitigate climate change. This was also true of the Liberal government of Jean Chrétien, which was not only one of the original signatories to the Kyoto Accord in 1997 but also one of its most enthusiastic supporters. But neither the Chrétien government nor the Paul Martin government that succeeded it ever unveiled a credible plan to achieve the Kyoto target of reducing national emissions to six percent below 1990 levels by 2012. It was left to a Conservative Harper government to pull Canada out of the accord in 2011 when it had become clear that the target was hopelessly out of reach.

Both the United States and Canada pledged new emission reduction commitments at the United Nations Climate Change Conference in Copenhagen in 2009. President Obama committed the United States to cutting emissions to 17 percent below 2005 levels by 2020 — a threshold equivalent to reducing emissions to five percent below 1990 levels.

The United States subsequently raised the bar for its emission reduction target when President Obama, during a historic 2014 meeting in Beijing between leaders of the world's two largest carbon polluters, pledged that the United States would target a 26–28 percent reduction from 2005 emission levels by 2025 (Landler 2014). The new objective would accelerate the pace of emission reduction mandated by the earlier 2020 target. In return, Chinese President Xi Jinping — for the first time — committed his country to capping its emissions by 2030 and to relying on clean energy for 20 percent of China's total energy production by that date (The White House 2015).

Obama's Clean Power Plan, which sought to reduce carbon emissions from the US power sector by almost one-third of 2005 levels by 2030, was expected to do most of the work in achieving the new, more aggressive US emission targets.¹ The White House's focus on utilities was driven by the fact that, unlike Canada, where more than half of the country's power is generated from emission-free hydro and less than 10 percent from coal, emissions from coal-fired utilities were the principal source (40 percent) of carbon pollution in the US economy.²

Among the measures included in the Clean Power Plan was a new provision by the US Environmental Protection Agency (EPA) that all new coal-fired power plants would have to meet a new federal standard of no more than 1,400 lbs. of CO₂ emissions per megawatt hour — a standard only slightly higher than the 1,000 lb. emission ceiling set for new natural gas-fired power plants (Center for Climate and Energy Solutions 2015). Without prohibitively expensive carbon sequestration facilities, no new coal plant could come anywhere near meeting that requirement.

In addition, the Clean Power Plan's emission reduction target would require shuttering hundreds of existing coal-fired power stations across the country, which, according to the US Energy Information Administration (EIA), account for almost 70 percent of utility sector emissions.³ The plan would also encourage the use of renewable power as well as promoting energy conservation, both of which

1 See https://en.wikipedia.org/wiki/Clean_Power_Plan.

2 See www.nrcan.gc.ca/energy/facts/electricity/20068.

3 See www.eia.gov/tools/faqs/faq.php?id=77&t=11.

would contribute to the required emission reductions mandated from the utility sector.

In a calculated effort to realign Canadian emission targets with those of the United States (possibly in the hope of securing White House approval for the much-delayed and ultimately rejected Keystone XL pipeline), the Harper government announced new emission targets just prior to the 2015 federal election. The new target committed Canada to reduce emissions to 30 percent below 2005 levels by 2030 — effectively matching the 2025 target for the United States that President Obama had announced earlier, on his historic Beijing visit.

The Trudeau government, wishing to dispel Canada's well-deserved international reputation as a laggard in climate change policy, quickly reaffirmed the previous Harper government's 2030 emission reduction target at COP 21 in Paris. To underscore the importance of climate change to the new regime in Ottawa, Prime Minister Trudeau even changed the name of the country's environment ministry to Environment and Climate Change Canada. Trudeau later announced the Pan-Canadian Framework on Clean Growth and Climate Change, which outlined a federal plan in conjunction with the provinces on closing the huge gap between projected emission growth and the 2030 emission target, including the imposition of a national carbon tax to apply in provinces that failed to price carbon emissions themselves at the federally mandated rate, which would rise to \$50 a ton by 2022.

Canadian Emission Targets and Actual Performance

While the Trudeau government boldly trumpeted its commitment to the distant 2030 target set by the previous Harper government, it has quietly abandoned honouring the country's nearer-term target to reduce emissions to 17 percent below 2005 levels by 2020 — a commitment that, unlike the more distant 2030 target, would fall largely under its mandate. As one commentator wryly noted, that near-term commitment first made by Harper in Copenhagen in 2009 seems to have

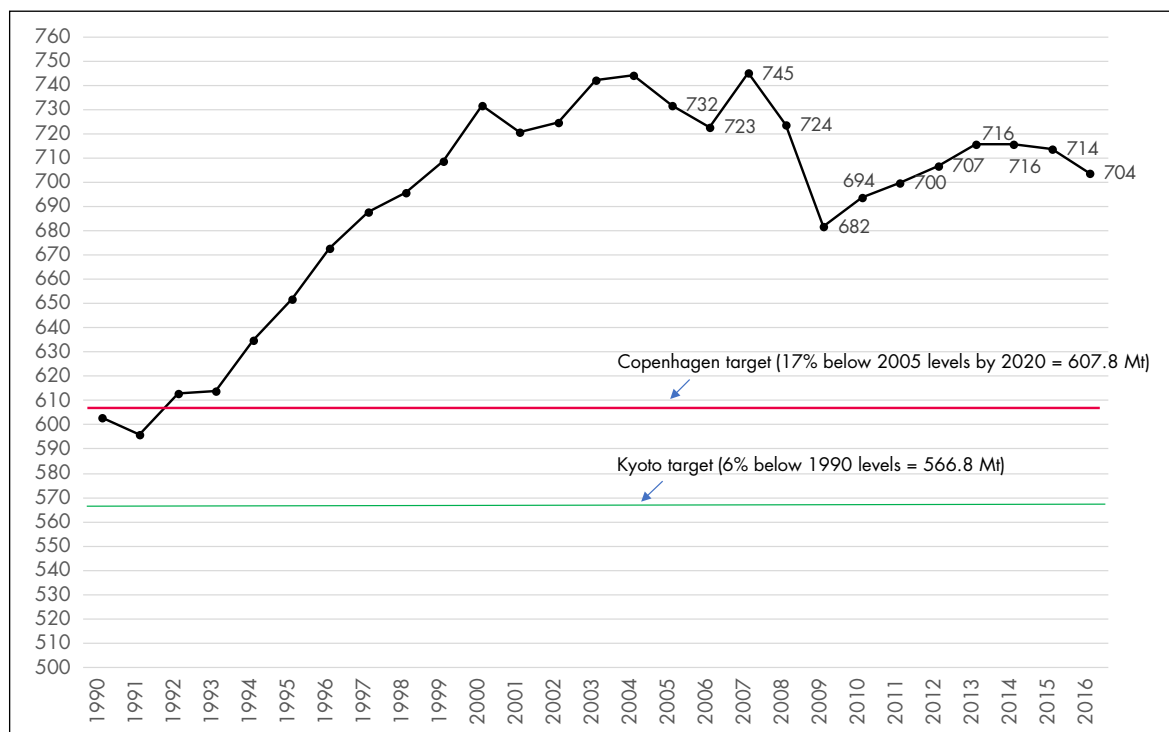
been “airbrushed” out of the current government's carbon emission targets (Reguly 2017).

And with good reason. The most recent data (2016) shows the country's emissions running above 700 Mt per year (Environment and Climate Change Canada 2018), almost 25 per cent higher than the Kyoto target the country was supposed to hit a half decade ago (see Figure 1). And it is more than 16 percent higher than the 2020 target that Julie Gelfand, the federal commissioner of the environment and sustainable development, has already conceded the country would once again miss by a considerable margin.

In its 2016 reference case for emissions, Environment and Climate Change Canada was projecting that the country would miss its 2030 target by an even more egregious margin (Rubin 2016b). Annual emissions were projected to either stabilize at current levels or rise to as much as 790 Mt, depending on which underlying assumptions were used. A more recent update now projects emissions to fall to just below 600 Mt — still above the 2030 target, but about 100 Mt lower than current levels (Environment and Climate Change Canada 2017a). But the revised projection includes the impacts of measures that have yet to be taken, most notably the federal government's carbon tax, whose implementation has already been delayed and challenged by a growing list of provinces, including the new Conservative government in Ontario.

Federal enforcement of this tax is likely to become a major source of federal-provincial friction and indeed the tax itself could become a major campaign issue in the 2019 federal election. Moreover, even with full provincial compliance of implementing the federally prescribed carbon tax rate and other planned measures, independent analysts (Jaccard, Hoffele and Jaccard 2018) have noted the targets are not achievable with a further expansion of oil sands production — a task the current federal government is doing everything possible to ensure, including the direct use of taxpayers' money to twin the Trans Mountain pipeline and nearly triple the existing pipeline's capacity.

Figure 1: Canada's Domestic Emissions Projections in 2020 and 2030 (Mt CO₂ eq)



Source: Environment and Climate Change Canada (2018).

Oil Sands Expansion Principal Reason for Missed Targets

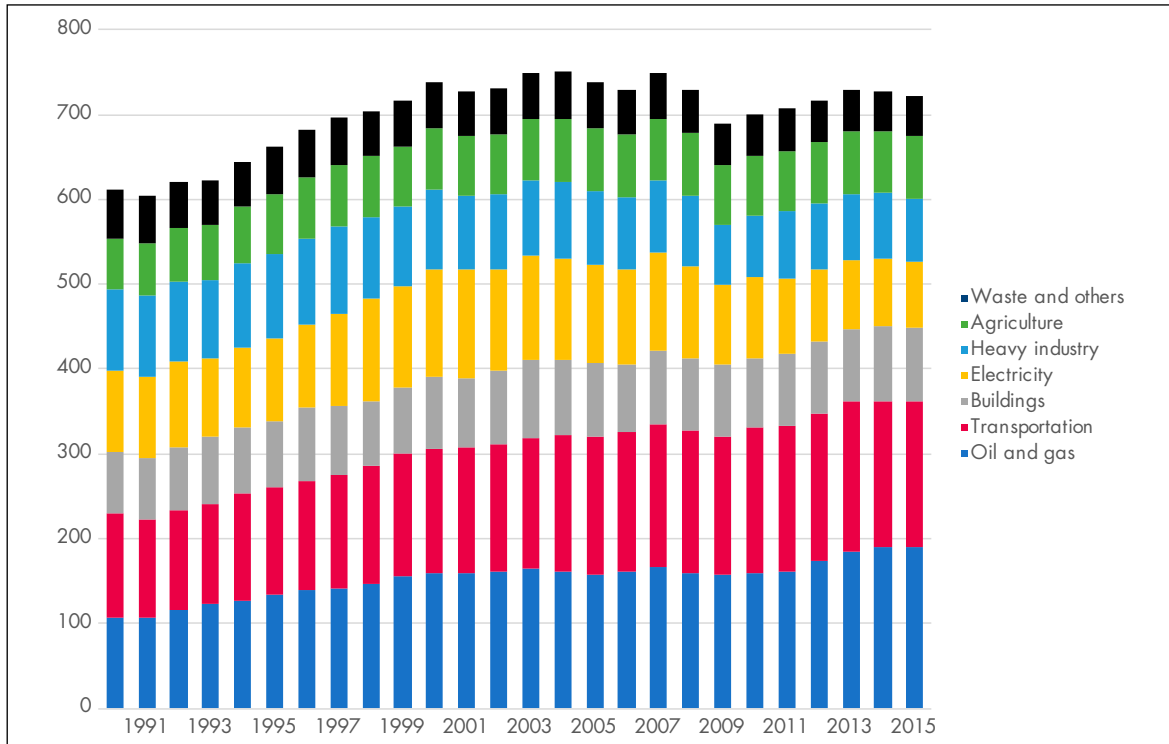
Over the past two decades, the energy sector, and in particular the oil sands, has been the principal source of rising emissions and missed emission reduction targets. Whereas the utility sector is the principal source of carbon pollution in the United States, the oil and gas industry is the major source of industrial pollution in Canada, accounting for just over one-quarter of the country's total emissions. It is also the country's fastest-growing source of emissions (see Figure 2). Since 1990, emissions from the sector have almost doubled (108 Mt in 1990 to 189 Mt by 2015), driven by a four-fold increase in oil sands emissions, which in themselves are now more than 60 Mt a year (see Figure 3). During that period, oil sands production has increased almost ten-fold to more than two and a half million barrels per day.

Rapid growth in the oil and gas sector's emissions accounts for more than three-quarters of the more than 100 Mt increase in Canadian emissions since 1990, the base year for the Kyoto Accord, which Canada had originally agreed to. Emissions from Canada's oil sands grew by 267 percent, far and away the fastest-growing source of emissions from the country's oil and gas sector (see Figure 3).

Environment and Climate Change Canada expects emissions from the country's oil and gas sector to continue to grow robustly. Emissions from the sector are projected to grow to 233 Mt by 2030 — a roughly 25 percent increase from current levels (Environment and Climate Change 2017b).

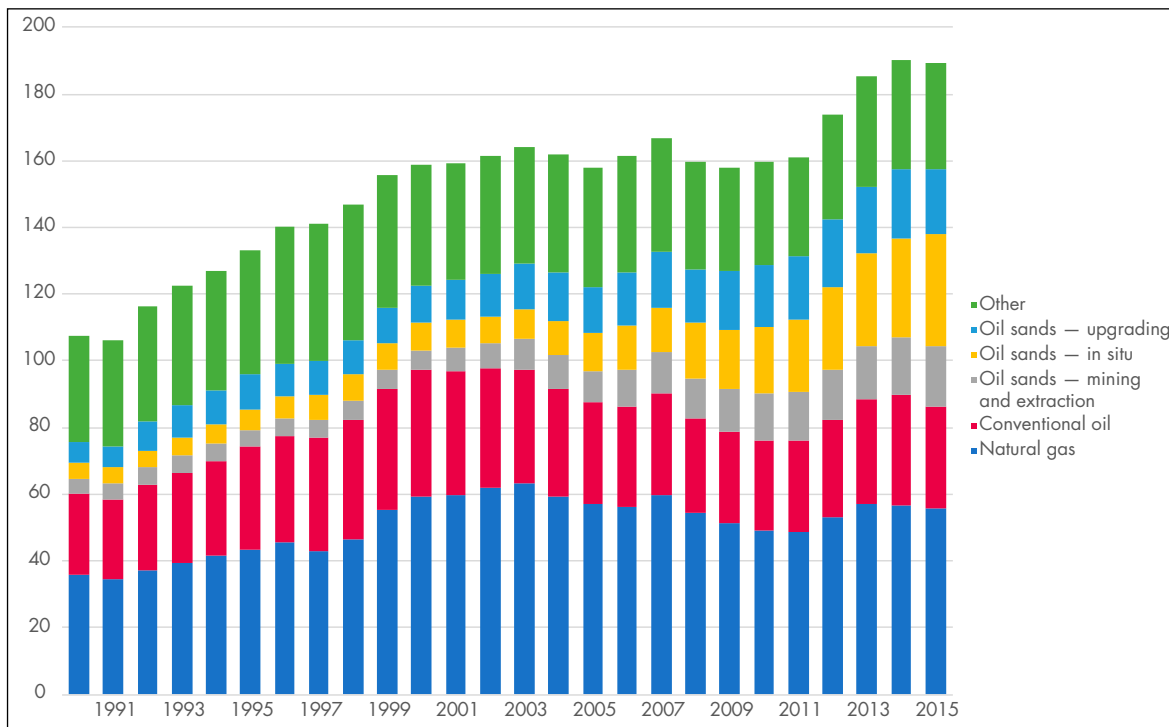
The increase will be primarily driven by continued expansion of emission-intensive in situ oil sands production. Oil sands emissions have doubled over the last decade. While the current provincial government in Alberta has set an upper limit of 100 Mt for oil sands emissions by 2026 — that still provides room for another

Figure 2: Greenhouse Gas Emissions by Canadian Economic Sector, 1990–2015



Source: Environment and Climate Change Canada (2017b, 8).

Figure 3: Oil and Gas Sector Greenhouse Gas Emissions, Canada, 1990–2015



Source: Environment and Climate Change Canada (2017b, 9).

almost 50 percent increase from the country's largest industrial source of carbon pollution.⁴

The Canadian Association of Petroleum Producers predicts oil sands production will grow by 1.5 million barrels per day (mbd) by 2035, from its current 2.6 mbd output (McCarthy 2018).

US Emission Target and Performance

Despite President Trump's decision to pull the United States out of the Paris Agreement, the United States remains much closer to hitting the 2020 emission target pledged by the Obama administration than Canada is of hitting the targets originally proposed by the Harper government and later enthusiastically endorsed by the Trudeau government. US emissions have fallen steadily over recent years and seem to be on track for at least meeting the original 2020 target (see Figure 4). As of 2016, US emissions had fallen to just 2.5 percent above 1990 levels, their lowest level in a quarter century, and were already 11 percent lower than 2005 levels. And while the energy sector in Canada is the main reason for not meeting national emissions targets, in the United States the energy sector is the principal source of emission reductions over the last decade and is likely to play a similar role during the next decade.

The EIA estimates that emissions from the US energy sector, which have been falling for over a decade, continue to decline under the Trump administration. Energy-related emissions fell by 1.7 percent in 2016, following a 2.7 percent decline the previous year (EIA 2017a). The decline in energy sector emissions has largely come from a decline in emissions from coal-fired power plants, which have been shut down across the country in response to more favourable economics from burning now abundant and cheap natural gas taken from shale formations.

Not only is natural gas a cleaner-burning fuel than coal (roughly half the carbon emissions per British thermal unit of energy), but gas-fired power plants require less energy expenditure to produce

a kilowatt of electricity than coal-fired plants. Both attributes provide emission savings in the switch from coal-fired power to natural gas-fired power.

For more than a century, coal was the principal source of American power generation; its share of US electricity production was surpassed by natural gas in 2016. Since 2000, coal's share of US power generation fell from 52 percent to a record low 30 percent last year. During the same period, the natural gas share had doubled from 16 percent to 32 percent, and as of 2016 had surpassed coal's dominance of US power generation, which lasted for more than a century. Renewables have also taken market share from coal, having almost doubled their share of power generation from nine percent in 2000 to 17 percent in 2017, as their costs have fallen markedly (see Figure 5).

By 2017, US coal consumption of an estimated 731 million short tons was 35 percent below the all-time peak of 1,218 million metric short tons in 2007 (Reuters 2017).

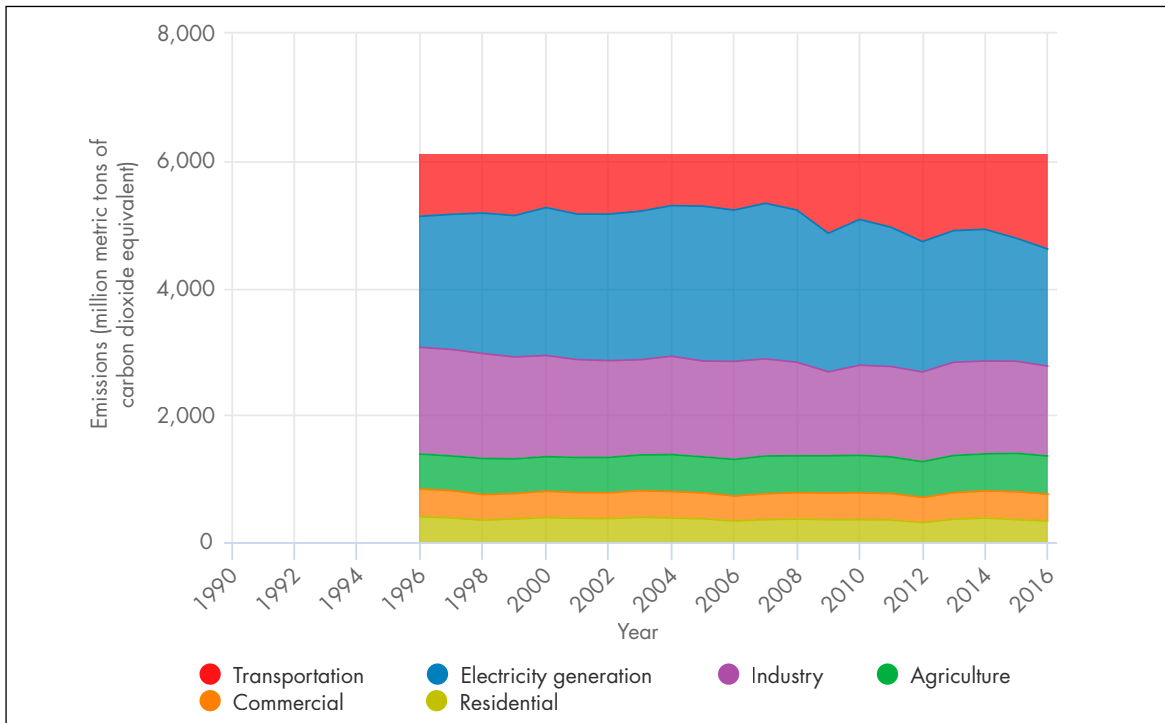
Driven by a steep decline in emissions from coal-fired power plants across the country, energy-sector emissions fell to their lowest level in 25 years in 2016 and for the first time were surpassed by the transportation sector as the principal source of emissions in the US economy (EIA 2017a). Most of the decline in the emissions from power generation has come from the coal sector; emissions have dropped by roughly one-quarter over the last decade (see Figure 6), and by more than eight percent in 2016, more than offsetting a rise in natural gas emissions as the later fuel has taken market share from coal in the US power sector. Emissions from the power sector have already fallen by more than half that mandated by the 2030 target originally specified by the Obama Clean Power Plan (Goldenberg 2016).

Plummeting domestic coal consumption has imposed a devastating loss of market capitalization for some of the largest coal producers in the United States, including Peabody Energy, Alpha Resources and Arch Coal. All have emerged from bankruptcy protection after losing as much as 90 percent of their market capitalization.

The more than 20 percentage point drop in coal's share of US power generation has similarly taken a heavy toll on US coal plants (EIA 2018). The number of coal plants in operation has fallen from 616 in 2006 to 381 in 2016. Since then, the EIA reports that nearly 30 additional coal-fired power plants were closed in the first year of Trump's presidency (Feldman 2018).

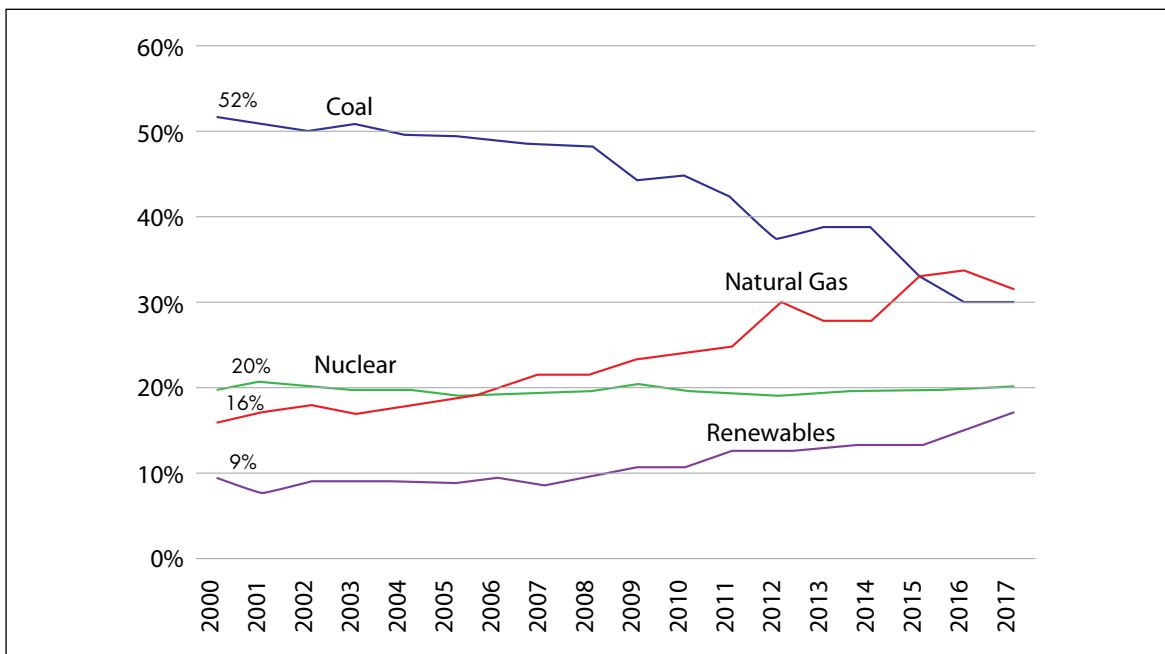
4 The emission cap, along with the province's carbon tax, may be repealed depending on the outcome of the upcoming Alberta election. The favoured opposition party has vowed to scrap both.

Figure 4: US Greenhouse Gas Emissions by Economic Sector, 1990–2016



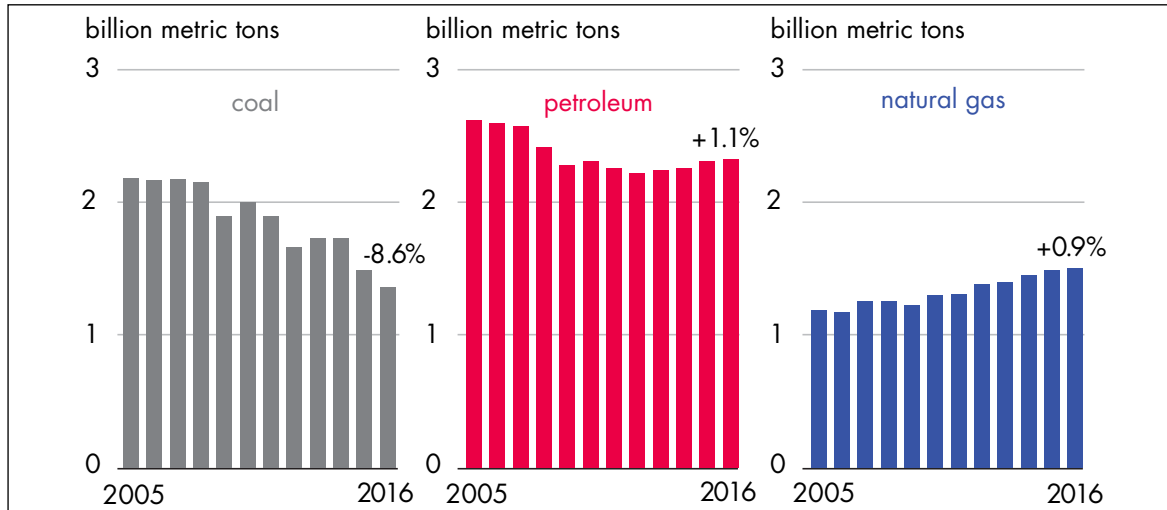
Source: www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks.

Figure 5: US Electricity Generation by Fuel Type



Data source: EIA (2018).

Figure 6: Change in Emissions from Fuel Source – US Power Sector



Source: EIA (2017a).

Are Further Reductions in US Energy Sector Emissions Sustainable under a Trump Administration?

Given the sweeping changes in Washington, many have questioned whether the progress on reducing energy sector emissions can be sustained in light of the stark contrast between the former Obama administration, which took on a global leadership role on the issue, and the Trump administration, which has questioned the very existence of climate change.

President Trump has wasted little time in rolling back most of the Obama administration's climate change initiatives. He has cancelled the much stricter standards President Obama had imposed for the release of fugitive methane from oil and gas production and distribution, opened the Arctic national wildlife refuge to oil drilling, as well as ending the principle of the "social cost of carbon" relating to climate change in the EPA's regulations. In addition, the Trump administration has announced that it will review and likely rescind the tough new fuel economy regulations imposed by the outgoing Obama administration

for 2022–2025 models, which mandated an average of more than 50 miles per gallon fuel economy for 2025 model automobiles and light trucks, with much lower, yet-to-be-announced fuel economy targets (Institute for Energy Research 2018).⁵

But perhaps the singularly most important change Trump has ordered was rescinding the Clean Power Plan regulations that would have compelled an almost one-third cut in greenhouse gas emissions from all American power utilities by 2030. The move, along with Trump's decision to approve the Keystone XL pipeline and Dakota Access pipeline connection to the Bakken shale deposits, are designed to encourage oil and gas production and, most of all, resuscitate an imploding American coal industry and its steadily shrinking payrolls. While US oil and gas production is booming (as it was during the previous Obama administration), US coal production in 2016 was the lowest it had been since 1982 and was down 35 percent from its 2007 peak, following in the path of steadily dropping domestic consumption (Reuters 2017). Virtually all of this decline has occurred within power utilities, which account for more than 90 percent of US coal consumption. While the Obama administration's Clean Power Plan has been widely blamed for the industry's demise, the plan's true significance may be far less than either its opponents or supporters suggest.

⁵ Individual states, however, are free to adhere to the Obama-era targets through setting their own state requirements. California, Pennsylvania and New York have already indicated they will do so.

The US Coal Industry's True Nemesis: Hydraulic Fracturing and the Shale Revolution

Eliminating carbon emissions from coal-fired power plants was probably the last thing George Mitchell, the famous Texan wildcatter who first married the practices of horizontal drilling with hydraulic fracturing, cared about. But the subsequent shale revolution has done just that. By unleashing a flood of hydrocarbons that were previously unreachable in shale formations, Mitchell revolutionized America's energy sector — a revolution that has not only measurably lessened US dependence on oil imports (so much so that, at the oil industry's urging, President Obama rescinded the decades-long ban on crude exports imposed after the first Organization of the Petroleum Exporting Countries oil shock) by doubling US oil production over the last decade, but has at the same time unleashed so much natural gas that the latter has replaced coal as the primary source of power generation in the country.

As recently as a decade ago, coal-fired utilities supplied half the power that drove the world's largest economy. But as Mitchell's refinements to hydraulic fracturing allowed commercial exploitation of massive shale deposits, such as the Permian Basin or Eagle Ford basins in Texas or the Marcellus and Utica basins, the advent of shale gas has suddenly boosted US natural gas production by almost 50 percent over the last decade.⁶ The flood of cheap shale gas has cut North American natural gas prices by two-thirds from only a decade ago. At today's natural gas prices, typically around \$3 per thousand cubic feet, American utilities can generate power by burning natural gas as cheaply as they can with coal, and without the huge fixed expenditure of building massive, capital-intensive coal plants. At the same time, the plunging cost of both solar and wind power has seen a sharp rise in the use of renewable energy in US power generation, further weakening coal's position in the US power market.

A study from the Center on Global Energy Policy at Columbia University's School of International and Public Affairs (SIPA) estimated that the advent of cheap shale gas accounted for almost half the decline in US coal consumption. By comparison, the study found that the impact of tougher emission regulations on utilities introduced by the Obama administration was responsible for a small fraction of this amount (Houser, Bordoff and Marsters 2017).

Next to the competitive challenge posed by cheap and abundant shale gas, stagnant utility demand over the last decade has been the most important factor undermining domestic coal demand with an impact many times that of the Obama administration's Clean Power Plan.⁷ Since 2008, US electricity demand has delinked from its historical relationship to GDP growth, in part a reflection of increased energy efficiency and in part the result of the growing use of renewable power as more and more utility customers are producing their own energy through wind and solar, hence lessening their need for distributed power from the grid. As the cost of renewables (in particular solar) continues to plunge, in many cases approaching grid parity, demand leakage from the grid is widely expected to grow, suggesting a further decoupling of distributed power demand from underlying economic growth. If so, base load power capacity as provided by coal-fired plants could increasingly become stranded by declining electric utility demand.

7 Next to natural gas (49 percent), the study found that lower-than-expected power demand growth (26 percent) and the falling cost of renewable energy (18 percent) were major contributing factors behind the last decade's decline in coal consumption, compared to only three to five percent for Obama administration regulations (Houser, Bordoff and Marsters 2017). It should be recognized, however, that it was way too soon to see the full impact of those regulations since they would not be even partially implemented until 2022.

6 See www.eia.gov/dnav/ng/hist/n9070us2m.htm.

Exports Increasingly Vital to US Coal Industry Prospects

Traditionally, the US coal industry has been domestic based, with exports typically accounting for no more than eight to 10 percent of US production. Facing intense competition from cheap natural gas from shale formations, coupled with static power demand from the nation's utilities, the US coal industry, the second-largest in the world, is being forced to reorient toward foreign markets.

Unlike the unrelenting competitive pressure the US coal industry faces from natural gas in its own domestic market, the economics of coal-fired power generation are far more robust elsewhere. While shale gas deposits can be found throughout the world, hydraulic fracturing remains an essentially North American practice, and is not utilized on a large-scale commercial basis outside of the United States and Canada. As a result, natural gas prices are significantly higher in both Europe and Asia than they are in the United States and hence do not pose the same competitive threat to coal-fired power generation in those markets as they do in the US market.

While coal demand is declining in North America, across the Pacific the demand for the fuel is booming. Asia's share of global coal consumption has increased steadily from less than half in 2000 to almost three-quarters by 2017 (Gloystein and Paul 2018). China alone accounts for half of world thermal coal consumption. In recent years, Asian demand has benefited from very strong demand from China and Japan, the latter in response to effectively shutting down almost all of its 48 nuclear reactors following the Fukushima disaster and importing record amounts of coal to make up for the resulting energy shortfall.⁸ Meanwhile, China's coal imports rose in 2017 to their highest level since 2014, while future prices for thermal coal in China soared to US\$108 a tonne — up five-fold from 2016 levels (ibid.).

While the Chinese authorities ultimately want to shift energy production from coal to natural gas (coal accounts for roughly two-thirds of the country's energy), in the short term at least the crackdown on illegal coal mining in the country has simply boosted the demand for coal imports. Demand for thermal coal in South Korea is also robust, with coal imports rising by more than 10 percent last year (ibid.).

Driven by consumption in China, India, South Korea and Japan, resurgent Asian demand has meant a boom for foreign suppliers to the region. Australia's reference export price for thermal coal, Newcastle coal price, topped US\$100 a ton in the first quarter of 2018, double the price of only a year ago.⁹

A reorientation toward Asian markets is not only motivated by the resurgent strength of coal demand in that continent, but also by the shift in US coal production to the western part of the country. The massive Powder River Basin lying in Montana and Wyoming has, for the last decade, surpassed Appalachia as the primary source of thermal coal production in the United States.

The industry's greatest challenge was not the actions of an anti-coal Obama administration in Washington, but rather the logistics of moving coal from the Powder River Basin reserves in Montana and Wyoming to coal-hungry Asian markets. In fact, the majority of Powder River Basin coal production is on federal land leased at royalty rates as low as five percent (Repetto 2016).

The real obstacle facing Powder River Basin coal, like that facing Alberta's land-locked bitumen, is that America's largest coal deposits are more than 1,300 km away from tidewater. Before it can find its way to booming Asian coal markets, Powder River Basin coal must first be transported by train to tidewater, just as Alberta bitumen must be piped there.

But virtually all the US coal terminals are located on the eastern seaboard, either along the Atlantic Ocean or along the Gulf of Mexico, serving traditional coal markets in Europe and the rest of the Atlantic Basin. The only coal terminals operating on the West Coast are in California — Long Beach, Port of Stockton and Levin-Richmond Terminal. Together these have

⁸ Nuclear had accounted for more than 25 percent of the country's power supply.

⁹ See "Coal, Australian thermal coal Monthly Price," www.indexmundi.com/commodities/?commodity=coal-australian.

a limited capacity of moving only 1.5 million tons of coal per year (Finn Host 2017).

Just as states such as Nebraska have opposed the flow of heavy oil from the oil sands through the proposed Keystone XL pipeline, none of the Pacific Coast states (Washington, Oregon and California) have been very keen on carloads of coal-dust spewing trains crossing their state en route to coal terminals along their coastline. Unlike pipelines that largely fall under federal jurisdiction, the construction of coastal coal terminals falls under either municipal or state jurisdiction.

Within the last decade, no less than eight proposed coal export terminals have been turned down or withdrawn in the face of overwhelming state or local opposition. A new terminal that would have shipped 8.8 million tons of coal per year at the mouth of the Columbia River was rejected by state legislators on the grounds that it would damage marine ecosystems as well as pose a threat to the traditional fishing grounds of the region's native American tribes. Plans for a similar terminal to be constructed in neighbouring Washington State have similarly been turned down. Proposed coal terminals in Bellingham, WA (Cherry Point); Gray's Harbour, WA; Port of St. Helen's, OR; Port of Morrow, OR; Coos Bay, OR, and in an abandoned army base in Oakland, CA, have all been either turned down or the applications have been withdrawn in the face of intense local opposition. If built, these terminals would have collectively shipped more than 100 million tons of coal — more than 66 times the amount of thermal coal the US exports from American Pacific ports.

Locally induced transportation bottlenecks have effectively blocked any expansion of US coal exports from western deepwater seaports, just as those exports have become more critical to the US coal industry in the face of steadily falling domestic demand for the fuel. But as doors to boost coal exports to Asia close along the US Pacific coastline, western coal producers have pried another one open north of the border.

British Columbia: A More Than Willing Conduit to Export Powder River Basin Coal

In sharp contrast to President Trump's vociferous support for the American coal industry, the Trudeau government has assumed a global leadership role in attempting to lessen coal's role in the world's energy mix — according to the International Energy Agency, coal will soon surpass oil as the world's most important fuel source. Canada, along with the United Kingdom, led a 25-country group that vowed to phase out the use of coal as a source of power generation by 2030. In addition, Canada has jointly sponsored climate partnerships with France and the World Bank that will help developing countries shift from coal-based power. At COP 23, Canada and the United Kingdom announced that they will launch the Power Past Coal Alliance (Maciunas and Saint-Geniès de Lassus 2017).

While officially both Canada and the United Kingdom are counselling developing countries on how to wean themselves off coal, behind the scenes both governments support booming coal exports to those countries. The United Kingdom has lessened its domestic dependence on the fuel and pledges to phase out coal-fired power entirely by 2025; however, it supports a coal industry that is a major exporter of both the fuel and coal-mining technology to the developing world, where the demand for coal is the greatest. British coal exports are booming and were up more than 20 percent over the first half of 2017 following a 15 percent increase in 2016 (Twindale and Lewis 2017). In Canada, the Port of Vancouver is playing a pivotal role in the shipment of thermal coal exports to Asia, even if the coal is not being mined in the country.

Fortunately for Powder River Basin coal producers, Canada provides a not only convenient but also critical conduit to booming overseas Asian coal markets.

Vancouver's Westshore Terminals at Roberts Bank, just south of Vancouver at the delta of the Fraser River, has become far and away North America's busiest West Coast coal terminal (Keiran 2018). Built originally to handle exports of British Columbia's

abundant metallurgical coal deposits, thermal coal from the Powder River Basin now accounts for one-third of total coal shipments from the terminal, worth about CDN\$100 million in annual revenue to the terminal. Last year, 11.5 million short tons (or 10.5 million metric tons)¹⁰ of Powder River Basin coal were shipped from there. Between 2014 and 2017, shipments of Powder River Basin coal from the Westshore Terminals accounted for between 27 and 35 percent of total US thermal coal exports.¹¹ A more than doubling in shipments to Asia drove a large rebound in US coal exports last year, which were the highest since 2012.

With the traditional trade in BC metallurgical coal now augmented by Powder River Basin thermal coal, Vancouver is rapidly evolving into one of the world's major coal ports. Canadian ports helped facilitate the export of approximately 37 million metric tons of coal, representing as much as one-third of all the industrial traffic shipped from Canada's busiest port in 2016 (Hopper 2018). Next to softwood lumber, it is the province's largest export. Approximately 80 percent of Canada's coal exports are shipped through British Columbia to Asia (principally Japan and South Korea), given that the vast majority of the country's coal deposits are located in western Canada. British Columbia's own coal exports are, for the most part, metallurgical coal used in steel making.¹²

Vancouver is not the only BC port that has provided a much-needed conduit to booming Asian coal markets. Powder River Basin thermal coal has even been hauled another 750 km north to the Ridley Terminals in Prince Rupert. Arch Coal, a major producer in the Powder River Basin, signed a five-year agreement in 2011 to export up to 2.5 million tons of US thermal coal from Prince Rupert's Ridley Terminals.¹³ The terminal also signed contracts with Cloud Peak Energy and Enserco, other Powder River Basin producers, to ship their coal. In 2016, more than two million metric tons of thermal coal were shipped from the northern BC terminal; however, prohibitive rail costs mean all Powder River Basin coal is now shipped from the closer Westshore Terminals in Vancouver.

10 One US short ton equals 0.907185 metric ton or tonne.

11 Clark Williams-Derry, email message to author, June 12, 2018; figures calculated by Sightline Institute Seattle based on EIA statistics and Westshore Terminals Annual Reports.

12 See www.nrcan.gc.ca/energy/facts/coal/20071.

13 See www.sourcewatch.org/index.php/Ridley_Terminal.

Conclusion: Outlook for Further Energy-related Emission Reduction Continues to Look Better in the United States

In sharp contrast to their very different ideologies regarding climate change and very different views on the need for mitigation policies, the United States is likely to continue to make significant reductions in its energy sector emissions while in Canada those emissions are expected to continue to grow — so much so that they could compromise the country's 2030 emission reduction target, just as they have already compromised the 2020 target.

Despite the Trump administration's best efforts to support the US thermal coal industry, the outlook remains positive for further emission reductions in the US energy sector, continuing a trend of declining coal usage by power utilities that has now been in place for more than a decade. Under most scenarios of continued low natural gas prices, the EIA projects emissions from the power sector will continue to decline over the next two and half decades, led by a further almost 50 percent decline from coal-based emissions (EIA 2017b).

Only a sharp and sustained rise in natural gas prices could reverse this trend. But this seems a highly unlikely prospect, as a flood of cheap shale gas has already expanded US gas production by almost 50 percent. The EIA estimates shale gas production in 2017 at 16.76 trillion ft.³, already accounting for 60 percent of total US dry natural gas production. The US coal industry will continue to face highly unfavourable economics against competition from shale gas in US power generation, and access to overseas markets in Europe and Asia will become increasingly critical.

In Canada, the Trudeau government remains heavily conflicted between its energy policies in support of expanded oil sands production and its environmental objective of meeting the 2030 emission reduction target, a target originally pledged by the previous Conservative government and later reaffirmed at COP 21 by the new Liberal government. While the federal government has been

an advocate of taxing carbon emissions throughout the economy, it has also taken unprecedented action in support of further emission growth from the oil sands — the country's leading source of carbon pollution. In fact, through its acquisition of the Trans Mountain pipeline, the Trudeau government has taken a more active role in support of the sector than even the previous Conservative Harper government, which, like the current Liberal government, considered new pipelines to be of the utmost national strategic interest.

However, as we have seen with US coal-fired emissions, market forces driven by technological change can often stump policy objectives. The same outcome could happen in Canada. Despite the Trudeau government's best efforts to support the future growth of bitumen production, the impact of soaring US oil production from shale formations may ultimately have the same lethal impact on the oil sands that shale gas has had on US thermal coal.

The tight oil found in shale reserves is an ultra-light crude, and hence a far more valuable product than the bitumen from the oil sands, which must first be upgraded into oil before it can be refined into finished products such as gasoline or diesel. Moreover, production costs for shale are much lower than those for the oil sands, and the tight oil found in shale formations can be accessed through much smaller capital investments than the megaprojects typically required for oil sands extraction. In many respects, the disadvantages of oil sands versus the light oil from shale formations mirrors the disadvantages that coal-fired power plants incur against competing gas-powered plants.

The impact of soaring US oil production from shale deposits is already being felt in the oil sands. Oil sands producers' new-found need to access overseas markets, even though those foreign markets have historically been paying less for heavy oil than North America (Rubin 2017), has been driven by the displacement of Alberta bitumen in the US market by soaring domestic production, mostly from shale fields. Massive production gains from the Permian, Eagle Ford and Bakken shale deposits have doubled US oil production over the last decade, catapulting the country into the front ranks of global oil producers. Those shale-driven production gains, the largest in the world, have already cut US oil imports by one-quarter.¹⁴

While there is still reasonably strong regional demand for Alberta bitumen from US West Coast refineries in Washington and California, which are configured to accept the fuel as feedstock and have limited access to shale production, there is little demand for additional bitumen in the rest of the US marketplace. Ironically, about half the bitumen that is exported to these US West Coast refineries via the Trans Mountain pipeline is sent back to British Columbia as refined gasoline and diesel at roughly twice the value of the bitumen exports.

Future growth in both oil sands production and emissions are critically tied to the construction of new pipelines. However, building new pipelines to the oil sands has been as controversial as building coal export terminals in Washington and Oregon. Canadian pipeline projects face fierce local opposition, which has already led Enbridge to abandon its Northern Gateway project and TransCanada to abandon its proposed Energy East pipeline. More recently, Kinder Morgan, which had threatened to walk away from the intended twinning of its Trans Mountain pipeline, sold the existing pipeline, along with the rights to twin it, to the Canadian government. However, the proposed expansion, which would almost triple the throughput of the pipeline and lead to a seven-fold increase in tanker traffic in Vancouver Harbour, still faces legal challenges from First Nations groups and the Province of British Columbia. The two other remaining pipeline projects, Enbridge's Line 9 expansion and the now Trump-approved Keystone XL pipeline, have yet to be built.

A recent ruling by a Minnesota judge to not grant Enbridge a new and less costly right of way has seriously compromised the economics of its Line 9 renovation that would double the throughput of the existing line from Hardisty, AB to Superior, WI (Reuters 2018). Meanwhile, more than a year since gaining approval from President Trump, TransCanada has yet to proceed with construction of its Keystone XL pipeline. The project still faces legal challenges from environmental groups and native communities in Montana and from landowners in Nebraska. And with the acquisition of the Trans Mountain pipeline by the Canadian federal government, both TransCanada and Enbridge find themselves in direct competition with a pipeline that can use taxpayers' money to subsidize shipping costs, rendering their own new pipeline projects less commercially attractive.

¹⁴ See www.eia.gov/energyexplained/index.php?page=oil_imports.

While new pipelines are certainly a necessary precondition for production growth in the oil sands, they are by no means a guarantee that growth will occur. Even if the remaining pipeline projects go ahead, it is unclear whether future growth in world oil demand will be sufficient to raise oil prices high enough to leverage a sufficient number of new oil sands megaprojects to fill them. What is clear is that the pace of future demand growth necessary to make such high-cost projects commercially viable will not be possible if countries, including Canada, come anywhere close to meeting the emission reduction targets pledged at COP 21 (Rubin 2016a). Meeting those targets would require at least a 25 percent reduction in world oil demand over the next two decades, which would strand high-cost production such as the oil sands.

Even today, with costs of new production ranging upwards from US\$80 a barrel (roughly twice the current price Western Canadian Select has averaged over the first half of 2018)¹⁵ it is highly unlikely that greenfield projects could be funded in the marketplace, even if new pipelines are built. With the exception of Exxon, which was earlier forced by the US Securities Exchange Commission to write down the entire value of its oil sands reserves, virtually all the other major global oil producers have exited the sector, leaving it in the hands of Canadian producers. Most have seen a very significant drop in their stock market valuations over the last four years of sub US\$100 per barrel world oil prices. The final verdict on energy sector emissions in Canada over the next decade may ultimately be in the hands of the market.

What Will British Columbia Do?

British Columbia, however, could be a wild card, at least in the near term. Access to its coastline could play a critical role in both the thermal coal industry in the United States and the oil sands industry in Canada. The province's opposition to Kinder Morgan's intended twinning of the Trans Mountain pipeline has prevented the project from proceeding and prompted Kinder Morgan's

sale of the pipeline to the federal government. Should British Columbia choose to regulate US thermal coal shipments through the province, it might have an even more devastating impact on Powder River Basin coal production.

Many of the arguments that the BC government has made in its court challenge to halt the twinning of the Trans Mountain pipeline would seem to apply equally to Vancouver's Westshore Terminals, which handle virtually all the Powder River Basin shipments to Asia.

While the shipment in coastal waters of Powder River Basin coal may not pose the same threat to marine conditions and the coastline as a bitumen spill would, the impact of coal dust on Vancouver-area residents is similar to the impacts that led Oregon and Washington communities to reject new coal terminals. And insofar as the fuel contributes to global climate change, the combustion of the coal shipped to Asian markets would have an emission trail that, while not quite on the same scale as the emission trail from what flows through the Trans Mountain pipeline, nevertheless adds roughly 22 Mt of carbon emissions into the atmosphere every year.

The current New Democratic Party government in British Columbia or indeed the federal government may want to apply their respective carbon taxes on thermal coal shipments going through the province. The previous premier, Liberal Christy Clark, threatened to impose a \$70 a ton tax on thermal coal shipments moving through the province as a trade retaliation measure to mounting US duties on BC softwood lumber. Certainly, the principle of applying the province's carbon tax on those shipments would be more consistent with the position the province has taken with regard to the movement of additional Alberta bitumen across its territory though new or expanded pipelines. Given the slim operating margins that Powder River Basin producers such as Cloud Peak Energy make on those shipments, the application of the province's current \$35 a ton carbon tax, or even the soon-to-be-implemented \$10 a ton federal carbon tax, would likely stop those shipments right in their tracks and with them any chance of the US coal industry supplying Asian markets.

¹⁵ See <https://oilprice.com/oil-price-charts>.

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