Climate Justice Project

Peddling GHGs

What is the Carbon Footprint of BC's Fossil Fuel Exports?

KEY FINDINGS

- Greenhouse gas emissions in other jurisdictions from BC exports of fossil fuels (coal and natural gas) are more than double the emissions from all fossil fuel combustion within BC, and almost eight times the emissions from extracting and processing fossil fuels in BC.
- BC's reserves of coal and natural gas (in the ground) are equivalent to more than three years of global CO_2 emissions.
- Carbon capture and storage (CCS) technologies are the only means by which continued fossil fuel extraction and export could continue in a sustainable manner. However, such technologies are expensive, and are not likely to sequester 100% of emissions from fossil fuels.
- BC should impose a moratorium on new fossil fuel extraction unless CCS can be implemented, and by 2030 all existing facilities should be required to implement CCS.

by Marc Lee

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BASED PRIMARILY ON THE CREATION OF A BC CARBON TAX TWO YEARS AGO, the BC government has been propelled into the position of North American climate action leader. While there was much to applaud as first steps on climate action in BC's 2008 "green" budget, two years later there remain some glaring contradictions between climate action and BC's transportation and industrial policies. BC has legislated a target of a 33% reduction in emissions by 2020 (relative to 2007 levels), but does not yet have a plan to get there.

Those contradictions are no more apparent than in the oil and gas sector, highlighted by the recent approval of an $800 million EnCana natural gas facility in BC's Northeast. The new plant will add 2.2 million tonnes of CO_2 (Mt CO_2e) per year to BC's greenhouse gas inventory. When completed, the plant will become the single largest point-source emitter in BC, topping Spectra's Fort Nelson gas plant, which produced 1.3 Mt CO_2e in 2006 (the last year for which we have data).[1]

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To put this into perspective, an extra 2.2 Mt of emissions is like adding half a million cars to BC's roads.[2] BC's carbon tax is estimated to reduce emissions by 3 Mt per year, but not until 2020 (notably, BC's carbon tax applies to the combustion of fossil fuels in the province, but does not apply to a large share of emissions from oil and gas production, such as venting of gas and pipeline leaks, or exports).[3]

The father of the ecological footprint, UBC professor William Rees, argues that fossil fuels are a powerful drug. We are all addicted to the energy provided by cheap and abundant fossil fuels, and so have reshaped our economy and society in fundamentally unsustainable ways. But BC is more than just another addict; it is also a dealer. When it comes to law and order, we have learned not to crack down on the users of drugs, but instead focus our efforts on the dealers. So what if it turns out that beautiful BC is running the resource economics equivalent of a meth lab?

This brief reviews the emissions from BC's production and export of fossil fuels, a key plank of the province's industrial policy, and one clearly at odds with climate action. There is a battle at the heart of the BC government between the Ministry of the Environment and the Ministry of Energy, Mines and Petroleum Resources, and so far the latter is winning. Looking forward, BC has massive fossil fuel reserves (still in the ground), highlighted by a recent $404 million auction of land for exploration of shale gas in the Northeast.[4] As BC aims to dramatically cut its consumption of fossil fuels, at some point the province must also stop peddling fossil fuels in export markets.

FOSSIL FUELS AND BC'S ECONOMY

Like other jurisdictions around the world, BC burns a lot of fossil fuels. In 2007, these accounted for 49 million tonnes of carbon dioxide equivalent (48.6 Mt CO_2e) out of a total inventory of greenhouse gas emissions 67.3 Mt.[5] BC performs better than most North American jurisdictions, largely because 90% of its electricity comes from clean sources like hydro power, whereas the dirtiest Canadian provinces and US states rely on coal. Nonetheless, we use fossil fuels to heat many homes (3.3 Mt) and other buildings (4.3 Mt), and to move people and freight (24.9 Mt).

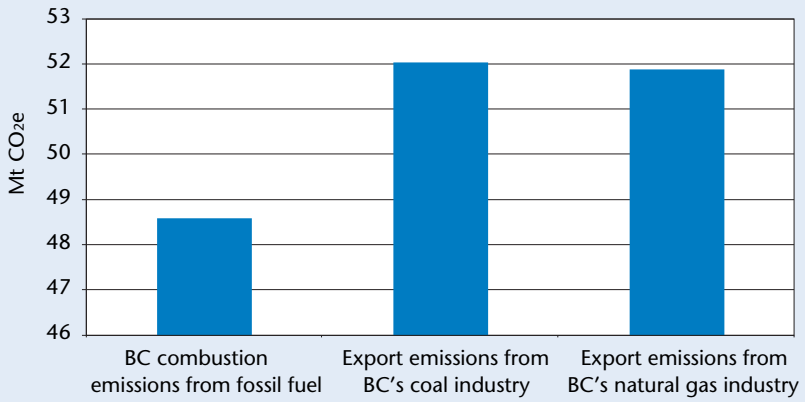
In addition to these energy services derived from fossil fuels, BC is a major producer of them. The extraction and processing of fossil fuels (oil, natural gas and coal) led to 13.7 Mt of emissions in 2007, or one-fifth of BC's emissions. But the footprint of BC's fossil fuel production is actually even larger because official inventories only count emissions released *within the borders* of a jurisdiction. The combustion of coal, oil and gas outside BC in export markets is not counted. As a result, the emissions attributable to BC's fossil fuel industries in BC's official inventory are vastly understated.

As a resource economy, BC extracts large amounts of natural gas for export to the US, and coal to Asia, Europe and Latin America. In 2008, natural gas and coal together hit a record $8.5 billion in BC exports (with the recession, this fell to $6 billion in 2009).[6] While BC has become a more diversified and service-oriented economy, resource extraction remains a major part of the provincial economy and a large source of export revenues, and as a result continues to dominate thinking in Victoria.

We can estimate the greenhouse gas (GHG) emissions associated with exports by multiplying export volumes by the emission factors in BC's GHG inventory report.[7] In 2008, BC exported 13 billion cubic metres of natural gas in marketable form to the US and eight billion cubic metres to Alberta, plus another five billion cubic metres of raw gas to Alberta. Converted to tonnes of carbon dioxide exported, BC natural gas was the source of 51.9 Mt counted in the inventories of the US and Alberta. In addition, more than 25 million tonnes of coal left BC ports in 2008, which count for another 52 Mt of CO_2 emissions in export markets. Combined, BC's GHG exports were 104 Mt CO_2e in 2008. As Figure 1 shows, exports of these two commodities alone led to emissions elsewhere that are more than double emissions from fossil fuel combustion within BC (and 166% larger than BC's total emissions), and 7.6 times BC's domestic emissions associated with extraction and processing of those fossil fuels.

Exports of natural gas and coal alone led to emissions elsewhere that are more than double emissions from fossil fuel combustion within BC.

Figure 1: BC's Domestic Emissions vs Exported Emissions



Note: BC official emissions from 2007, last available data year, while estimated coal and natural gas exported emissions are for 2008.

Sources: BC Greenhouse Gas Inventory; Author's calculations based on Statistics Canada, Table 135-0002—Production and exports of coal; BC Ministry of Energy, Mines and Petroleum Resources, Supply and Distribution of Natural Gas in British Columbia, www.empr.gov.bc.ca/OG/oilandgas/statistics/Documents/GasNew.xls

The flipside of exports is that the proceeds enable BC to import goods and other fossil fuels from other jurisdictions. These too have embodied emissions that are not counted in BC's GHG inventory. Getting into these details is beyond the scope of this brief, but suffice it to say that BC is a player in a global economy and this contributes to substantial emissions outside of provincial borders.

FOSSIL FUEL RESERVES AND GHG EMISSIONS

A recent Globe Foundation report on BC's green economy, commissioned by the BC government, notes that the province has 1,000 trillion cubic feet of natural gas reserves in the ground, commenting that this represents a "low carbon resource opportunity for both transportation and for export to other economies around the world."[8] There is no small measure of irony in this statement. Converted to emissions, these natural gas reserves represent 55.8 *billion tonnes (gigatonnes, or Gt)* of CO_2 awaiting release into the atmosphere—if extracted. Similarly, a report for the BC government cites 20 billion tonnes of coal reserves in BC, equivalent to another 41.5 Gt CO_2.[9]

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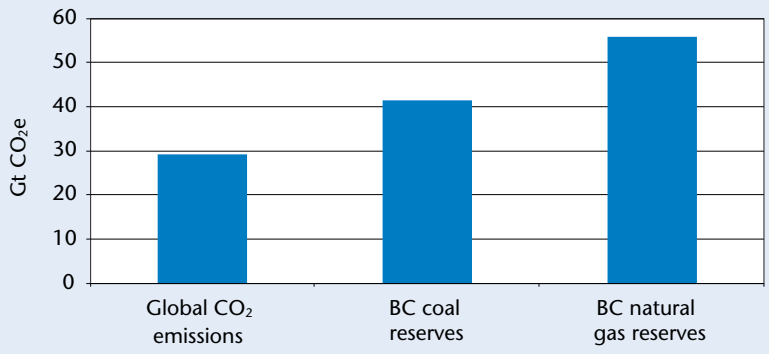
Figure 2 puts that combined 97.3 Gt CO_2 potential in global perspective. BC's fossil fuel reserves represent more than three years of global CO_2 emissions (worldwide emissions were 29.2 Gt CO_2 in 2006). While coal is increasingly understood as a dirty fuel, natural gas is generally seen in a more positive environmental light, although it still creates half of the emissions of coal when combusted and is much more fossil-fuel intensive in the extraction and processing stage (natural gas is methane, itself a very potent greenhouse gas).

A reality check comes from estimates of the world's carbon budget—the total stock of emissions that can be emitted between now and 2050 by everyone worldwide, consistent with a reasonable probability of keeping global temperature increase under 2° Celsius above pre-industrial levels. Above 2° Celsius, it is widely believed that humans

Figure 2: Global CO_2 Emissions vs BC Reserves



Notes and Sources: Global CO_2 emissions from World Resources Institute are for 2006, last available data year. Estimates of BC coal reserves from Ministry of Energy, Mines and Resources, and natural gas emissions from Globe Foundation.

lose the ability to stop climate change, and runaway global warming could be the result. The World Wildlife Federation estimates this global carbon budget at just over 1 trillion tonnes of CO_2 equivalent.[10] BC's fossil fuel reserves are thus equivalent to nearly one-tenth of the world's remaining carbon budget.

BURYING THE EVIDENCE?

Given the need for GHG emissions in BC (and every other jurisdiction) to fall dramatically over the coming decades, the only way BC can have an export industry would be for emissions to be buried back underground. Carbon capture and storage (or CCS) technology is based on separating out CO_2 from fossil fuel processing or combustion, and pumping it deep underground where it will stay, forever. If CCS technologies can be successfully implemented—and this is a big "if"—there might be a case to be made for the development of "sustainable fossil fuels."[11]

Even if everything goes right, CCS would not be able to contain anything close to 100% of emissions on a life-cycle basis.

At a technology and engineering level, CCS is plausible. Spectra Energy, for example, has experimented with CCS in eight locations in BC, and claims it has plans to capture and sequester the emissions from its Fort Nelson gas processing plant, which would make it one of the largest such operations in North America.[12] The oil and gas industry sees this as its future and these efforts are aimed at gaining the knowledge needed if and when CCS becomes required.

Much of the concern around CCS has been that those millions of tonnes of CO_2 pumped underground may come back up to the surface. Over a very long time horizon, from a few hundred to thousands of years, one cannot dismiss such concerns entirely. In the aftermath of the BP oil spill in the Gulf of Mexico, caution is clearly recommended when it comes to large capital projects from the oil and gas industry. That said, the problems seem to be less about technology and geology and more about economics, politics and legal liability. On the crucial issue of economics, a pro-CCS task force reporting to the Alberta government commented that:

> *CCS is expensive and currently uneconomic. CCS costs are site-specific and vary widely. They range from $70 to more than $150/tonne. Over and above any potential compensation available to industry, deploying CCS currently carries a financial disadvantage of up to $100/tonne.*[13]

Those carbon prices seem unlikely to appear out of current political processes – whether in BC, Canada or the US—any time soon. The report additionally notes that development and implementation of CCS is complex and will take time. It recommends large public subsidies in the early stages to bridge the cost gap (the Alberta government has already created a $2 billion CCS fund).

Even if everything goes right, CCS would not be able to contain anything close to 100% of emissions on a life-cycle basis. There are already substantial emissions associated with extraction even if a single processing facility can sequester all of its emissions. At the facility level, Mark Jaccard estimates that "most CO_2 capture technologies currently under serious consideration prevent 85-90% of the carbon in the fuel from

reaching the atmosphere."[14] And while this may be applicable in power stations and large industrial plants, there are no foreseeable technologies that would capture and sequester emissions from small-scale natural gas combustion in homes or businesses.

So if we are generous about the potential of CCS as a technology, we are left with some big and dirty challenges en route to a low-carbon economy. Developing CCS would be expensive, and it would be less costly (especially if governments are expected to pick up the tab in the short- to medium-term) and less risky to spearhead aggressive conservation efforts and shifts to truly renewable sources of energy.

THE CHALLENGE OF GETTING TO ZERO

Given the sheer urgency of getting over our addiction to fossil fuels, this inevitably means a moratorium on new oil and gas development is needed—unless CCS can be implemented in a way that captures 100% of lifecycle emissions.

The good news is that BC's fossil fuel resources are not going anywhere, and will only be worth more as time goes on. There is no reason we shouldn't dramatically slow down coal mining and oil and gas extraction. Given the sheer urgency of getting over our addiction to fossil fuels, this inevitably means a moratorium on new oil and gas development is needed—unless CCS can be implemented in a way that captures 100% of lifecycle emissions. Some time between 2020 and 2030 CCS should be required of all existing operations. If this cannot be done, the BC government should think the unthinkable and consider leaving those resources in the ground.

Currently, there is no political will in Canada to say no to fossil fuel extraction. There is a case to be made that natural gas is the "cleanest" of the fossil fuels, and thus it could be a "transition fuel" from coal *en route* to truly sustainable sources. This might be true if we were able to guarantee that coal-fired power plants would be shut down in place of natural gas-generated power. But no such guarantees seem likely in export trade and we should assume that all emissions will be additional to current emissions.

An important social justice concern in taking an aggressive approach to fossil fuel extraction is the negative impact on many workers in those industries, and the communities they live in. The oil and gas industry contributed about 3,000 direct jobs to the provincial economy in 2009, and coal mining another 3,000 jobs, plus various support services for mining and oil and gas adding several thousand more jobs.[15] In total, fossil fuel extraction accounts for less than 1% of total employment in BC, although jobs are high paying on average.

While there is a strong case to be made for new green jobs in renewable energy, the promise of green jobs in the future is not the same as a good job today. The transition away from fossil fuels must happen in a way that minimizes impacts on resource-dependent communities. A moratorium would stop the sector from growing in the absence of CCS, and this would ease the transition up to the point where all existing facilities had to become compliant.

While 1% is a small part of BC's total employment, a government serious about climate action should also make serious commitments to "just transition" strategies for affected workers. These include income supports, retraining provisions and mobil-

ity allowances as part of a "green social contract" that ensures that no groups bear disproportionate costs of adjustment to a carbon neutral economy. Further research along the lines of Denmark's "flexicurity" model, which provides extensive income support and education and training for displaced workers, is needed to better define what an ideal package would look like.[16]

Confronting GHG emissions from the oil and gas sector, and emissions from fossil fuel exports that are combusted in other jurisdictions, is perhaps the biggest challenge BC faces, and the most glaring contradiction when it comes to climate policy. This challenge, and its social justice transitional issues, must be acknowledged if BC is to be a real climate action leader.

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NOTES

1 Pollution Watch online database, *Pollution Rankings*: www.pollutionwatch.org/rank.do

2 BC Budget 2008, p. 19, estimates that the top 10 passenger cars sold in BC in 2006 had emissions ranging from 3.1 to 4.4 tonnes per year (light trucks had a range of 4.4 to 6.8 tonnes per year). Author's calculation assumes 20,000 km per year and 4 tonnes per vehicle per year.

3 Relative to business-as-usual growth. BC Ministry of Environment (2008). *British Columbia's Climate Action Plan*. Victoria.

4 D. Ebner (2010) "B.C. shale gas gets jump-start with $404-million land auction" in *The Globe and Mail*, June 24. www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/bc-pulls-in-404-million-for-gas-rights/article1616371/

5 BC Ministry of Environment (2009). *British Columbia Greenhouse Gas Inventory Report 2007*. Victoria. 2007 is the last year for which we have data. Total includes net deforestation.

6 BC Stats (2010). *Exports (BC Origin), 2000-2009*. Victoria.

7 Data on coal exports and production from Statistics Canada, CANSIM table 135-0002. Natural gas data from the Ministry of Energy, Mines and Petroleum Resources: www.empr.gov.bc.ca/OG/oilandgas/statistics/Documents/GasNew.xls

8 Globe Foundation (2010). *BC's Green Economy: Building a Strong Low Carbon Future*. www.globe.ca/media/3887/bcge_report_feb_2010.pdf. This may be an underestimate—a presentation by Chris Adams of the Ministry of Energy, Mines and Petroleum Resources cites about 1,500 trillion cubic feet of "undiscovered conventional and unconventional gas potential", www.empr.gov.bc.ca/OG/oilandgas/petroleumgeology/UnconventionalOilAndGas/Documents/C%20Adams.pdf

9 It is easy to get overwhelmed by extremely large numbers. One gigatonne (Gt) is a billion tonnes or 1,000 megatonnes (Mt). One Mt is one million tonnes.

10 World Wildlife Fund (2009). *Establishing a Global Carbon Budget*. www.panda.org/about_our_earth/all_publications/?181642/Establishing-a-Global-Carbon-Budget

11 M. Jaccard (2005). *Sustainable Fossil Fuels: The Unusual Suspect in the Quest for Clean and Enduring Energy*. New York: Cambridge University Press.

12 Based on a presentation by Spectra Energy to a CCS roundtable hosted by the Pembina Institute in Vancouver, October 26, 2009.

13 Alberta Carbon Capture and Storage Development Council (2009). *Accelerating Carbon Capture and Storage Implementation in Alberta*. Final Report, March.

14 Jaccard (2005), p. 190.

15 Oil and gas, and support services data from BC Stats, www.bcstats.gov.bc.ca/data/dd/handout/naicsann.pdf. Mining data from PricewaterhouseCoopers (2010). *The Mining Industry in British Columbia 2009*. Vancouver, May.

16 See, for example, S.K. Anderson and M. Mailand (2005). *The Danish Flexicurity Model: The Role of Collective Bargaining*, Employment Relations Research Centre, compiled for the Danish Ministry of Employment, www.sociology.ku.dk/faos/flexicurityska05.pdf

CLIMATE JUSTICE PROJECT

The Climate Justice Project is a multi-year initiative led by the CCPA and the University of British Columbia in collaboration with a large team of academics and community groups from across BC. The project connects the two great "inconvenient truths" of our time: climate change and rising inequality. Its overarching aim is to develop a concrete policy strategy that would see BC meet its targets for reducing greenhouse gas emissions, while simultaneously ensuring that inequality is reduced, and that societal and industrial transitions are just and equitable. The project is supported primarily by a grant from the Social Sciences and Humanities Research Council through its Community-University Research Alliance program. Thanks also to Vancity and the Vancouver Foundation.

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