The Environmental Impacts of British Columbia’s Transportation Conversion to Natural Gas

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This report is written by Madeline Collins, BA Geography (Environment and Sustainability) 2015. This report is the second, of a two-part research series assessing British Columbia's proposed conversion of its transportation fleet to Liquefied Natural Gas (LNG). The first research project was conducted by another student, Kiyomi Henry, assessing the economic feasibility of this conversion. This report, written by Madeline Collins, assesses the environmental impacts associated with the conversion. Madeline Collins does not have any formal political affiliation with the Green Party.

Executive Summary

I argue that only until there is more scientific evidence to support the claims of the British Columbia Natural Gas Strategy and the policy recommendations I propose are put into place should the government move forward with their plans of liquefied natural gas (LNG) development. Natural gas is widely considered to be a crucial “bridging fuel” in the transition to low carbon energy systems to mitigate climate change. Given that British Columbia is located on top of a surplus of natural gas reserves, the B.C. Liberal government sees the development of LNG for transportation as an incredible revenue opportunity that could potentially eliminate government debt, amass funds for government services, and increase the province’s sustainability. In this report I will show through analysis of life cycle assessments (LCA) comparing the greenhouse gas emissions of diesel to natural gas (NG) that there remains a great amount of uncertainty as to the levels of fugitive emissions released along the supply chain of LNG and produced through shale gas extraction. This lack of academic consensus inhibits a scientifically based estimate as to the reduction of greenhouse gas emissions associated with LNG fuel use. The economic costs incurred by the public as a result of LNG production, as well as the environmental risks associated with shale gas extraction outweigh the projected revenues outlined in the British Columbia Natural Gas Strategy. Therefore, while natural gas is greener than conventional fuels (i.e. diesel), the framing of LNG in the B.C. Natural Gas Strategy misrepresents policy on gas production and ignores concern for the associated environmental costs of LNG production.

If the B.C. government were to proceed with LNG development, I recommend to the Green Party of British Columbia that they:

1. **Strengthen climate policies to lessen carbon pollution**
    a. The application of B.C.’s carbon tax to all lifecycle emissions from gas development and the LNG sector will greatly reduce greenhouse gas emissions.
    b. British Columbia’s current Carbon Tax, established in 2008, only applies to around 78% of the carbon pollution that is produced along the entire production process.

   c. The formation of carbon dioxide that is vented during shale gas extraction, methane that is vented and leaks along the LNG supply chain are currently exempt.

2. **Implement policy incentives to reduce greenhouse gas (GHG) emissions**
   a. Implement more programs such as British Columbia's *Environmental Incentive Program* that rewards LNG facilities for having a carbon intensity between 0.16 and 0.23 tonnes of CO2 per ton of LNG.
   b. Offer express lane access for transportation. For example, priority access for ships coming into ports and trucks passing through refueling stations.
3. **Adopt more efficient and sustainable practices at LNG plants**
   a. The use of electric drive power compressors for liquefaction instead of direct drive plants, powered by gas, can have positive impacts on the environment.
   b. An electric drive can reduce carbon pollution from around 0.30 tonnes of CO_2 per tonne of LNG to 0.25 tonnes of CO_2 per tonne of LNG.
   c. Mandating the use of electric drives, while initially more expensive than direct drives, are more reliable, more efficient, and safer and would reduce GHG emissions in the long run.
4. **Increasing the monitoring and regulation enforcement upstream at shale operations**
   a. Implement a province-wide monitoring system that includes the use of helicopters, leak patrols, gas detectors and in line surveys that detect pipeline corrosion and leaks.
   b. Reducing flaring at wellheads and capturing carbon dioxide instead of venting it along the LNG supply chain will reduce the release of methane.
5. **Conduct more research of LNG life cycle emissions**
   a. I recommend conducting more research to fill in the gaps in quantifying the lifecycle emissions of LNG as well as the upstream emissions and fugitive emissions from shale gas production.

Introduction

According to Natural Resources Canada (2008), the transportation sector is the largest source of greenhouse gas (GHG) emissions in Canada. Transportation accounts for more than one third of Canada's total GHG emissions (British Columbia Ministry of Environment 2012). With global CO2 emissions projected to rise by close to 30% between 2005 and 2030 there is increasing pressure to meet growing energy needs while reducing greenhouse gas emissions produced by primary energy sources (Stephenson et al. 2012).

Liquefied natural gas (LNG) appears to be a promising alternative to traditional fuels used for transportation that produce higher levels of greenhouse gas emissions (Goehner et al. 2014). Natural gas is seen as the most preferred fuel because of its inherent environmental benignity, greater efficiency and cost effectiveness. Given that British Columbia is located on top of a surplus of natural gas reserves, the B.C. Liberal government sees the development of LNG as an incredible revenue opportunity that could potentially eliminate government debt, amass funds for government services, and increase the province's sustainability. The rhetoric surrounding natural gas as a "bridging fuel" in the transition to the low-carbon energy systems is unsubstantiated in the academic literature however, as there remains a lack of consensus. While LNG does not require environmental cleanup there are rising questions as to the environmental implications of the production process, mainly in regards to its production of greenhouse gases. There are mounting concerns that natural gas extraction procedures, mainly hydraulic fracking, have detrimental impacts on surface and groundwater. On behalf of my community partner, the Provincial Green Party of British Columbia, I will utilize life cycle assessment case studies, government and industry reports to assess the environmental impacts of British Columbia's potential conversion of its transportation fleet to natural gas. I will detail a comparative life cycle analysis of diesel-fueled vehicles and liquefied natural gas (LNG) fueled vehicles to identify the differential production of greenhouse gases. I will also look at the economic and environmental costs associated with B.C. shale gas and LNG development. Lastly, I will provide five policy recommendations to the Green Party of British Columbia.

Research Question

What would be the reduction in greenhouse gases and other pollutants if British Columbia's transportation fleet were converted to run on natural gas? In addition, what are the economic and environmental costs associated with liquefied natural gas (LNG) development?

B.C. Strategy for Liquefied Natural Gas Industry Development

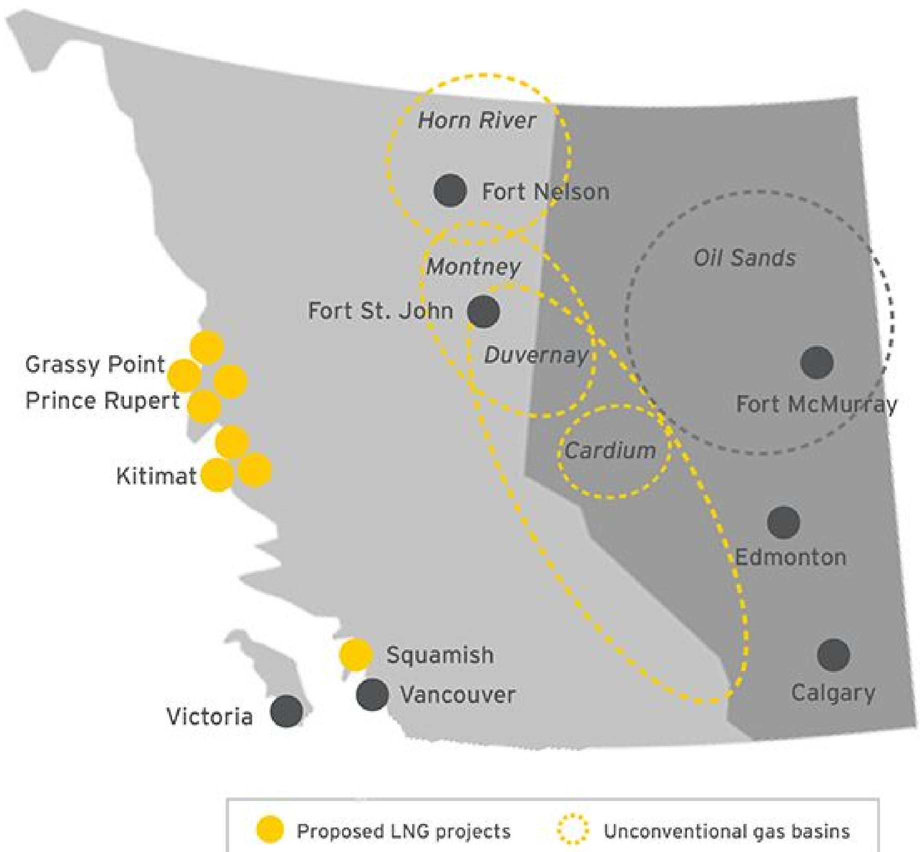

Figure 1: Map of British Columbia shale gas reserves and proposed LNG plants
Source: (Ernst & Young Global Limited)

In recent years there has been a surge in natural gas extraction. B.C. production has grown from 32 billion cubic metres in 2007 to 41 billion in 2011 (Lee 2012). This rise in shale gas extraction is a result of the recent economic and technical feasibility of hydraulic fracking (Campbell & Horne 2011a). Most drilling activity in B.C. is concentrated in two main deposits: the Montney Basin near Dawson Creek, and the Horn River Basin near Fort Nelson (Campbell

& Horne 2011b). The largest of B.C.'s shale gas deposits, the Horn River Basin, covers 1.31 million hectares in the northeastern region of the province and holds the potential of providing B.C. with 65 years worth of marketable gas (Stephenson et al. 2012).

Given this profit opportunity, in 2012 the British Columbia Ministry of Energy and Mines produced a strategy for the development of their liquefied natural gas (LNG) industry. The development of the LNG industry for export is seen as an excellent investment that will generate thousands of jobs and millions of dollars in new investment, creating revenues for health care and education services (Ministry of Energy and Mines 2012). Further, the LNG industry is said to generate economic spillover effects in the service sector, in growing B.C.'s clean-energy sector and increasing economic prosperity. Specifically, because liquefied natural gas is a clear, non-toxic, odorless, non-corrosive there is no environmental cleanup needed for LNG spills on water or land (Kumar et al. 2011a). With the implementation of the B.C. Jobs Plan, British Columbia has committed itself to having its first LNG plant up in Kitimat running by 2015, with a total of three LNG facilities operating by 2020. The following sections will analyze these claims.

Method

This report is informed through two methods of analysis. First, a comparative analysis of liquefied natural gas (LNG) and diesel was conducted to quantify the differential production of greenhouse gases. Next, a literature review to evaluate the claims of the British Columbia Natural Gas Strategy and assess the associated environmental impacts of natural gas production in British Columbia. I consulted a variety of industry and government reports as well as journal articles.

Three semi-structured interviews were conducted with experts in the field of natural gas to strengthen my recommendations. Consulting industry reports and using a snowball method I identified these experts. I identified twelve informants to contact. Of these I received responses from five, but four in the end were interviewed. I conducted interviews with Matt Horne from the Pembina Institute, Douglas Stout from FortisBC and Werner Antweiler, a professor of Economics at the University of British Columbia. Each interview varied in its length from twenty minutes to a little over an hour. The appendix contains the interview questions.

To compare the differential production of greenhouse gases between liquefied natural gas (LNG) and diesel fuel I consulted a variety of life cycle assessment/ analysis case studies.

Life cycle assessment (LCA) is a ‘cradle-to-grave’ approach of assessing systems or technologies at various points in their production process. A full LCA of fuel emissions takes into account the direct emissions from vehicles and those that are associated with the fuel’s extraction, production, transportation, processing, conversion and distribution (Beer et al. 2002). Figure 2, below, illustrates the framework of the LCA. It is classified into two categories: the fuel cycle and the vehicle cycle (Rose et al. 2013). Emissions are produced and energy is required throughout the entire life cycle. Each of the case studies discussed in the next section differs slightly in its LCA framework, however all compare the LCA’s of natural gas fuel to the LCA’s of conventional fuels.

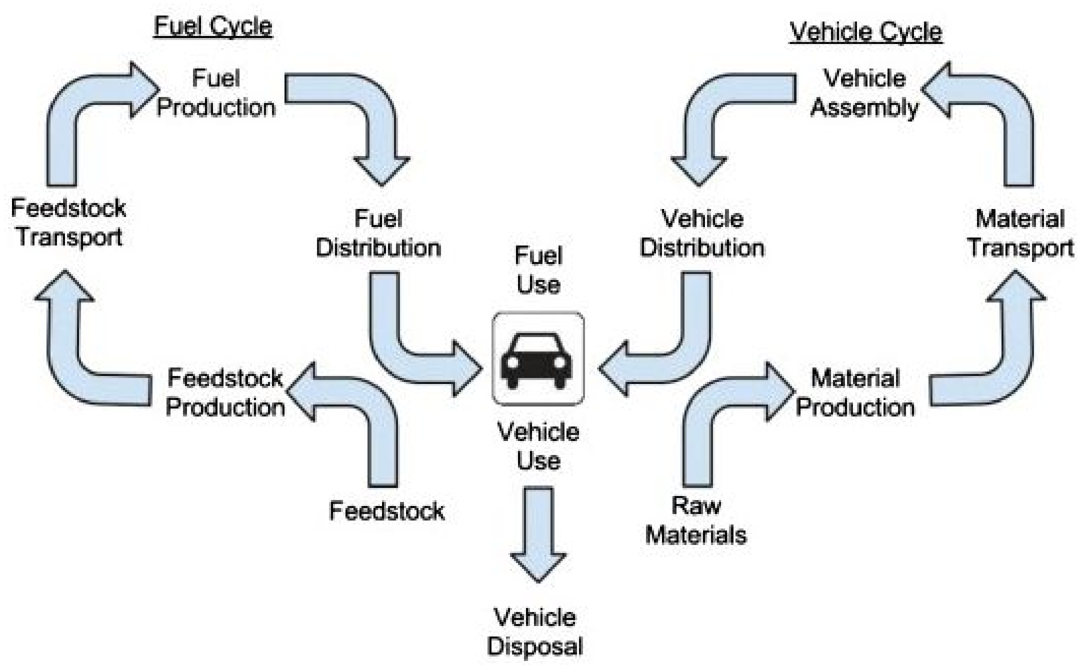

Figure 2: A typical life cycle of a vehicle technology
Source: (Rose et al. 2013)

Analysis

Natural Gas versus Diesel: GHG Production

Carbon pollution is released along the entire LNG supply chain from the point of shale gas extraction to the point where the gas is burned for electricity or transportation (Horne 2014). Various life cycle assessments conducted in Canada have shown that vehicles fueled by natural gas produce less greenhouse gas emissions than those fueled by diesel. Graham et al. (2008) analyzed a multitude of heavy-duty vehicles and engines, within a Canadian context, operating on different fuels such as diesel, biodiesel, compressed natural gas (CNG), hythane (20% hydrogen, 80% CNG), and liquefied natural gas (LNG). The study findings show that the use of natural gas (either compressed, liquefied, or blended with hydrogen) can reduce GHG emissions at the tailpipe by 10-20% on a “CO2-equivalent” basis compared to diesel fuel. Rose et al. (2013) conducted a comparative life cycle assessment (LCA) of diesel and compressed natural gas (CNG) powered “heavy duty refuse collection vehicles” (RCVs). Using data obtained from the City of Surrey in British Columbia, they found that while there is no net energy gain when a diesel powered vehicle is replaced by a CNG powered vehicle, there are significant reductions (approximately 24% CO_2 –equivalent) in GHG and criteria air contaminant (CAC) emissions (Rose et al. 2013). Rose et. al therefore make the argument that the use of CNG powered vehicles can lead to improved urban air quality. Arteconi et al. (2010) also argue that we can expect a future reduction in the emissions coming from the life cycle of LNG as fuel because of the continuing technological advances along LNG’s procurement chain.

Various life cycle case studies have found that LNG may produce higher greenhouse gas emissions than diesel. Beer et al.(2002) conducted a study of the pre-combustion and combustion emissions of greenhouse gases from Australian “heavy vehicles” using alternative fuels. Comparing low sulfur diesel (LSD), ultra-low sulfur diesel (ULS) to compressed natural gas (CNG) and liquefied natural gas (LNG) they found that the extra energy required to liquefy and cool LNG cause it to have the highest embodied greenhouse gas emissions of all the fuels analyzed in the study. In a similar study on CNG and diesel buses in Australia, Ally and Pryor (2007) found that CNG produced 25% higher overall GHG emissions than for diesel. Stephenson et al. (2012) findings mimic these results as they found that the liquefaction, tanker transport, and regasification associated with LNG development leads to the life-cycle of natural gas producing higher GHG emissions. These results invalidate the claims made in the B.C. Strategy trying to justify LNG as a "clean" transition fuel or climate solution.

One reason for the lack of academic consensus is the uncertainty surrounding important input variables. Particularly, the level of fugitive emissions being produced, or the unintentional emissions along the LNG supply chain. A study by Howarth et al. (2011) found that methane leaks account for between 3.6% and 7.9% of life cycle production, including leakages during the well extraction stage, leaks from equipment, as well as other fugitive emissions associated with processing, transport by pipeline and distribution. According to a National Oceanic and Atmospheric Administration (NOAA) study, it is estimated that the 3.2% of gas leaks wipes out any GHG advantage relative to coal (Romm 2012). Lee (2012) argues that because of leakages of methane in the extraction and processing phase of unconventional gas development this lends to the possibility that on a lifecycle basis, natural gas from unconventional sources is equivalent or worse than coal per unit of energy. Estimated fugitive emissions in 2020 from B.C.'s natural gas sector range from 42 to 86 Mt (million tonnes) per year (Lee 2012). Graham et al. (2008) also point out in their study that the measured emission rates of methane and nitrous oxide from heavy-duty vehicles are substantially higher than what is published in the literature on the subject.

Ultimately, the development of B.C.'s LNG industry will substantially increase British Columbia's greenhouse gas emissions. Lee (2012) explains that for the three LNG plants proposed by the Natural Gas Strategy by 2020, a total production of 23.8 Mt of gas per year will be produced. This means B.C. will emit 22.4 Mt CO2 per year (Lee 2012). Lee argues that the expansion of natural gas production and LNG production contradicts the climate action objectives and targets (Lee 2012). According to Lee (2012) the expansion of LNG production according to the proposed plan by B.C.'s Natural Gas Strategy would lead to global GHG emissions originating in B.C. to rise to 167 Mt CO2e in 2020. This is almost four times greater than the legislated B.C. greenhouse gas target it has set for itself for that year (Lee 2012). This increase in global emissions would be equivalent to putting 24 to 64 million cars on the roads (Lee 2012). The Figure 3 below illustrates the level of GHG emissions if B.C. were to make 5 LNG plants operational.

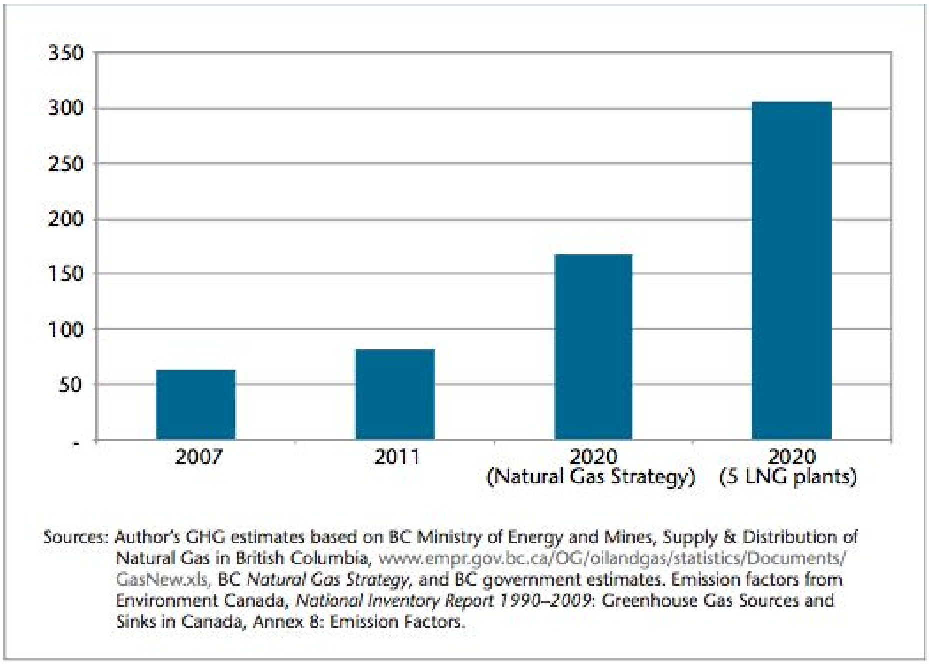

Figure 3: Global GHG Emissions from BC's Natural Gas Production (Mt CO2e)

Source: (Lee 2012)

Economic Costs

The B.C. Natural Gas strategy promises that the expansion of LNG development will lead to increases in provincial revenue. The development of shale gas has led to increases in North American natural gas production levels. This has resulted in the drop in North American prices from over $7 per gigajoule (GJ) in 2005 to under $2 per GJ in 2012 (B.C. Ministry of Finance 2012; Lee 2012). This has undercut the profitability of natural gas companies and the royalties accumulating to the B.C. government as it has dropped from $1.9 billion in 2005/06 to $339 million in 2011/12 and $157 million for 2012/13 (B.C. Budget and Fiscal Plan 2012; Lee 2012). Unfortunately, even though the amount of natural gas being extracted is increasing, the public is receiving much less revenue because B.C.'s royalty system is partially a function of market price (Lee 2012).

The B.C. government is not adequately addressing the costs that will be imposed on third parties. These costs are also called externality costs. Specifically those due to climate change, for example the impact of drought on food production or flooding on infrastructure (Lee 2012). A recent study by Ackerman and Stanton (2012) on the externality costs of GHG emissions, also called the “social cost of carbon,” estimates that costs from LNG production will range from $150 to $500 per tonne of CO_2 and as high as $893 per tonne. Using the estimates from the B.C. Natural Gas Strategy, Lee (2012) produced a low estimate of 167 Mt of CO_2 into the atmosphere per year, with external costs of $150 per tonne. This implies $25 billion per year in externalized costs (Lee 2012). The higher estimate projects 305 Mt for the five major LNG plants based on the current plan by the B.C. government, with $500 per tonne and external costs of $152 billion per year (Lee 2012). As a frame of reference, British Columbia’s Gross Domestic Product (GDP) is around $200 billion per year (Lee 2012). It is clear that the corporate profits to be gained from natural gas development should be resituated to include the massive climate change associated costs on British Columbians, the planet and future generations.

Environmental Costs

Shale Gas

There are mounting concerns as to the associated health and environmental impacts of shale gas extraction. Scotland, Wales, Spain, New York, Texas, California and Ohio have all placed bans on hydraulic fracturing due to the uncertainty surrounding the associated environmental risks (“List of Bans Worldwide” 2015; Campbell & Horne 2011b). Moratoriums have been placed on hydraulic fracking in Pennsylvania and Delaware. The Environmental Protection Agency (EPA) is conducting research to examine the relationship between hydraulic fracking and its effects on drinking water resources ("EPA's Study of Hydraulic Fracturing…”2015). This report has not yet been released however, it will detail and identify factors that could lead to the human exposure as well as risk.

Chemical additives used in hydraulic fracturing increase the risk of water contamination. The additives help the fluid to carry proppant more effectively and reduce friction to stimulate the flow of gas to extract the gas more easily (Campbell & Horne 2011b). The number, type, and concentration of chemical additives used in the shale extraction process can vary depending on engineering requirements specific to the formation, the wellborn and the location (B.C. Oil and Gas Commission 2010). A typical fracture operation will use between 3 and 12 additive chemicals, depending on the rock formation being fractured ("Chemical Use"; B.C. Oil and Gas Commission 2010). Companies can use different sources of water, including flowback water, which is a combination of injected water and water within the gas formations that is returned to the surface during gas extraction. Flowback fluid can contain high concentrations of salts as well as naturally occurring radioactive material (NORM) and other contaminants such as mercury, arsenic and benzene that are found in shale gas (Campbell & Horne 2011b). There is a high potential for flowback water from hydraulic fracking to be contaminated by the fracturing fluid chemicals as well as the other substances found in the geological formation. It was found that at the Marcellus Shale, located in eastern North America, operation's wastewater could contain up to one-third dissolved solids. In other words this is around 10 times more saline than seawater (Campbell & Horne 2011b). Currently in British Columbia there is no requirement for companies to disclose the chemicals and additives they use in their hydraulic fracturing operations to the regulator or the public (Campbell & Horne 2011b). In addition, the Oil and Gas Commission's fact sheet *Fracturing (Fracking) and Disposal of Fluids* does not include a description of any potential dangers of chemical additives that are used in fracturing fluids ("Chemical Use"; B.C. Oil and Gas Commission 2010). The lack of transparency in the use of chemical additives increases the worry and risk associated with hydraulic practices.

Inadequate cement or steel casing surrounding gas wells increases the risk of surrounding subsurface contamination. If not properly sealed, fracturing fluid and rock formation water can leak into the target formation, contaminating water aquifers as well as rock layers (Campbell & Horne 2011b; Zoback et al. 2010). There have been cases documented of natural gas migrating into surface formations as a result of leakages in cement casing wells in Alberta as well as coalbed methane wells in the United States. The Pennsylvania Department of Environmental Protection declared in 2009 that inadequate casing of shale gas wells was the cause of gas migration into the water supplies of fourteen homes (Hanger 2010). The company responsible, Cabot Oil and Gas Corporation was required to cap the wells, suspend drilling in the area for at least a year, install water systems in the affected homes and pay $240,000 (Hanger 2010; Campbell & Horne 2011b) In addition, in 2007 a well was drilled 4,000 feet into a sand formation in Bainbridge, Ohio that had not been properly sealed with cement causing gas to leak from the casing up into an underground drinking water aquifer. Methane built up to such a point that it lead to an explosion in an Ohio resident's basement (Zoback et al. 2010). Within the Canadian context, in 2010 the Quebec government inspectors discovered high methane concentrations of more than 20% in the air surrounding four shale gas operations (Bureau d'audiences publiques sur l'environnement 2011; Campbell & Horne 2011b). Osborn et al. (2011) completed a study examining the relationship between methane contamination of drinking water and shale gas extraction procedures. They found that weaknesses in well-casing is the most common cause for groundwater contamination (Osborn et al. 2011). These examples strengthen the conclusion that shale gas operations can lead to the increasing concentrations of methane and groundwater as well as surface contamination.

The potential for contaminated water to migrate from shale rock formations to surface structures is lessened by the increasing depth of shale gas operations in British Columbia. The Montney and Horn River basins are located at depths of 1,700 to 4,000 metres and 2,500 to 3,000 metres (National Energy Board 2009; Campbell & Horne 2011a). This is contrasted with an average depth of fresh water wells in B.C. being between 18 and 150 metres (B.C. Oil and Gas Commission 2010). The GroundWater Protection Council, an association in the United States for groundwater regulatory agencies has found that the depth and the rock barriers make it so that contamination of groundwater is highly unlikely (Campbell & Horne 2011b). Myers (2009), a hydro-geologist, produced a study illustrating that fracture fluids found at increasing depths could potentially reach fresh water sources in “decades to centuries.” Currently the B.C. Oil and Gas Activities Act allows hydraulic fracking in wells as shallow as 600 metres, with the potential for even more shallow operations in the future (Campbell & Horne 2011b). These findings weaken the sustainability narrative surrounding LNG production and incite a halt of shale gas operations until further research can be conducted.

Recommendations

Based on my research and findings I propose the following policy recommendations to the Provincial Green Party of British Columbia. These recommendations incorporate information gathered from interviews with numerous stakeholders that have interests in how proposed amendments to the laws and legislation surrounding the LNG industry in British Columbia are developed.

1. **Strengthen climate policies to lessen carbon pollution**
    a. I recommend the application of B.C.’s carbon tax to all lifecycle emissions from gas development and the LNG sector, especially upstream emissions.

b. The current carbon tax legislation in British Columbia applies to all fossil fuels burned when extracting shale gas as well as producing LNG. Figure 5 below illustrates where along the production line the carbon tax applies and where specific sources are exempt.

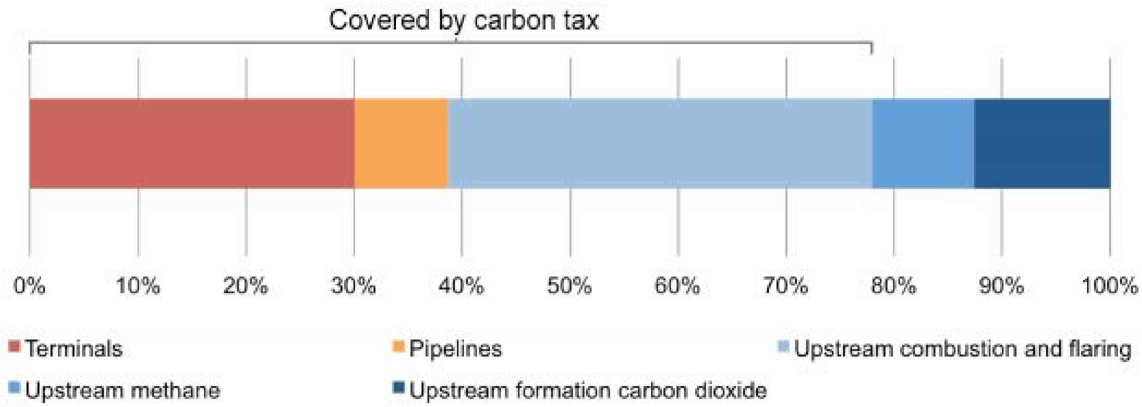

Figure 4: LNG carbon pollution produced throughout entire lifecycle with carbon tax coverage
Source: (Horne 2014)

c. The Carbon Tax only applies to around 78% of the carbon pollution that is produced from along the entire production process (Horne 2014). The formation of carbon dioxide that is vented during shale gas extraction, methane that is vented and leaks along the LNG supply chain are exempt.

2. Implement policy incentives to reduce Greenhouse gas (GHG) emissions

a. The LNG *Environmental Incentive Program* is one example of this. It rewards facilities that have a carbon intensity between of 0.16 and 0.23 (Antweiler 2014). The incentive is to be paid for with the revenue collected from the LNG industry. Ultimately, the program will pay for adopting cleaner LNG production methods and increase the province's sustainability.

b. After interviewing and insights received from Douglas Stout, Vice President, Market Development and External Relations at FortisBC, I propose that there be increased priority for transportation fleet. For example, express lanes at ports for ships fueled by LNG as well as priority lanes for trucks passing through refueling stations to be considered in policy implementations.

3. Adopt more efficient and sustainable practices at LNG plants

a. The use of different technologies at LNG plants can have different impacts on the environment, specifically in terms of the carbon dioxide emissions per tonne of LNG. I propose renewable energy be used to power compressors at LNG facilities instead of natural gas.
b. While electric drives are more expensive than direct drives powered by gas, they are more reliable, efficient and safer.
c. An electric drive can reduce carbon pollution from around 0.30 tonnes of CO_2 per tonne of LNG to 0.25 tonnes of CO_2 per tonne of LNG (Antweiler 2014).
d. Mandating the use of electric drives puts the province on the right path to building more sustainable infrastructure.

4. Increasing the monitoring and regulation enforcement upstream at shale operations

a. I propose that B.C. implement a widespread monitoring system of LNG upstream and pipeline activities that include:
    i. The use of helicopters, leak patrols, gas detectors, in line surveys to detect corrosion and leaks along pipelines.
    ii. Reducing flaring at wellheads.
    iii. Carbon dioxide to be captured instead of vented.

5. Conduct more research of LNG life cycle emissions

a. I recommend conducting more primary research to fill in the gaps in quantifying the lifecycle emissions of LNG as well as the consequences of additional upstream emissions and fugitive emissions from shale gas production.

Conclusion

In British Columbia there is a clear disconnect between the “transition fuel” discourse promoted by the government as well as shale gas industry and the actual conditions of the British Columbia natural gas process. There is an increased amount of uncertainty in the actual greenhouse emissions produced in the LNG production process as well as the environmental impacts associated with shale gas extraction. I argue that only until there is more scientific evidence to support the claims of the British Columbia Natural Gas Strategy and the policy recommendations I have proposed are put into place should the government move forward with their plans of LNG development.

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Appendix: Expert Interview Questions

Interview Timeline:

Matt Horne Interviewed March 6, 2015
Werner Antweiler Interviewed March 6, 2015
Douglas Stout Interviewed March 17, 2015

1.What obstacles do you predict in British Columbia's conversion of its transportation fleet to LNG?

> -For example: In Australia LNG is not readily used due to the cost of the infrastructure, and the ready availability of natural gas in many areas by pipeline. Do you foresee similar obstacles here in BC?

2. What do you think makes LNG a more sustainable alternative rather than compressed natural gas (CNG)? Or is this the case in your opinion?
3. Are there any factors specific to British Columbia that you feel need to be taken into consideration in order to sustainably expand the LNG industry?(for example the colder temperature)
4. What steps do you think need to be taken in order for this conversion to take place?
    - For example, manufacturing vehicles that can switch back and forth from diesel to LNG until enough gas refilling stations are constructed.
5. It is likely that the potential carbon pollution from the LNG facilities and processing would make B.C.'s climate targets unachievable, and would make it exceedingly difficult for Canada to meet its national 2020 target. Do you have any suggestions for potential strategies to expand LNG production while still meeting 2020 targets? What actions should the government take? (electric drives, carbon offsets etc.)
6. How does the drop in the oil prices affect the viability or profitability of natural gas extraction procedures?
7. How does the emergence of the United States as an oil and gas supplier affect the future profitability and success of B.C.'s LNG industry?
8. What relationship with First Nations people in those areas? Is there a procedure you follow when constructing a new LNG facility or pipeline?
9. Is there anything else you would like to say? Any further comments?