BC Reality Check Series

Path to Prosperity?

A Closer Look at British Columbia's Natural Gas Royalties and Proposed LNG Income Tax

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SUMMARY

This brief takes a closer look at potential public revenues from planned liquefied natural gas (LNG) development in BC, with a focus on BC's natural gas royalty regime and the proposed LNG income tax. The BC government has made bold claims of a $100 billion Prosperity Fund arising from LNG over 30 years, but this figure is premised on large export volumes and high prices in Asia that may not be realistic:

- Japan and South Korea account for more than half of global LNG imports, yet both may reduce LNG imports as they reinstate nuclear power after shutdowns in recent years.
- China aims to shift away from coal use, but it has many domestic and international options for new energy supplies in addition to BC-based LNG.
- On the supply side, substantial LNG capacity in other countries is coming on stream in the next five years.
- A "buyer's club" of Asian importers comprising 70 per cent of the market is seeking to negotiate lower prices.

BC's proposed LNG income tax is particularly sensitive to lower Asian prices for LNG:

- Expensive new infrastructure requirements greatly eat into the gap between Asian and North American gas prices. Because of this, small drops in the Asian price have a large impact on profit margins, and therefore, on government revenues.

- Because companies can fully deduct all capital costs before paying the full 7 per cent LNG income tax, any cost overruns will be paid for by reduced taxes.

Based on a more realistic expectation of LNG export volumes and prices, this analysis estimates the fully-implemented LNG income tax is likely to raise between $0.2 and $0.6 billion per year. For comparison, consider that the total annual BC Budget is $45 billion per year.

BC's current royalty regime has not achieved a good return for the development of this finite public resource, and places more emphasis on encouraging high levels of production:

- Natural gas production in BC has increased by one-third over the past five years, even in the face of extremely low North American prices.
- Yet royalty revenues have dropped significantly during this time due to low market prices and large credits for deep drilling and gas infrastructure.

At more plausible Asian prices and production levels, combined royalties and LNG income taxes would likely be much smaller than the best-of-all-possible-worlds projection from the BC government. LNG development also poses costs to the public sector—for regulatory oversight, infrastructure and additional public services, for example—as well as environmental costs that should be considered alongside revenues. The BC government should go back to the drawing board and develop a tax/royalty regime that puts more emphasis on achieving public benefits before signing away rights to this non-renewable public resource.

INTRODUCTION: ARBITRAGE AND THE ASIAN PRICE

This brief looks at the supply and demand factors driving Asian and North American prices, and whether those large price margins will continue in the future. If not, BC may produce and export significant amounts of the province's long-term gas supply for little public benefit.

The recent interest in liquefied natural gas (LNG) in British Columbia and elsewhere can be attributed to the "Asian price"—the substantial markup in recent years between North American natural gas prices and those in Asia. Historically, natural gas has been traded in regional markets and moved over land through pipelines. Over the past couple of decades, shipments of gas in liquid form by tanker have surged, with LNG accounting for almost one-third of gas trade in 2012.[1] This growing LNG capacity enables the development of global markets for natural gas, with arbitrage (buying low, selling high) to take advantage of the price gap between previously regional markets.

The BC government has argued that the province has a "generational opportunity"—through massive expansion of natural gas production for export as LNG to Asia—to boost economic development in northern BC, create thousands of new jobs and garner new public revenues representing a share of those arbitrage profits. While this may seem like easy money, global LNG markets may not play out as rosily as the BC government envisions. In particular, achieving BC's promise of a $100 billion Prosperity Fund (to eliminate provincial government debt, lower taxes and/or support public services) is in conflict with the need for BC to be competitive as a private investment location (i.e. keeping total costs, including taxes and royalties, low) in what is really just another global commodity market.[2]

1 LNG exports account for about 10 per cent of world gas consumption, as most natural gas is not traded. *BP Statistical Review of World Energy 2013* <http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy-2013.html>.

2 Ernst and Young, *Analysis of the Competitiveness of BC's Proposed Fiscal Framework for LNG Projects*, prepared for the Ministry of Natural Gas Development, February 18, 2014 <http://www.empr.gov.bc.ca/OG/Documents/Summary%20Competitiveness%20Analysis%20Report%20-%2018%20February%202014.pdf>.

Measuring natural gas and LNG

Natural gas data are reported in a variety of ways, in both metric and imperial units. In this paper, we have tried to minimize the use of different units.

Natural gas production is often reported by volume (cubic metres or feet) in BC. Shipments of LNG, however, are typically measured in mass—millions of tonnes (Mt)—rather than volume, as liquefaction reduces the volume to 1/600th of gas. One billion cubic metres (bcm) is equal to 35.3 billion cubic feet (bcf) and to 0.74 million tonnes (Mt).

Gas prices are often reported in dollars per thousand cubic feet (mcf), millions of British Thermal Units (mmBTU) or gigajoules (GJ). One mcf (the unit we use) is equal to one mmBTU, and one GJ is equal to 0.94 mcf.

This brief takes a closer look at BC's proposed LNG income tax and tests some of the government's claims about future LNG revenues flowing into the province. It looks at the supply and demand factors driving Asian and North American prices, and whether those large price margins will continue in the future. If not, BC may produce and export significant amounts of the province's long-term gas supply for little public benefit. Revenues for BC over a range of price and output scenarios are then estimated as a reality check on LNG claims.

GLOBAL LNG SUPPLY AND DEMAND TRENDS

Figure 1 illustrates the arbitrage opportunity associated with natural gas. A major price gap emerged after 2008, stemming from a drop in North American prices (including the two principal markets for BC's existing natural gas production, the US and Alberta), along with a spike in price in Japan (prices in South Korea and China are similar to Japan).[3] The key questions for BC's LNG plans are why this gap emerged and whether long-term contracts incorporating that price margin can be negotiated.

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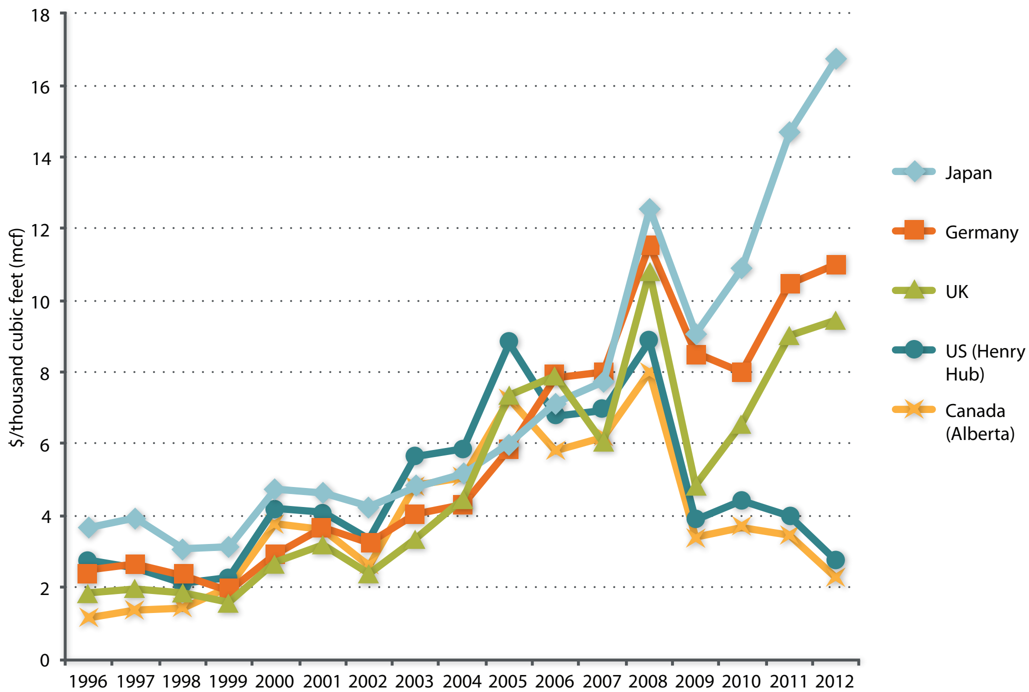
A decade ago, it appeared that North America was running out of natural gas supplies. Instead, the natural gas industry has been transformed by advances in "unconventional" extraction techniques. Hydraulic fracturing (or "fracking") is a process that involves injecting water, sand and chemicals deep underground to crack rock formations that contain natural gas. Combined with new horizontal drilling techniques, this has launched what industry analysts call the "shale gas revolution," with vast new supplies of natural gas accessible at a relatively low cost.

Tapping unconventional gas reserves has driven up North American production levels, even as overall demand fell due to the recession. In the US, production in 2012 was up 33 per cent over 2005 levels; similar growth has been seen in BC (although overall Canadian production was down 16 per cent during this period).[4] More supply and a drop in demand led to falling gas prices after 2008, although there have been price hikes in late 2013 to early 2014 due to a large increase in energy demand during the deep freeze ("polar vortex") across much of North America. The

3 *BP Statistical Review.* Prices include cost, insurance and freight.

4 *BP Statistical Review*. Note: US production was in decline from 2001 to 2005 and has been increasing since, so figure quoted is somewhat sensitive to choice of base year.

Figure 1: Comparison of natural gas prices



Note: 2012 is the last year for which we have comparable data.
Source: *BP Statistical Review* 2013.

Japan's ultimate direction for nuclear power will impact global demand and gas prices. If Japan's gas consumption fell back to 2010 levels, this drop would be more than all of China's LNG imports in 2012.

United States Energy Information Administration projects the slow and steady growth of natural gas production until 2040, accompanied by modest annual gas price increases.[5]

On the Asian demand side, much of the story to date revolves around Japan, a long-time importer of LNG and other fossil fuels. In the wake of the March 2011 Fukushima nuclear disaster, Japanese officials took offline the country's nuclear power capacity (accounting for about 30 per cent of electricity generation), substituting LNG, oil and coal. Japan's natural gas consumption surged 23 per cent between 2010 (the year before Fukushima) and 2012,[6] with the result that prices have gone up dramatically. In 2012, Japan was the single largest importer of LNG by a large margin, with more than one-third (36 per cent) of global imports.

Higher energy costs associated with fossil fuel imports have adversely affected Japan's economy, and are part of the reason why Japan's 50-year trend of trade surpluses turned into trade deficits starting in 2011.[7] These economic factors and a change in government in late 2013 led Japan to table a February 2014 Basic Energy Plan, which, pending regulatory approvals, would restart much of its nuclear capacity. Japan's ultimate direction for nuclear power (as well as a push for increased conservation and renewables) will impact global demand and gas prices. For example,

5 *Energy Information Administration, Annual Energy Outlook 2014*, Reference Case Summary and Detailed Tables, Table 13 <http://www.eia.gov/forecasts/aeo/tables_ref.cfm>.

6 *BP Statistical Review.*

7 "Seeing Red: After Half a Century of Trade Surpluses, Japan is Now in Deficit," *The Economist*, January 14, 2012 <http://www.economist.com/node/21542794>.

if Japan's gas consumption fell back to 2010 levels, this drop would be more than all of China's LNG imports in 2012.[8]

In South Korea, which accounted for 15 per cent of LNG imports in 2012, nuclear woes have also been a factor in driving up demand for LNG. Corruption scandals in 2012 and 2013 related to faked safety documents led to six reactors being taken offline, with LNG partly bridging the energy gap.[9] Their return to service and newly approved plans for two new reactors will also undercut LNG demand going forward.[10]

A future of strong Asian LNG demand growth thus rests on developments in China and India (6 per cent each of LNG imports in 2012). Already, China is the biggest consumer of natural gas (among other things) in the world, though relatively little is in the form of imported LNG. Notably, both China and India have been paying lower prices for LNG due to previously negotiated contractual arrangements (though they pay higher prices for additional supply on spot markets).[11]

Moves by the Chinese central government to address the pressing problem of air pollution in Chinese cities could herald a major shift away from burning coal. This will likely lead to increased LNG imports, but also to a range of other measures: energy efficiency, nuclear, renewables, intermediate options like gas produced from coal itself,[12] pipelined gas imports from Russia and tapping of China's own shale gas reserves. Many analysts, however, are projecting the growth of Chinese coal consumption for at least another decade. And because coal is a cheaper source of energy, high prices for LNG serve as a disincentive to its adoption.[13]

With substantial new LNG supplies coming soon, Asian buyers are pressing hard for lower prices. Five countries accounting for 70 per cent of LNG imports are forming a common front on price through a "buyer's club."

While the future of LNG demand is uncertain and rests primarily on decisions being made by Asian governments, huge new supplies of LNG are coming on line. According to the International Gas Union, 238 million tonnes (Mt) of LNG were traded in 2012, with total potential at 281 Mt. About 110 Mt of liquefaction capacity is currently under construction, with another 158 Mt in the design and engineering stage—a doubling of global LNG capacity within the next few years.[14] Moreover, an additional 357 Mt of capacity has been proposed in North America and around the world.

With substantial new LNG supplies coming soon, Asian buyers are pressing hard for lower prices. Indeed, five countries (India, Japan, Korea, China and Taiwan) accounting for 70 per cent of LNG

8 Calculations based on *BP Statistical Review*.

9 N. Cunningham, "Japan, South Korea Face Higher LNG Costs to Meet Power Shortfall," *OilPrice*, November 4, 2013 <http://oilprice.com/Energy/Natural-Gas/Japan-South-Korea-Face-Higher-LNG-Costs-to-Meet-Power-Shortfall.html>.

10 "S. Korea approves $7bn nuclear reactor plan," *RT News*, January 29, 2014 <http://rt.com/news/south-korea-nuclear-reactor-328>.

11 W. ten Kate, L. Varró and A. Corbeau, *Developing a Natural Gas Trading Hub in Asia: Obstacles and Opportunities*, International Energy Agency, 2013 <http://www.iea.org/publications/freepublications/publication/name,36107,en.html>. And *Medium-Term Gas Market Report 2012*, International Energy Agency <http://www.iea.org/publications/freepublications/publication/name,39142,en.html>.

12 That is, China could continue to rely on coal, but expand coal gasification facilities outside major cities so that the cities reduce air pollution through cleaner-burning gas. "Forecast: China Coal-to-Gas Projects," Platts McGraw Hill Financial, January 31, 2014 <http://www.platts.com/news-feature/2014/naturalgas/china-coal-to-gas-projects/index>.

13 Low gas prices have created an incentive for electricity generation in the US to switch from coal to natural gas. Interestingly, massive exports of natural gas to Asia could drive up North American prices, which would put coal back in the money (although new regulations from the US Environmental Protection Agency have sought to restrict carbon pollution from coal plants).

14 International Gas Union, *World LNG Report—2013 Edition* <http://www.igu.org/gas-knowhow/publications/igu-publications/IGU_world_LNG_report_2013.pdf>.

imports are forming a common front on price through a "buyer's club."[15] Some Asian corporations have also taken equity stakes in LNG proposals in BC. Their expectation is for pricing arrangements linked in whole or in part to (lower) North American gas prices (plus markups for liquefaction and shipping). This would remove much of the arbitrage profits upon which the LNG industry in BC is predicated.[16] In the case of the only reported BC export contract to date (for the small Douglas Channel LNG project in Kitimat), the sale is linked to lower North American prices.[17]

Finally, price differentials between North America and Asia are greatly reduced by the cost of getting natural gas to market. Liquefaction capacity is particularly expensive, with the cost for a single plant at about $1.2 billion per million tonnes of annual LNG production capacity.[18] This puts various BC proposals in the $6–$20 billion range, depending on size. In addition to "greenfield" construction of LNG plants in BC, the industry would also require new upstream investment in production infrastructure, pipelines and shipping terminals. In several other parts of the world, new capacity is "brownfield"—based on adding capacity to existing liquefaction sites or conversion from import facilities to export ones. In BC's favour, in terms of costs, are cooler temperatures (which reduce the operating cost of liquefaction) and shorter shipping distances to Asia.

The large gap between North American and Asian prices is greatly reduced by the high costs of liquefaction and shipping. This means small reductions in the negotiated Asian price can have a large impact on corporate profits.

A study of the LNG industry by Macquarie estimated all-in costs for building liquefaction capacity at $5.30 per mcf in BC, with cost of gas supply between $3.30–$4.06 per mcf for BC's Montney region, and $4.74 for the Horn River region.[19] Together, landed LNG in Asia needs a price in the range of $8.60–$10 to break even. Two other estimates, from Deutsche Bank and Ernst and Young, put the break-even price at $10.[20] That is, the large gap between North American and Asian prices is greatly reduced by the high costs of liquefaction and shipping. This means small reductions in the negotiated Asian price can have a large impact on corporate profits. For example, with a fall in price of just $2, from $16 to $14 in Asia, total profits drop by one-third. We return to this point when we consider the proposed LNG income tax below.

The supply and demand dynamics described above suggest a need for caution and lowered expectations that BC's proposed LNG industry will garner the top-end price and high volumes envisioned by the BC government. How much LNG BC could possibly export—and at what price—is directly linked to future BC LNG revenues and the possibility of a financial windfall for the province.

15 N. Verma and J. Winterbottom, "Asian LNG buyers come together in bid to secure lower prices," *The Financial Post* (sourced from Reuters), December 3, 2013 <http://business.financialpost.com/2013/12/03/asia-lng-buyers-come-together-in-bid-to-secure-lower-prices/?__lsa=f8e4-964c>.

16 In economics, the tendency for arbitrage profits to be whittled away is known as "the law of one price." This would suggest lower Asian prices and higher North American prices, with the difference being made up by liquefaction and shipping costs.

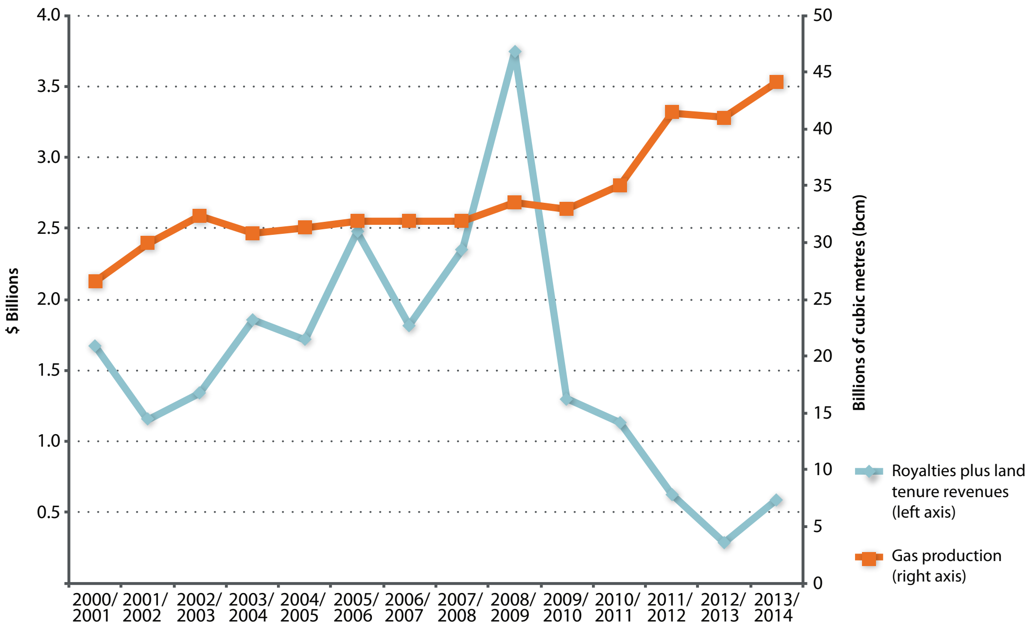
17 Note that this is just one step toward a final investment decision, which has not yet been announced by the proponents. N. Vanderklippe, "BC LNG inks Asian sales contract," *The Globe and Mail*, January 20, 2013 <http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/bc-lng-inks-asian-sales-contract/article7563307/#dashboard/follows>.

18 B. Songhurst, "LNG Plant Cost Escalation," The Oxford Institute for Energy Studies, February 2014 <https://www.oxfordenergy.org/2014/02/lng-plant-cost-escalation/>.

19 Macquarie Private Wealth, Canadian *LNG: The Race to the Coast*, September 2012 <http://www.investorvillage.com/uploads/8056/files/Cdn_LNG_100912.pdf>.

20 Ernst and Young, *Global LNG: Will New Demand and New Supply Mean New Pricing?*, 2013 <http://www.ey.com/Publication/vwLUAssets/Global_LNG_New_pricing_ahead/$FILE/Global_LNG_New_pricing_ahead_DW0240.pdf>. Deutsche Bank, *Global LNG Industry Update*, September 17, 2012 <http://view.microbell.com/upfile1/201209/2012920144456915.pdf>.

Figure 2: BC gas production vs natural gas revenues



Sources: BC royalty data from BC Budget, various years; Crown lease data from BC Ministry of Natural Gas Development; BC gas production data from Ministry of Natural Gas Development, Supply and Distribution of Natural Gas in BC, various years (data in calendar years, eg. 2013 production data corresponds to fiscal year 2013/14).

BC'S NATURAL GAS ROYALTY REGIME

BC's existing revenue framework for natural gas is intended to capture a share of the "economic rent" from exploitation of a public resource. Companies pay royalties on their sales of marketable natural gas less a range of credits. They also pay for extraction rights that are auctioned off by the BC government—which, in theory, is supposed to capture some of the additional economic rent (excess profits) from development. This regime was developed with an emphasis on encouraging economic activity, and is designed to share risks between private and public sectors.[21]

Figure 2 shows that while BC gas production has increased substantially in recent years (top orange line, right axis), the royalties received for this public resource have been falling (blue line, left axis). In 2007/08 and 2008/09, when gas prices were much higher, BC saw peak royalty revenue of $1.1 billion and $1.3 billion, respectively. Since then, BC gas production increased about one-third in 2011 and 2012 relative to 2007 and 2008, but royalty revenues fell to $0.3 billion in 2011/12 and $0.2 billion in 2012/13. Lower royalty revenues are in part due to low market prices,[22] while royalty and infrastructure credits also erode revenues. These credits averaged $0.3 billion over the past seven years, most of which are credits for deep drilling activities.

21 For an overview of BC's tenure arrangements, see J. Dagg, K. Campbell and T. Simieritsch, *Tenable Tenure: The Need for Oil and Gas Tenure Reform in British Columbia*, Pembina Institute, March 2011 <http://pubs.pembina.org/reports/tenable-tenure.pdf>.

22 A +/-$0.50 change in price affects royalties by +/-$140 million, according to BC Budget 2014.

The February 2013 BC Speech from the Throne sets out a vision for a British Columbia Prosperity Fund:

For our province, two new major revenue streams can be created. The first comes from revenues generated from the growth in employment and business activity... The second stream of revenue comes from ***new royalty revenues directly for the province—British Columbia's share of resource profits. This could exceed $100 billion over the next 30 years****. ...To protect this second stream of revenue for generations to come, your government is establishing the British Columbia Prosperity Fund. Future royalties will be designated to this fund, ensuring British Columbia families can benefit from the prosperity created by natural gas in our province. ... A main focus of the BC Prosperity Fund will be to reduce provincial debt. ...The BC Prosperity Fund can also target measures to improve social services and make life more affordable for families. Whether it is eliminating the provincial sales tax, or making long-term investments in areas like education or vital infrastructure that strengthen communities—these are the kinds of opportunities the BC Prosperity Fund can provide.* [emphasis added]

The same is true for auctions of Crown leases, with record revenues of $2.4 billion in 2008/09, but a more modest $0.3 billion and $0.1 billion in 2011/12 and 2012/13.[23] Auction revenue for Crown leases depends on the amount of land base put up for auction, as well as the selling price per hectare. In the years of peak revenues, both the amount of land and price per hectare were at all-time highs; both have since come down substantially.

While BC gas production has increased substantially in recent years, the royalties received for this public resource have been falling.

It is not clear whether BC will amend its royalty regime in the face of LNG development. The proposed LNG income tax (next section) is aimed at capturing a portion of arbitrage profits from Asian exports. To estimate royalties, we assume a delivered cost of $4/mcf to the LNG facility. Based on the past five years of production and price data, net royalties have averaged approximately 7 per cent of the value of marketable gas in BC, although this number has been higher in the past when gas prices were higher.

On this basis, if BC realizes its ambition of an industry supplying 82 Mt of LNG per year—equivalent to one-third of all LNG exports worldwide in 2012—royalty revenue to the BC government would be $1.1 billion per year. A caveat is that a (potentially significant) portion of the gas going to LNG facilities could come from Alberta. In this case, BC would not collect royalties as currently structured. In addition, we do not have sufficient information to estimate Crown leases; this revenue source could be substantial, although a small number of LNG plants with integrated upstream operations could undermine a competitive auction, something viewed as necessary to generate fair returns to BC.

23 Crown lease data from BC Ministry of Natural Gas Development, Sale Results and Statistics, Fiscal Year Statistics <http://www.empr.gov.bc.ca/Titles/OGTitles/SaleResults/Pages/default.aspx>. By accounting practice, Crown auction revenues are spread over nine years when reported in the BC Budget; however, that document does not break out natural gas leases from petroleum and mining lease auction revenue.

PROPOSED LNG INCOME TAX

The 2014 BC Budget proposed an LNG income tax, in addition to corporate income tax, although details and legislation are still to come:

> *The LNG Income Tax will be a two-tier income tax with a Tier 1 tax rate of 1.5 per cent and a Tier 2 tax rate of up to 7 per cent (final rate to be determined and confirmed in legislation)… A description of how the two tiers will operate is as follows:*
>
> - *The Tier 1 tax rate of 1.5 per cent applies to an operator's net proceeds (revenue less expenses) after commercial production begins. The amount of the Tier 1 tax rate that has been paid can be deducted from the Tier 2 tax.*
> - *Net income for purposes of the Tier 2 tax will be net proceeds less up to 100 per cent of the capital investment account. As such, the Tier 2 tax rate is not effective until the capital investment account is depleted.*
>
> *The costs associated with constructing an LNG facility will form the basis of the capital investment account.*[24]

In practice, the essential part of the LNG income tax is the Tier 2 rate of 7 per cent. The Tier 1 rate applies earlier in the lifetime of an LNG facility, but it is deductible from later Tier 2 taxes paid. The Tier 1 rate thus represents a pre-payment of Tier 2 taxes in order to get revenues flowing earlier to government. Companies may also be able to delay the transition to the Tier 2 tax through accounting practices. Transfer pricing is a common practice among the subsidiaries of companies, whereby they charge prices different from market prices for their internal operations in order to reduce tax liabilities in certain jurisdictions. There has also been pushback from the industry about the 7 per cent rate.[25]

Cost overruns for new LNG facilities have been problematic, most notably in Australia, where they have ranged from 15–50 per cent above original estimates. Similar outcomes in BC would further reduce lifetime (30-year) LNG income tax revenues available to the BC government.

The negotiated price margin on Asian sales matters a great deal for determining when the Tier 2 rate would apply, due to the allowance for capital costs. Figure 3 illustrates this point by considering three price scenarios of $16, $14 and $12 per mcf in Asia, with a landed break-even cost of $10 (i.e. profit margins of $6, $4 and $2).[26] Lower prices in Asia require longer capital cost payback times—in excess of 12 years in the case of a $12 price in Asia.[27]

Moreover, we model what would happen if capital costs increased by one-third;[28] the repayment period before the Tier 2 LNG tax would apply increases to almost 17 years at the $12 price. This is important because the proposed LNG tax design means any construction cost overruns by the proponents will essentially be paid for by the reduced LNG income tax. Cost overruns for new LNG facilities have been problematic, most notably in Australia, where they have ranged from 15–50

24 BC Budget 2014, quote from text box "Long-Term Opportunities for British Columbia Liquefied Natural Gas—Update," pp. 51–53.

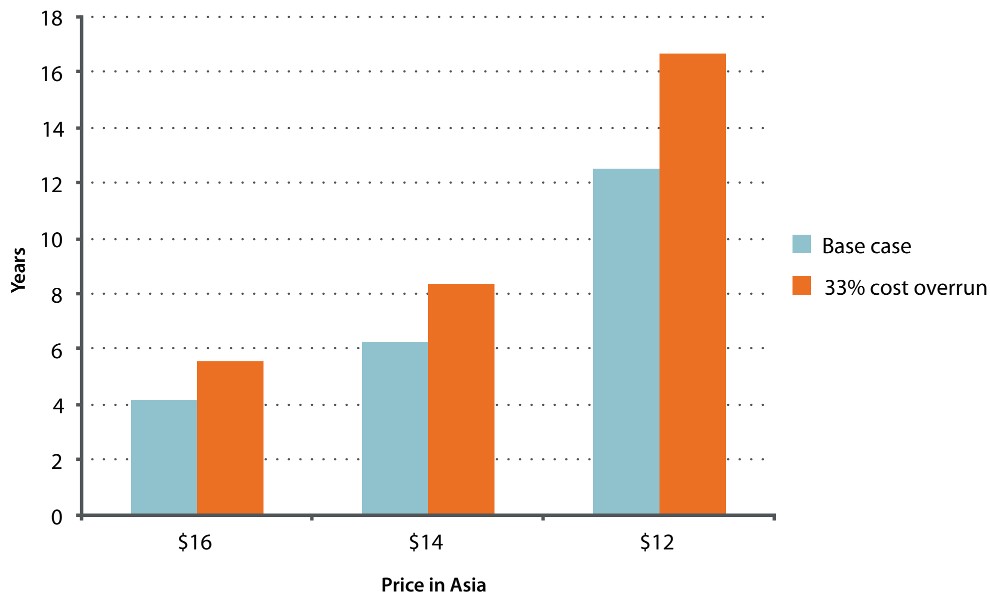
25 G. Hoekstra, "Energy Companies Balking at Level of LNG Taxation in BC," *The Vancouver Sun*, February 23, 2014 <http://www.vancouversun.com/business/Energy+companies+balking+level+taxation/9541861/story.html#ixzz2wGQxdSHM>.

26 Alternatively, this exercise could be conceived of as Asian prices of $15, $13 and $11 relative to landed costs of $9 per mcf. What matters for the analysis is the price margin (profit) received.

27 Budget 2014 provides a sample calculation showing that the Tier 2 tax would be paid as of year 5 of operations. This is somewhat deceptive as it implicitly assumes a (high) $6/mcf price margin. At lower price margins, capital cost payback would be more like what we see in Figure 3.

28 Songhurst (note 18) estimates capital costs at $1.2 billion per million tonnes of LNG produced per year. So the construction of a 12 Mt facility would cost an estimated $14.4 billion. For our estimated cost overrun of one-third, capital costs would thus be $1.6 billion per million tonnes of annual LNG production.

Figure 3: Number of years to recover capital costs of LNG facility through LNG income tax



Note: Capital costs in the base case are $1.2 billion per million tonnes of export capacity per year, and $1.6 billion for the cost overrun case.

Source: Author's calculations based on Songhurst (2014), note 18.

The negotiated price margin on Asian sales matters a great deal for determining when the Tier 2 rate would apply, due to the allowance for capital costs. The proposed LNG tax design means any construction cost overruns by the proponents will essentially be paid for by the reduced LNG income tax.

per cent above original estimates.[29] Similar outcomes in BC would further reduce lifetime (30-year) LNG income tax revenues available to the BC government.

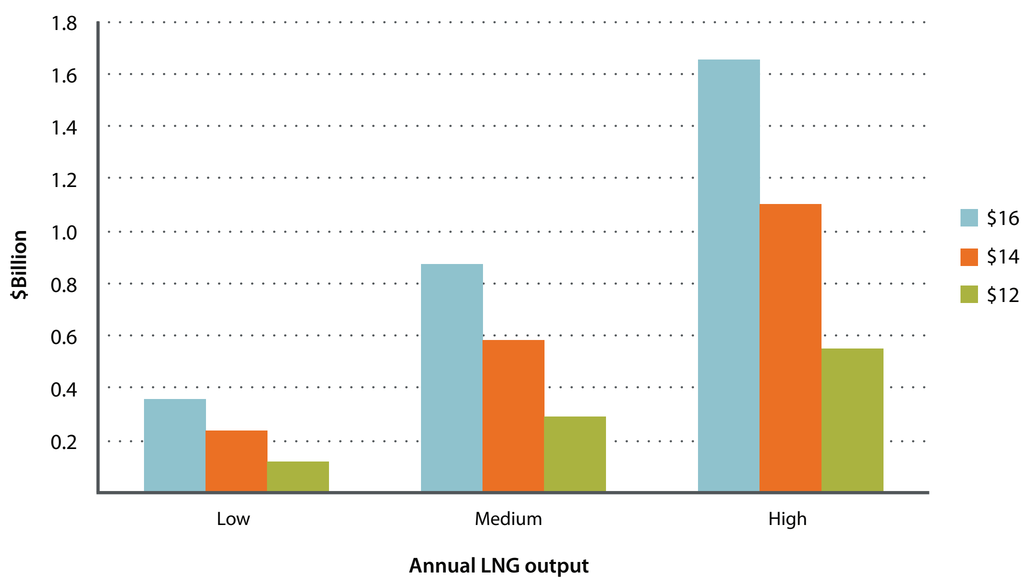
Lower prices (and profit margins) reduce annual BC government revenues. In Figure 4, we "stress test" estimated LNG revenues for each of the three Asian price points above, and at three potential levels of output:

- A low output (most realistic) scenario composed of Douglas Channel LNG (Golar/Haisla), LNG Canada (Shell) and Kitimat LNG (Chevron/Apache) moving forward, equivalent to 17.7 Mt per year of LNG exports.
- A medium (plausible) scenario adding Pacific Northwest LNG (Petronas) and Prince Rupert LNG (BG), which would comprise 43.3 Mt per year of LNG exported.
- A high (unlikely) scenario based on BC government aspirations of 82 Mt of LNG per year exported.[30]

29 C. Forster, "Australian LNG: Busting the Budget," *Insight Magazine*, Platts McGraw Hill Financial, October 2013 <https://www.platts.com/IM.Platts.Content%5Caboutplatts%5Cmediacenter%5Cpdf%5Cinsight-oct13-australia.pdf>.

30 The low and medium scenarios include only the first phase of some planned investments, although many proponents (e.g. Shell) have potential for a doubling of production in a second phase of investment. Even if these were fully built out, at least one more major proposal would have to go ahead for the high scenario to come to fruition.

Figure 4: Estimated annual LNG income tax revenues for mature industry at different prices in Asia and quantity supplied



Note: LNG income tax is the full value of the Tier 2 tax, after recovery of capital costs and Tier 1 tax, and assumes no transfer pricing.

Source: Author's calculations based on BC Budget.

In a best case scenario, where LNG ventures garner a price of $16/mcf (and margin of $6) at a high level of output, LNG income tax could be as high as $1.7 billion per year. However, in the low and medium output scenarios, revenues fall to between $0.4 billion and $0.9 billion, even at the top price of $16.

As a benchmark, BC's total natural gas production in 2011 and 2012 was about 30 Mt per year.[31] This model represents the LNG income tax for a mature industry: the 7 per cent Tier 2 tax, fully phased in, after recovery of capital costs and past Tier 1 tax paid. In making these estimates, we assume that all plants come on line at the same time, with capital costs written off—that is, it is a model of a mature LNG industry producing stable output from year to year. In practice, the output and timing will be much messier. In addition, we assume no transfer pricing activities on the part of the companies. This is a significant assumption that likely leads to an overestimate of total revenues.

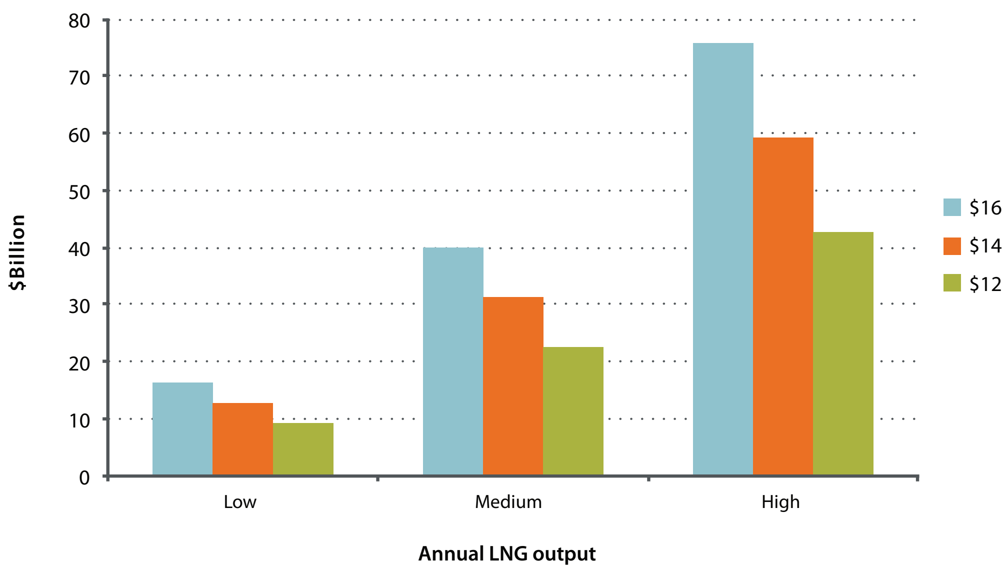
Figure 4 shows that in a best case scenario (blue bars), where LNG ventures garner a price of $16/mcf (and margin of $6) at a high level of output, LNG income tax could be as high as $1.7 billion per year. However, in the low and medium output scenarios, revenues fall to between $0.4 billion and $0.9 billion, even at the top price of $16. Annual BC government revenues in 2014/15 are estimated to be $45 billion, so the relative impact of the LNG income tax is modest, even if we assume top prices in Asia.

Revenues fall with lower negotiated prices in Asia, and drop as low as $0.1 billion for a low level of output at a price of $12/mcf. As noted above, liquefaction and shipping costs erode the price differential between North America and Asia, so even moderately lower prices translate into much lower profit margins, and greatly diminish BC's potential to secure new LNG revenues by taxing those profits. A prudent forecast for BC, as one might forecast in a budget, would be to assume a price of $14, with a range between the low and medium output scenarios. This leads to an estimate of between $0.2 and $0.6 billion per year in LNG income tax.

31 Note this is mass (Mt), not volume (bcm) as in Figure 2.

Combined LNG income tax and royalty revenues over a 30-year time horizon, for our prudent range, works out to a total between $13 billion and $31 billion over 30 years. For comparison, BC's taxpayer-supported debt is $43 billion and total provincial debt is $65 billion, according to the 2014 BC Budget.

Figure 5: Total LNG income tax and royalties over 30 years



Note: Figures are in current dollars. LNG income tax assumes capital cost of $1.2 billion per million tonnes of LNG exported. Auctions of Crown leases are not included in royalty estimates.

Source: Author's calculations based on BC Budget.

Figure 5 sums combined LNG income tax and royalty revenues over a 30-year time horizon. Whereas royalties would accrue for the full 30 years, a lower price margin would not only affect corporate profits and the resulting LNG tax revenues, but it would also reduce total revenues over the 30-year period by delaying the application of the Tier 2 tax. For our prudent range, this works out to a total between $13 billion and $31 billion over 30 years. For comparison, BC's taxpayer-supported debt is $43 billion and total provincial debt is $65 billion, according to the 2014 BC Budget.

OTHER REVENUES

The $100 billion Prosperity Fund announced in the 2013 Speech from the Throne emphasizes BC royalties and the proposed LNG income tax. However, increased revenues can also be expected from corporate income, carbon and property taxes paid by industry, and incremental personal income and sales taxes paid by individuals. Personal income and sales taxes are more difficult to estimate and go beyond the scope of this brief. The key factors are how many people are employed by LNG facilities and upstream, their wage rates and how much of this is truly incremental activity (i.e. whether they would otherwise have been employed in BC).

Corporate income tax (CIT) revenues are analogous to the LNG income tax: lower price margins combined with repayment of capital costs have an impact of lowering tax revenues. The current statutory CIT rate is 11 per cent, but historically, companies have paid a lower rate due to credits and deductions. Over the past nine years, the *effective* CIT rate is substantially less than applying the statutory rate to corporate profits (about 24 per cent lower on average). As with the LNG income tax, a very large industry receiving very high prices in Asia would deliver substantial CIT revenues to BC, although transfer pricing remains a concern. An industry at a more plausible (low to medium) size and medium ($14) prices lead to a prudent range of $0.3–$0.7 billion per year in additional CIT revenue for a mature industry, and a total of $7–$17 billion over a 30-year period.

Carbon tax revenue is analogous to royalty revenue. Because we are talking about a fossil fuel, natural gas, there is clearly a lot of revenue potential from a carbon tax. However, the point of a carbon tax is to reduce carbon pollution, and BC's revenue-neutral carbon tax has primarily been used to finance corporate tax cuts,[32] so we should be careful in viewing it from a revenue-raising perspective. Powering upstream operations and LNG facilities with renewable energy would greatly reduce carbon tax paid.

Modelling from the Pembina Institute[33] estimates the carbon dioxide emissions per Mt of LNG. Because coverage of the carbon tax is more limited for upstream operations, they estimate the carbon tax would apply to 63 per cent of emissions. This yields a range of carbon tax revenue from $0.3–$0.7 billion per year, although this is only net revenue if it is not recycled back into other tax cuts. Carbon tax revenues are not sensitive to the Asian price, but are sensitive to quantity produced and to policy decisions on application of the tax to LNG facilities and upstream operations, including regulations that may require use of renewable energy supplies.

Global supply and demand conditions for LNG suggest a lowering of expectations about both the price BC is likely to receive in Asia and the quantities that will be exported. Against this revenue, good policy must also consider public costs associated with LNG development.

Carbon taxes represent a cost to industry that increases the landed price of BC LNG in Asia. It would reduce profit margins for LNG companies and thus LNG income tax revenues. This is not reflected in our model above. The same is true for local property taxes, a potentially lucrative and appropriate source of revenue for municipal governments, particularly in light of additional impacts on communities and infrastructure of industrial development on such a large scale. However, the BC government has indicated that it will cap property taxes for LNG facilities.[34]

THE PATH FORWARD: ENSURING PUBLIC BENEFITS

Over the course of 30 years, one range of numbers to keep in mind is the total corporate profits that can be expected from LNG development. If BC received top ($16) prices and sold 82 Mt of LNG, oil and gas companies would make over $600 billion in total profits. In this best-of-all-possible-worlds scenario (and assuming no transfer pricing or cost overruns), BC could meet its revenue target of $100 billion over 30 years (including corporate income tax). However, global supply and demand conditions for LNG suggest a lowering of expectations about both the price BC is likely to receive in Asia and the quantities that will be exported. For low to medium production levels at a $14 price in Asia, these revenues would range from $20 to $48 billion over 30 years of operations; and at a $12 price, $12 to $29 billion over 30 years (including corporate income tax).

Against this revenue, good policy must also consider public costs associated with LNG development to arrive at a net public benefit amount. Further research is required to quantify those costs, but they could be substantial, including: regulatory oversight; public infrastructure costs; provision

32 M. Lee, *Fair and Effective Carbon Pricing: Lessons from BC* (Vancouver: CCPA, 2011) <https://www.policyalternatives.ca/publications/reports/fair-and-effective-carbon-pricing>.

33 M. Horne, "Piecing Together BC's LNG Fiscal Framework," Pembina Institute blog, February 20, 2014 <http://www.pembina.org/blog/780>. Estimates from Pembina LNG model at <http://www.pembina.org/docs/bc/pembinainstitute-ghg-estimates-for-bc-lng-webversionjan2014.xlsx>.

34 J. Hunter, "BC Prepared to Cap Local Taxes on LNG Development," *The Globe and Mail*, February 24, 2014 <http://theglobeandmail.com/news/british-columbia/bc-prepared-to-cap-local-taxes-on-lng-development/article17075089/>.

of additional public services (health care, education, policing etc.) in areas where development is taking place; and, environmental costs, such as impacts on water supplies, treatment of wastewater and impacts of pipeline infrastructure.

Other costs are not borne by the province but by third parties in other countries and into the future, in the form of extreme weather and changes in climate patterns. Greenhouse gas emissions (GHG) from LNG development are significant, and at standard estimates of damage costs, these alone could represent billions of dollars per year in damages. There is also an important reputational cost for BC, as LNG development essentially means abandoning BC's GHG emissions reduction law.[35] Moreover, LNG development risks leaving behind stranded assets, both private and public, should a new international treaty to constrain carbon emissions be ratified.

In this brief, we have considered the potential for increased revenues. While there are many areas for further research, one point is clear: BC should not proceed full-speed ahead to sign away non-renewable and public gas resources at any price. Rather than rely on overly optimistic projections of LNG investment, BC should go back to the drawing board to develop a regime for LNG development that locks in public benefits before handing over the keys to global corporations. This might include:

BC should not proceed full-speed ahead to sign away non-renewable and public gas resources at any price.

- Developing changes in the royalty regime and LNG taxation to ensure a minimum public return per unit of gas extracted. The objective should be to ensure public costs of LNG development are covered, and are not undermined by low prices, cost overruns or transfer pricing.
- Regulating and pricing water use in upstream fracking operations.
- Ensuring that subsidies are not provided to the LNG industry through low BC Hydro industrial rates.
- Applying BC's carbon tax to all GHG emissions from LNG facilities and upstream operations. Even better, linking LNG exports to actual reductions of coal use in Asia.
- Requiring that a BC Crown corporation hold a minimum equity stake in any approved LNG operation. This model has been used successfully in Norway to ensure that a share of profits flows back to the country.[36]

BC has been blessed with an inheritance in the form of natural gas reserves. Development must exist within a carbon budget that is much smaller than those reserves. The key public policy question is how to maximize the benefits of production that does go forward. Public benefits from LNG development are not guaranteed, and recent management of BC's natural gas suggests low levels of public benefits for record levels of production. Companies are looking long and hard at whether their investments will deliver appropriate returns. The BC government needs to do the same, and to develop a multi-decade plan that really delivers economic benefits for British Columbians while demonstrating a renewed commitment to environmental and climate leadership.

35 M. Lee, *BC's Legislated Greenhouse Gas Targets vs. Natural Gas Development: The Good, the Bad and the Ugly*, CCPA, October 2012 <https://www.policyalternatives.ca/natural-gas-ghgs>.

36 L. Persily, *Norway's Different Approach to Oil and Gas Development*, Office of the Federal Coordinator, Alaska Natural Gas Transportation Projects, September 2011.

CLIMATE JUSTICE PROJECT

This report is part of the Climate Justice Project, 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 special thanks to the Vancouver Foundation for its financial support of this series.

For more reports from the Climate Justice Project, see **www.climatejustice.ca**

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