

SUMMARY

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BC's Carbon Conundrum

WHY LNG EXPORTS DOOM EMISSIONS-REDUCTION TARGETS
AND COMPROMISE CANADA'S LONG-TERM ENERGY SECURITY

ACCORDING TO THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), global greenhouse gas emissions must be reduced to net zero between 2040 and 2055 in order to limit global warming to 1.5 Celsius above pre-industrial levels.¹ The British Columbia government has pledged to reduce emissions by 80 per cent from 2007 levels by 2050 through its CleanBC Plan and the federal government has pledged that Canada will be net zero by 2050.

¹ Intergovernmental Panel on Climate Change, "Summary for Policymakers," in *Global Warming of 1.5°C*, ed. Valerie Masson-Delmotte et al. (Geneva, Switzerland: World Meteorological Organization, 2018), <https://www.ipcc.ch/sr15/chapter/spm/>.

This report assesses the emissions implications of the Canada Energy Regulator's (CER) 2019 oil and gas production forecast for BC, and the implications of ramping up gas production for liquified natural gas (LNG) export. Emissions data from the most recent Environment and Climate Change Canada (ECCC) submission to the United Nations Framework Convention on Climate Change (UNFCCC) are the basis for the emissions projections.

There are serious questions and considerations surrounding the current enthusiasm for developing a Canadian LNG export industry which are examined in this report. These include the impact of increasing gas production on emissions; the land disturbance and water consumption from the drilling required; the questionable benefits to taxpayers given reduced revenue from gas production royalties and the cost of incentives offered by government; and the fact that full-cycle analysis indicates that LNG exports to Asia will increase global emissions over the critical next few decades. A further consideration is higher long-term gas prices for Canadians if the lowest-cost portion of remaining resources is exported as LNG.

EMISSIONS VERSUS CLEANBC AND GLOBAL TARGETS

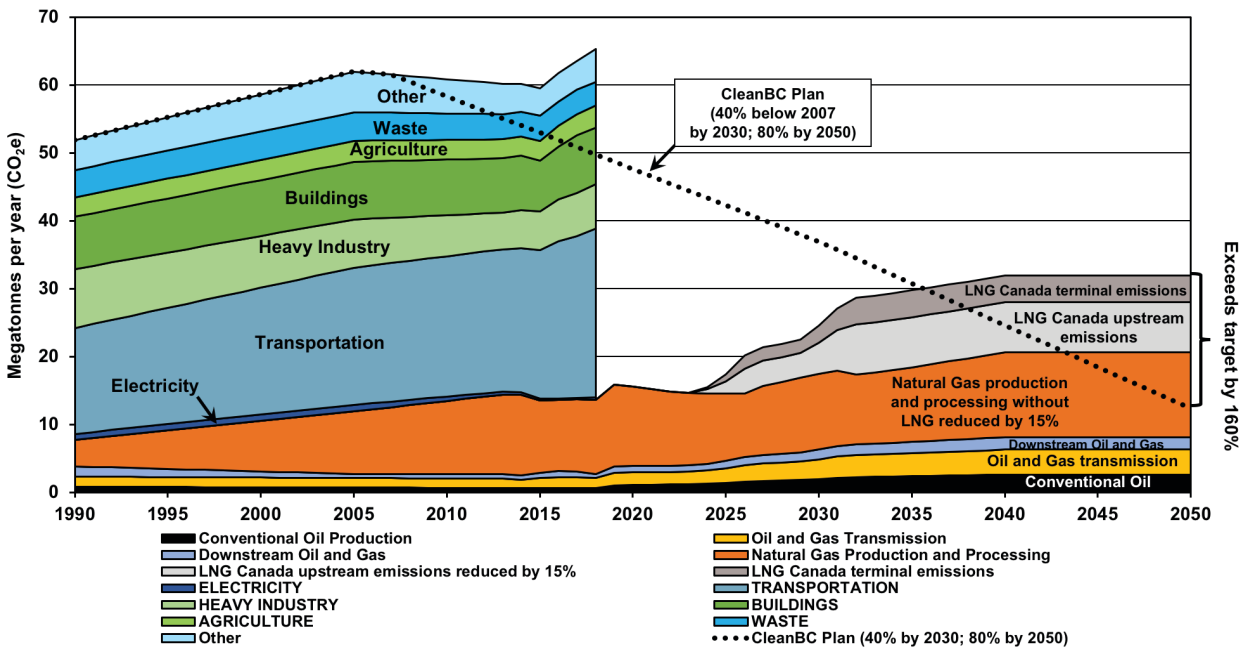
The industry and government narrative that BC LNG will contribute to a reduction in global emissions by displacing coal-fired electricity in China and elsewhere in Asia lacks credibility if a proper accounting of emissions is undertaken.

The emissions created in producing and liquefying LNG have very real implications for BC meeting its climate targets. Even without any LNG exports, and assuming a 15 per cent reduction in upstream emissions through reduced fugitive methane and electrification, emissions from oil and gas production alone would exceed BC's 2050 target by 54 per cent, given the CER forecast—and that is if all other sectors of BC's economy reached zero emissions by 2042. Increasing production for LNG Canada would add a total of 13 megatonnes per year, including the company's estimate of 3.96 megatonnes from the terminal itself. Including LNG Canada, emissions from oil and gas production would exceed BC's 2050 target by 160 per cent, even if emissions from the rest of the economy were reduced to zero by 2035 (Figure ES1). If Kitimat LNG and Woodfibre LNG were also built (both of which have 40-year export licenses approved by CER), total LNG emissions would amount to 22.6 megatonnes and BC's 2050 target would be exceeded by 227 per cent, even if all other sectors of BC's economy reached zero emissions by 2031.

The industry and government narrative that BC LNG will contribute to a reduction in global emissions by displacing coal-fired electricity in China and elsewhere in Asia² lacks credibility if a proper accounting of emissions is undertaken. While it is true that at the point of combustion natural gas emits only 54 per cent of the emissions of coal per unit of heat provided, full-cycle greenhouse gas emissions from LNG include emissions from production and processing of the gas, pipeline transportation, liquefaction, shipping, and regasification. As China replaces older, low-efficiency coal power plants, it has a choice of investing in several technologies, including renewable energy, LNG-fueled combined-cycle natural gas (CCNG), and best-technology coal.

2 Peter Kenter, "LNG Canada's Export Terminal Will Enable Coal-Reliant Customer Nations to Reduce GHG Emissions," *Vancouver Sun*, December 13, 2018, <https://vancouversun.com/sponsored/news-sponsored/lng-canadas-export-terminal-will-enable-coal-reliant-customer-nations-to-reduce-ghg-emissions>.

FIGURE ES1: PROJECTED OIL AND GAS EMISSIONS IN BC BASED ON CER'S FORECASTED PRODUCTION, WITH ADDITIONAL EMISSIONS TO SUPPLY GAS TO THE LNG CANADA TERMINAL AND EMISSIONS FROM THE TERMINAL ITSELF.



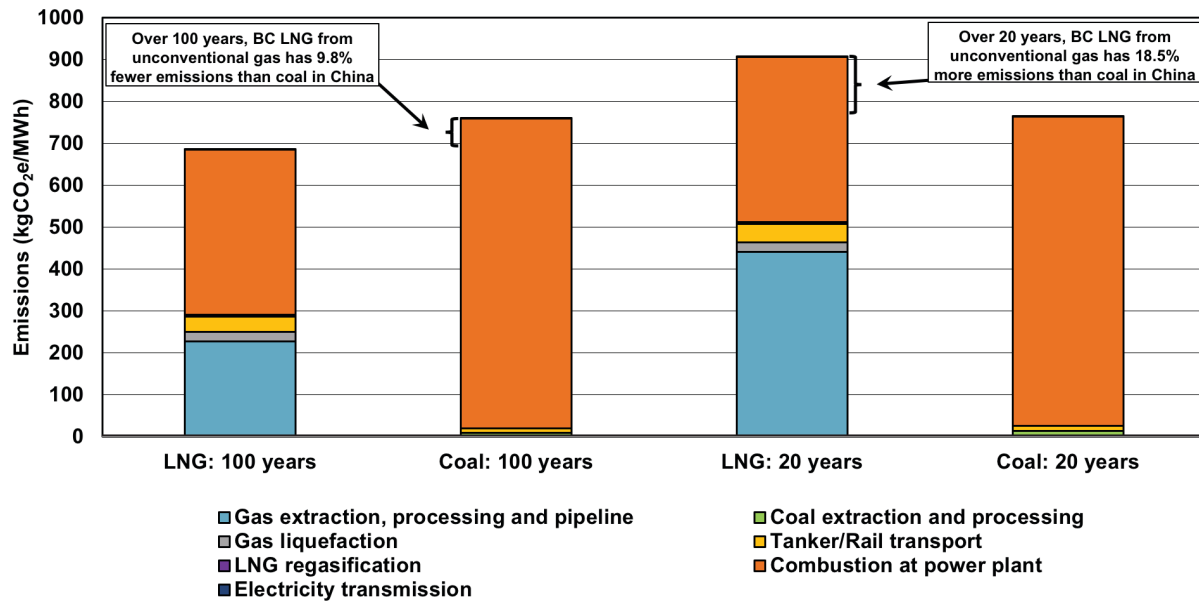
Sources: Data from Environment and Climate Change Canada, *National Inventory Report 1990–2018: Greenhouse Gas Sources and Sinks in Canada*; and Canada Energy Regulator's *Canada's Energy Future 2019* report (CER's 2040 production forecast is held flat through 2050).

The climate impacts of emissions from BC LNG compared to best-technology coal in China also depend on the timeframe considered and the level of fugitive methane emissions from the production, processing and transportation of the gas or coal. Over 20 years, methane has a global warming impact 86 times greater than carbon dioxide, but this is reduced to 34 times over 100 years. Upstream methane emissions (from the well to the LNG terminal) are estimated at 3.3 per cent of production for the unconventional gas that would supply LNG exports (based on studies of comparable deposits in the US).

Figure ES2 illustrates the full-cycle analysis of emissions from BC LNG in China versus best-technology coal. Emissions from LNG are 18.5 per cent greater than best technology coal over 20 years and 9.8 per cent less than coal over 100 years. Meaning that over the critical next few decades LNG exports will make the global climate problem worse. Even if fugitive methane emissions were reduced to 2 per cent (assuming supply came from conventional, not unconventional, gas), LNG exports would make global warming worse over at least the next three decades.

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FIGURE ES2: COMPARISON OF BC LNG FOR POWER GENERATION IN CHINA WITH BEST-TECHNOLOGY COAL, ASSUMING FUGITIVE METHANE EMISSIONS OF 3.3 PER CENT.



Sources: Data about emissions from LNG terminals from Environmental Assessment Office, *LNG Canada Export Terminal Project Assessment Report* (Victoria, BC: Environmental Assessment Office, 2015); and data about pipeline and ocean voyage distances (modified) from National Energy Technology Laboratory, *Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States* (Washington, DC: US Department of Energy, 2014).

LAND AND WATER IMPACTS

In order to meet both Canadian needs and LNG Canada exports, the number of wells in the BC Montney would have to more than triple by 2040

According to the CER, the Montney region in northeast BC and northwest Alberta is forecast to provide virtually all of the growth in Canadian gas production through 2040, when it will account for 64 per cent of Canadian production. Most of the gas for LNG exports will come from the BC portion of the Montney.

In order to meet both Canadian needs and LNG Canada exports, the number of wells in the BC Montney would have to more than triple by 2040. Through the end of the three approved 40-year LNG export licenses in 2070, the number of wells would have to increase by nearly 10-fold. The land disturbance impact of doing this would increase the existing oil and gas footprint by nearly four times, to 19.3 per cent of the BC Montney area (Table ES1).

In 2015 the Blueberry River First Nation, whose lands overlies much of the BC Montney deposit, filed a lawsuit over land disturbance and after a brief settlement returned to court in 2019. The current footprint of well-pads, roads, pipelines and other infrastructure is, however, only 5.1 per cent of the Montney area. A decision on this latest court case is expected in mid-2020, and may severely restrict the capacity of the BC government to double land disturbance on Blueberry River First Nation lands by 2040, let alone the additional land disturbance from drilling that would be required to meet the needs of the three approved 40-year LNG export licenses from 2040-2070.

TABLE ES1: CUMULATIVE LAND DISTURBANCE UNDER VARIOUS SCENARIOS OF LNG DEVELOPMENT IN THE MONTNEY.

	Cumulative area in hectares	Cumulative disturbance as percentage of the BC Montney play
To 2020	129,568	5.07%
To 2040 without the 3 LNG projects	208,683	8.16%
To 2070 without the 3 LNG projects	325,060	12.71%
Plus LNG Canada to 2065	417,502	16.32%
Plus Kitimat LNG to 2070	485,614	18.98%
Plus Woodfibre LNG to 2070	494,773	19.34%

Note: The percentage of the land area disturbed in this table is based on the prospective drilling area which is 25,580 square kilometres.

The existing footprint of the oil and gas industry on agricultural land is also a concern that has been raised by the BC Minister of Agriculture’s Advisory Committee for Revitalizing the Agricultural Land Reserve and the Agricultural Land Commission.

Water consumption by hydraulic fracking is also significant. If all three LNG export terminals were built, total water consumption would nearly triple from current levels, reaching 20 billion litres per year after 2030, which for reference is roughly two months of consumption for the city of Vancouver. Contaminated water is produced both by flowback from the initial fracking operation and from formation water produced during gas production. Although some of this contaminated water is treated and reused, most of it is injected into disposal wells. Contaminated water disposal would have to increase seven-fold from current levels by 2065 just with the LNG Canada project. If Kitimat LNG and Woodfibre LNG were also built, the water disposal problem would become even worse.

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LACK OF BENEFITS FOR TAXPAYERS

Notwithstanding the climate and other environmental impacts of developing a BC LNG export industry, government insists that LNG exports will provide a revenue and employment boom for its citizens.

In fact, LNG export projects in BC are not economically viable at current Asian prices according to studies by Canadian Energy Research Institute and the Oxford Institute for

Energy Studies. The prospect of much higher prices in 2025, when LNG Canada's first phase comes online, are highly uncertain, given the number of other LNG projects under development around the world, the current global LNG glut, and lower-cost pipeline-based supply from Russia being developed in China.

Despite the doubling of gas production in BC since 2005, the total royalty revenue has declined by 84 per cent. Although increasing gas production may increase government revenues somewhat, this decline in royalty revenue, along with the other taxpayer funded incentives to spur LNG exports, represents a giveaway of finite, non-renewable resources that Canadians will need at some level in the future.

Even assuming enough gas reserves can be proven up to meet projected demand, supplying current approved LNG export licenses will likely result in much higher gas prices for Canadians in the future.

The argument that BC requires the jobs that LNG expansion will bring is also suspect. According to LNG Canada, the number of permanent jobs that will be created by LNG Canada are half of the 950 estimated by the government.

Natural gas is a finite, non-renewable resource, and Canada is a well-explored petroleum region. Although government estimates of unproven resources have been inflated drastically in recent years, there have been no economic analyses to prove that these purported resources are economically viable. The three 40-year LNG export licenses already approved will alone exceed current proven Canadian gas reserves by 30 per cent. Although more drilling is likely to prove up additional reserves, the lack of credible economic analyses to show that Canada has enough gas to meet its own needs for the foreseeable future before ramping up exports is troubling.

Even assuming enough gas reserves can be proven up to meet projected demand, supplying current approved LNG export licenses will likely result in much higher gas prices for Canadians in the future. Industry always targets the lowest cost resources first in order to maximize profits. Exhausting the lowest cost resources for LNG exports means that more remote, higher cost, resources will have to be used to meet the future needs of Canadians.

NEED FOR A VIABLE ENERGY STRATEGY

Government narratives have stated that reducing Canada's emissions and expanding oil and gas production go hand-in-hand. Unfortunately, no amount of wishful thinking can overcome the math on the emissions generated from increased oil and gas production and the proposed LNG exports. Nor can wishful thinking overcome the impacts on the land surface of the increase in well-pads, roads, pipelines and other infrastructure that comes with increased production.

As outlined in my earlier research,³ Canada's practice of ramping up oil and gas production in the hope of financial gain is not a credible plan to meet the long-term energy needs and emissions reduction goals of its citizens.

³ J. David Hughes, *Canada's Energy Outlook: Current Realities and Implications for a Carbon-Constrained Future* (Vancouver, BC: Canadian Centre for Policy Alternatives-BC Office, 2018), <https://www.policyalternatives.ca/energy-outlook>.

The projections of BC greenhouse gas emissions in this report are conservative, as they incorporate the older estimates of the 100-year global warming potential of methane used by Canada in its emissions submission to the United Nations. The projections also assume that initiatives to reduce fugitive methane and electrify upstream gas production will reduce emissions further in the future. Even so, they demonstrate that growing oil and gas production is completely incompatible with achieving promised emissions reduction targets. Growth in oil and gas production for export is also incompatible with the long-term energy security of Canadians at affordable prices, and the desire of First Nations to protect the environmental integrity of their lands. Canada needs a viable energy strategy to address these issues and to have any hope of meeting its emission reduction targets.

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J. DAVID HUGHES is an earth scientist who has studied the energy resources of Canada for more than four decades, including 32 years with the Geological Survey of Canada as a scientist and research manager. He developed the National Coal Inventory to determine the availability and environmental constraints associated with Canada's coal resources. As Team Leader for Unconventional Gas on the Canadian Gas Potential Committee, he coordinated the publication of a comprehensive assessment of Canada's unconventional natural gas potential.

Over the past two decades, Hughes has researched, published and lectured widely on global energy and sustainability issues in North America and internationally. In his work for the Canadian Centre for Policy Alternatives, Hughes authored *A Clear View of BC LNG* in 2015, which examined the issues surrounding a proposed massive scale-up of shale gas production in British Columbia for LNG export, *Can Canada increase oil and gas production, build pipelines and meet its climate commitments?* in 2016, which examined the issues surrounding climate change and the Trans Mountain pipeline expansion, and *Canada's Energy Outlook: Current realities and implications for a carbon-constrained future* in 2018. He has also authored multiple reports on unconventional oil and gas development in the United States, consulted for the private sector on unconventional oil and gas, and served as an expert witness on hearings for energy projects in the US and Canada.

Hughes is president of Global Sustainability Research, a consultancy dedicated to research on energy and sustainability issues. He is also a board member of Physicians, Scientists & Engineers for Healthy Energy (PSE Healthy Energy) and is a Fellow of Post Carbon Institute. His work has been featured in *Nature*, *Canadian Business*, *Bloomberg*, and *USA Today*, as well as other popular press, radio, and television.

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