

Comparative Analysis of Canadian LNG to Global Natural Gas Supply: Shaping Canada's Energy Future

Afeez K. Popoola¹, Isabel C. Plata², Mark M. Mlella³, Nicholas D. Schumacher⁴, and Jeffrey Priest⁵.

¹ University of Toronto, Department of Earth Sciences, Toronto ON M5S 3B1, Canada

² University of Calgary, Department of Geoscience, Calgary AB T2N 1N4, Canada.

³ University of Alberta, Department of Physics, Edmonton AB T6G 2E1, Canada.

⁴ University of Calgary, School of Public Policy, Calgary AB T2P 1H9 Canada.

⁵ University of Calgary, Department of Civil Engineering, Calgary AB T2N 1N4, Canada.

Summary

LNG demand is forecasted to double in the next two decades, thus provides a strong opportunity for Canada to commit to the development of liquefied natural gas (LNG) projects. Canada has a competitive advantage in emissions [1] and cost [2], which allow it to aim to be a preferred supplier of natural gas as the world transitions towards a low-carbon future. However, regulatory processes and environmental assessments must be more efficient. Development of LNG projects would translate to economic prosperity for Canada while simultaneously helping other countries lower their greenhouse gas (GHG) emissions through the conversion of coal to natural gas for electricity generation. Additionally, LNG projects provide the opportunity for Canada to engage with First Nations to take action on reconciliation, and be the bridge in the energy transition from fossil fuels to renewable energy. This study aims to show that Canadian LNG exports may have a significant impact in the growth of the Canadian economy, in meeting the global clean energy demand, and in lowering global emissions.

Introduction

The transition in the global economy towards lower-carbon energy will be essential for all countries to meet the emissions requirements outlined in the Paris Agreement. However, the challenges facing the energy industry are conflicting; the reduction in the global carbon emission and the need to meet increasing global energy demand [3]. Coal-power generation produces the largest CO₂ emissions of any fossil fuel, producing 30% more emissions than other sources [4]. The IEA 2019 reported that CO₂ emissions in 2018 decreased more than 15% due to a switch from coal to gas [4]. LNG technology has been utilized by several countries to achieve both goals of increasing energy supply and reducing emissions by converting coal-fired electricity generation plants to natural gas.

Demand for natural gas is increasing; countries such as Japan, China, India, and South Korea now import large volumes of natural gas for electricity generation, but still rely heavily on coal [3]. Consequently, these markets are suitable targets for LNG exports for the purpose of displacing coal. Based on current proposals for LNG facilities around the world, Canada, the

United States, Qatar, Australia, and Russia will be the major players in the natural gas export market [3].

Canadian LNG is considered to be cost-competitive and low emitting. If European and Asian countries are committed to decreasing their use of coal for energy generation and move towards natural gas, Canadian LNG would likely have the advantage over other exporters due to its geographic location, and environmental and social standards. To test these assumptions, this study examines the competitiveness of Canadian LNG in its emissions intensity, total delivered cost, Indigenous considerations, and the strength of its environmental regulations to other LNG exporting countries.

Methodology

In this study, an extensive review and analysis of peer-reviewed papers, reports and publications from different international agencies will be conducted to compare the emissions intensity and cost-competitiveness of LNG exports from natural gas exporting countries (Canada, Australia, Russia, and the US). The study will analyze the complete supply chain including production, transportation, liquefaction, shipping, and regasification. Additionally, the study aims to test the hypothesis that Canadian LNG can be produced at lower total delivered cost, with stronger environmental regulations, and more inclusive Indigenous and social considerations than other exporting countries.

Opportunities

Liquefied natural gas has the potential to be the stepchange in the transition towards cleaner energy by displacing higher emitting fossil fuels. Canadian LNG could be the preferred source of natural gas as countries transition towards lower emitting sources of energy for electricity generation. This is because of the strength of its environmental regulations, low emissions, and low cost. Western Canadian LNG exports could reduce emissions by 370-640gCO₂/kWh by displacing coal in electricity generation [5]. This stepchange could be further accelerated by using government revenues from LNG exports to fund research in clean technology, develop emissions reductions initiatives, or create tax credits for investments in renewable resources.

In addition to the environmental benefits, Canadian LNG projects provide the opportunity to engage with Indigenous communities to provide economic opportunities such as jobs and equity partnerships. LNG projects could increase local and regional investments, promote economic and social development, as well as provide direct and indirect jobs for surrounding communities. Furthermore, engaging with First Nations to consider traditional land usage perspectives and environmental protection priorities will be essential for ensuring projects are completed with mutual benefit for Indigenous communities and industry.

Acknowledgements

Authors are scholarship recipients of CREATE REDEVELOP Grant #386133824, a collaborative research and training experience in responsible energy development funded by NSERC. We would also like to thank Dr. Jeffrey Priest, Thalia Aspeslet, Colin Anton, and Colin Nikiforuk for their advice and guidance.

References

- [1] CERI. 2018. Competitive Analysis of Canadian LNG. https://ceri.ca/assets/files/Study_172_Executive_Summary.pdf
- [2] Daily Oil Bulletin. 2019. Canada's Green LNG Advantage https://s3.amazonaws.com/media.dailyoilbulletin.com/pdf/LNG_Special+Report_2.pdf
- [3] BP. 2019. Energy Outlook. <https://www.bp.com/en/global/corporate/energy-economics/energy-outlook.html>
- [4] IEA. 2019. Global Energy and CO2 Status Report <https://www.iea.org/reports/global-energy-and-co2-status-report-2019>
- [5] Liu, R. E. 2019. Life Cycle Greenhouse Gas Emissions of Western Canadian Natural Gas and a Proposed Method for Upstream Life Cycle Emissions Tracking (Unpublished master's thesis). University of Calgary, Calgary, AB.
- [6] https://www.igu.org/sites/default/files/node-news_item-field_file/IGU%20Annual%20Report%202019_23%20loresfinal.pdf



Figure 1: Importing, exporting, and proposed exporting countries in the market for liquified natural gas. Adapted from IIHS Markit, IGU, 2019. [6]