

# Canada's LNG Opportunity

## A Value Proposition Worth Celebrating

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# Table of Contents

<b>A message from the Advisory Council</b> .....	4
<b>Executive Summary</b> .....	5
<b>1. Global Energy Supply and Demand</b> .....	8
<i>1.1. Natural Gas Demand</i> .....	9
<i>1.2. LNG Demand</i> .....	9
<i>1.3. Canada’s LNG Potential</i> .....	10
<b>2. Benefits of Canadian LNG</b> .....	11
<i>2.1. Environmental Benefits</i> .....	11
<i>2.2. Affordability Benefits</i> .....	15
<i>2.3. Energy Security Benefits</i> .....	18
<b>3. Economic Benefits to Canada</b> .....	19
<i>3.1. Benefits to Canadians and Governments</i> .....	19
<i>3.2. Benefits to Canadian Energy Workers</i> .....	20
<i>3.3. Benefits to Indigenous Communities</i> .....	21
<b>4. Summary and Recommendations</b> .....	22
<b>5. About Verum Consulting</b> .....	23
<b>References</b> .....	25

## A message from the Advisory Council

It is our pleasure to jointly introduce the report, Canada's LNG Opportunity: A Value Proposition Worth Celebrating. It articulates what has become a consensus view almost everywhere: that LNG is needed to advance goals of energy security, reliability and affordability, as well as incremental action to protect the environment. The G7 Leaders Summit Communiqué of May 2023 stressed the important role that increased deliveries of LNG can play in addressing these challenges.

We come at these issues from two very different perspectives. One sees the opportunity in leveraging Canadian resources to meet the energy needs of our allies; a practical way for Canada to contribute to global security and global emissions reduction. The other sees in Canadian LNG, thousands of high-quality jobs that can support families, communities and workers, building world class infrastructure that creates prosperity for Canadians.

Instead of embracing these opportunities, the policy debate in Canada has often presented a false choice: that of developing hydrocarbon fuels or not. In reality, global markets will seek out affordable sources of energy, and others will supply it if Canada does not. The real choice in front of us is whether we want to provide an alternative to coal, and an alternative to Russia. We have the choice between exporting clean Canadian LNG, developed by our workers with our environmental, safety and community standards; or watching others take our place.

We have missed energy opportunities in Canada in the past. But the ones still in front of us are tremendous. Our incredible natural gas reserves, coupled with growing global energy demand, can advance many of our most important priorities: a strong economy; good paying middle-class jobs; energy security; lower GHG emissions; and economic reconciliation in the form of Indigenous ownership in new projects.

This paper is about possibility: the things that can be accomplished when we act, rather than stall. Canada has the workers, the resources, the innovators and the business case to become a global leader in LNG. It is our hope that this report helps support those that are ready to act.

Dominic Barton  
*Chair, Rio Tinto*

Sean Strickland  
*Executive Director, Canada's Building Trades Unions*

*Energy for a Secure Future is a nonpartisan civil society initiative that brings together Canadian business leaders, Indigenous peoples, labour unions and experts in a new conversation about energy and building a secure future for Canada and our allies around the world.*

# Executive Summary

Canada's liquefied natural gas (LNG) industry has the potential to make a significant contribution to meeting current and future global energy needs, while also reducing global emissions, ensuring energy affordability, enhancing global energy security and delivering significant economic benefits to the Canadian economy.

## 1. LNG Market Outlook

### 1.1. Natural Gas

Natural gas will continue to play an increasing role in the global energy mix. Since 2000, global natural gas consumption grew by 68% – more than any other major hydrocarbon fuel source. According to the International Energy Agency (IEA), total natural gas demand will increase by 3.8% in 2030, and 3.4% in 2050 compared to 2021. For Canada, natural gas production is expected to increase from 189 billion cubic metres (bcm) to 200 bcm.

### 1.2. LNG

The market for LNG is also expected to grow. The IEA estimates that an additional 240 bcm per year of LNG export capacity is needed to reach 650 bcm by 2050 under the stated policy scenario. S&P Global estimates that global LNG supply will reach nearly 800 bcm by 2050, while the Global LNG Hub pegs LNG capacity reaching 850 bcm by 2050.

### 1.3. Canada's LNG Potential

In 2022 Canada produced 17.3 billion cubic feet (bcf)/day of natural gas, and is the sixth largest producer of natural gas globally. Canada also has an additional 1,373 trillion cubic feet of natural gas resources available for production. While Canada is not yet involved in significant LNG export, it does contribute approximately 7% of total U.S. natural gas supply, some of which is used as feedstock into U.S. LNG liquefaction facilities. However, there is not sufficient pipeline capacity to substantially take advantage of this opportunity over the

long term. A number of substantive LNG projects are advancing off the coast of British Columbia and could be completed by the end of the decade, with potential production totalling 6 bcf/day.

## 2. Benefits of Canadian LNG

Increasing the supply of Canadian LNG can have significant benefits for global populations due to its comparative emissions intensity, affordability and energy security attributes relative to other forms of energy that would serve as substitutes for Canadian LNG.

### 2.1. Environmental

Coal, oil and natural gas make up nearly 80% of the global energy mix and are expected to continue to comprise at least 62% by 2050. These fuels are all abundant and energy dense resources, although natural gas is among the highest in terms of energy density. Natural gas also emits the lowest pounds of CO<sub>2</sub> per million British Thermal Units (btu) among all of these fuels. Because of this, natural gas is widely regarded as an emissions efficient substitute for coal, and a significant low-emission fuel in the context of a transforming energy mix.

In terms of its actual impact on global Greenhouse Gas Emissions (GHGs), both the United States and the European Union (EU) have undertaken significant efforts to reduce energy consumption from coal by increasing consumption of natural gas and other sources. The result has been meaningful reductions in total GHG emissions (23% and 17% respectively). There is an opportunity to apply this proven approach more meaningfully in countries such as China and India, which rely heavily on coal as the lead source of their energy mix (55% and 57% respectively).

Canadian LNG projects are world leading from an emissions intensity perspective. LNG produced on Canada's West Coast would create 65% fewer greenhouse gases than coal when used to generate electricity.

## 2.2. Affordability

Natural gas is an affordable energy source, comparable in cost and abundance to other energy sources such as coal and oil. However, since the Russian invasion of Ukraine, commodity prices have increased substantially – particularly natural gas prices in Europe.

Prices have driven fuel switching and forced production curtailments across energy intensive industries – which substantially and adversely impacts the economic prosperity and competitiveness of European industries and the livelihoods of citizens.

Not only are countries limiting energy access to their industries as a result of high prices, but they are also switching to higher emitting and less secure sources of energy. Coal consumption in each of China, India, the U.S. and the EU have increased since 2020.

Canadian natural gas can play a significant role in addressing these challenges. North America has gas resources that can meet more than 30 years of demand, at a cost below \$3/MMBtu.

## 2.3. Security

The Russian invasion of Ukraine has created substantial geopolitical supply and demand disruptions. Notably, the recent G7 price caps and EU import bans applied to Russian petroleum products are displacing Russian supply into the EU, creating opportunities for other sources of supply to meet EU energy needs long term.

The United States has become a significant supplier of Europe's natural gas – providing two-thirds (43 bcm) of Europe's incremental LNG imports in 2022 alone. That said, countries such as India and China have increased their imports of discounted Russian oil by 40% and 20% respectively. These countries are experiencing significant demand for energy and are expected to continue to do so for the coming decades. Accessing affordable sources of

sufficient supply is a key priority for these countries over the long term. Not only does this present an opportunity for Canadian suppliers, but there are also geopolitical ramifications for the world if Russia is able to build stronger energy trade linkages into growing Asian markets on a long-term basis.

Consequently, Canada not only has an opportunity, but an obligation, to contribute additional LNG supplies to global markets. The key will be for Canada to position itself to provide the supply.

## 3. Economic Benefits to Canada

### 3.1. Benefits to Canadians and Governments

The LNG economic opportunity is compelling for the Canadian economy as a whole. If the majority of proposed LNG projects proceed, it would represent approximately 45 million tonnes of LNG per year (6 bcf/d). In terms of the economic impact, the construction, operational upstream, midstream and facility investments would create \$10.2 billion in annual GDP, \$3.6 billion in government revenues and 77,600 jobs across the country on an annual basis.

Provincially the economic impacts would be the most substantive in British Columbia (\$7.4 billion), followed by Alberta (\$1.5 billion). BC would see the greatest number of jobs (57,300), followed by Ontario (8,700), and then Alberta (7,400). In terms of government revenues, BC would earn \$1.8 billion, followed by the federal government at \$1.5 billion.

### 3.2. Benefits to Canadian Energy Workers

Not only are a significant number of jobs created as a result of increased LNG investment, but these jobs are high quality. Oil and gas average weekly earnings are the highest of any industry in the country. In fact, in 2022, oil and gas wages were approximately 40% higher than metal ore mining and electric power generation (the second and third highest paid industries).



### 3.3. Benefits to Indigenous Communities

LNG benefits extend deeply to Indigenous communities as well. According to research conducted for Energy for a Secure Future: “While jobs, business contracts and royalties are still important foundations for Indigenous economies, the following four trends in the natural gas sector demonstrate a new era in Indigenous involvement in energy development:

- Indigenous-led major projects, where Indigenous nations are project proponents.
- Major Indigenous equity options in projects involving natural gas pipelines, LNG terminals and carbon capture projects.
- An Indigenous agreement to reconcile downstream and upstream impacts and benefits, as shown in the Haisla, Nisga’a and Metlakatla Nations’ MOU with Halfway River First Nation.
- The first legally binding Indigenous-led environmental assessment in Canada, which saw the Squamish First Nation become both a partner and an environmental regulator of Woodfibre LNG.”

### Summary and Recommendations

Canadian LNG presents a significant and compelling opportunity to meet global energy, environmental, affordability, and security needs. It also creates a compelling opportunity for economic prosperity in Canada. What is needed is the right level of focus and support from governments to take advantage of this opportunity. This report offers the following recommendations:

1. Take a full value proposition approach to Canada’s LNG opportunity. Our allies are seeking reliable energy partners who can provide the secure and affordable supply of the fuels they need. Canada is well positioned to be that supply while helping to lower global emissions, creating high quality jobs and advancing reconciliation. These considerations should underpin a strategic approach and prioritization of LNG development in federal energy policies – including the regulatory environment, international relations, fiscal and climate policy, and in our approach to sustainable finance.
2. Create and nurture an effective, timely and predictable regulatory framework for advancing LNG projects. The regulatory approval process for major energy projects in Canada is perceived to be lengthy, burdensome, uncertain and uncompetitive relative to other jurisdictions. Canada needs a regulatory framework that is timely, efficient, predictable, reliable and encourages investment, while also adhering to our high environmental, social and governance (ESG) standards.
3. Work with allies, including the United States, a key energy delivery partner, as well as current and potential customers in Europe and Asia to recognize and credit Canada for the environmental benefits of Canadian LNG displacing higher emitting energy sources in international markets. Total global emissions from electricity and heat are 14,378 mega-tonnes (MT), of which coal comprises 73%. Switching from coal to natural gas could reduce global emissions from this sector by up to 4,502 MT, or 31%.

# Introduction

Canada’s LNG industry has the potential to make a significant contribution to meet current and future global energy needs, while also reducing global emissions, ensuring energy affordability, enhancing global energy security and delivering significant economic benefits to the Canadian economy.

- This report explores these issues in depth, by:
- Assessing current and future global energy and natural gas supply needs;
- Identifying Canada’s LNG production potential;
- Summarizing the emissions, affordability and security benefits of Canada’s LNG; and
- Quantifying the potential economic benefits to Canada.

The analysis and findings contained in this report are informed by a review of relevant research and agency reports; analysis of publicly available energy and emissions data; applied economic modelling; and key informant interviews with relevant business leaders and stakeholders.

The intent is to understand and convey the potential and benefits of developing Canada’s LNG industry,

and to identify policy recommendations to support the development of the industry.

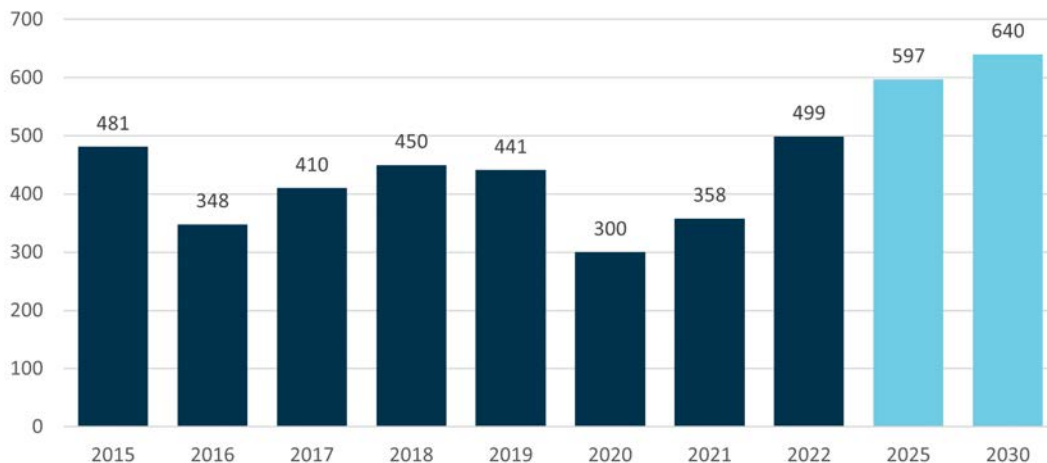
## 1. Global Energy Supply and Demand

Understanding the global energy market is critical to understanding the potential opportunity for Canadian LNG. In the short term, global energy demand is expected to remain robust for the foreseeable future. In its March 2023 *Oil Market Report*, the International Energy Agency (IEA) is forecasting “global oil demand to reach a record 102 million barrels per day” in 2023, largely driven by rebounding air traffic and pent-up Chinese demand.<sup>1</sup> Natural gas production levels are also expected to remain near historic highs, with the IEA predicting 2023 global natural gas production at 4.13 billion cubic metres (bcm).<sup>2</sup>

Capital investment has also been strong, with S&P Global indicating that “oil and gas upstream capital expenditures increased by 39% in 2022 to \$499 billion, the highest level since 2014 and the largest year-on-year gain in history,” with a significant increase in investment coming from North America.<sup>3</sup>

Longer term, both the IEA and International Energy Forum/S&P Global forecast an increase in oil and gas demand through the end of the decade.<sup>4 5</sup> In fact, S&P Global estimates that “annual upstream investment will

Figure 1: Global Oil and Gas Upstream Capex (Billions USD)



Source: IEF, S&P Global Commodity Insights 2023



Table 1: Changing Global Energy Mix							
	Coal	Oil	Natural Gas	Wind/Solar & Other	Hydro	Nuclear	Geo/Biomass
<b>% Change in Consumption, 2000-2021</b>	62.1%	19.3%	68.3%	103%	43%	-4%	313%
<b>% Of 2021 Energy Mix</b>	27.2%	31.3%	24.7%	5.3%	6.8%	4.3%	0.5%

Source: Our world in Data. 2023.

need to increase from \$499 billion in 2022 to \$640 billion in 2030 to ensure adequate supplies...a cumulative \$4.9 trillion will be needed between 2023 and 2030 to meet market needs and prevent a supply shortfall, even if demand growth slows toward a plateau.” (Figure 1)

### 1.1. Natural Gas Demand

Natural gas has experienced a particularly favourable growth trajectory in recent years (Table 1).<sup>6</sup> Since 2000, global natural gas consumption grew by 68% – more than any other major fuel source. Comparatively, coal consumption increased by 62% and, while wind and solar have also increased substantially, they comprise approximately 5% of the energy mix.

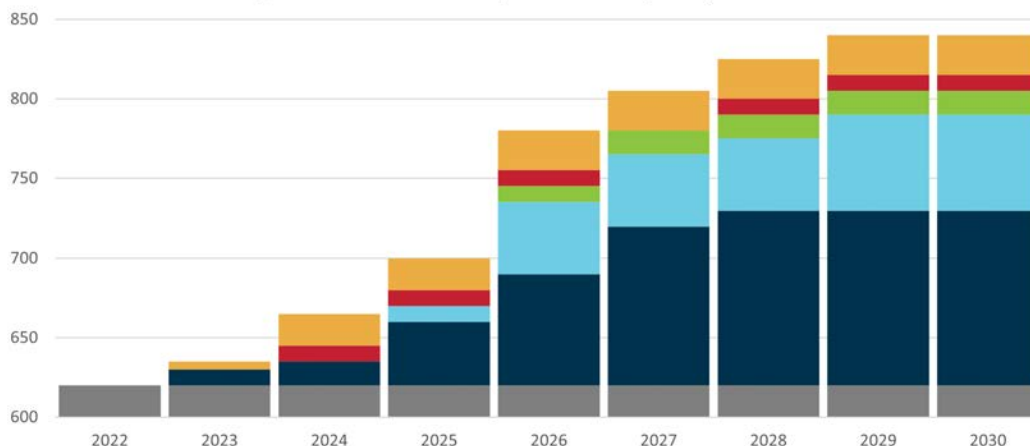
The demand for natural gas is expected to continue to remain robust. Under the IEA’s Stated Policies Scenario (STEPS), total natural gas demand will increase by 3.8% in 2030, and 3.4% in 2050 relative to 2021.<sup>7</sup> Significant demand growth is expected in Africa, the Middle East,

and Asia Pacific (Table 2).<sup>8</sup> Under this scenario, Canada is forecasted to increase natural gas production from 189 bcm in 2021 to 200 bcm in 2050.<sup>9</sup>

### 1.2. LNG Demand

The conflict in Ukraine and subsequent energy security disruptions have shifted the global energy landscape and presented a significant opportunity for LNG supply growth from non-Russian sources. In 2022, LNG imports into Europe increased by 66 bcm, two thirds of which was supplied by the U.S.<sup>10</sup> Looking ahead, the IEA estimates that EU countries “revived or accelerated plans for an estimated 130 bcm of new LNG import capacity since the beginning of 2022...[with] the effective LNG import capacity to increase at least 40 bcm between the end of 2021 and the end of 2023.”<sup>11</sup> Consequently, the IEA estimates that an additional 240 bcm per year of LNG export capacity is needed to reach 650 bcm by 2050 under the stated policy scenario.<sup>12</sup> Similarly, S&P Global estimates that global LNG supply will reach nearly 800

Figure 2: Global LNG Liquification Capacity Forecast



Source: Global LNG Hub 2023

**Table 2: Natural Gas Demand Forecast (Billions of Cubic Metres, bcm)**

	2021	Government Stated Policy Scenario		% Change (Relative to 2021)	
		2030	2050	2030	2050
World	4213	4372	4357	3.8%	3.4%
North America	1106	1118	820	1.1%	-25.9%
Central & South America	161	159	179	-1.2%	11.2%
Europe	625	511	395	-18.2%	-36.8%
Africa	172	215	292	25.0%	69.8%
Middle East	567	689	833	21.5%	46.9%
Eurasia	662	626	635	-5.4%	-4.1%
Asia Pacific	920	1043	1173	13.4%	27.5%
China	368	443	442	20.4%	20.1%
India	66	115	170	74.2%	157.6%
Japan	103	64	43	-37.9%	-58.3%
Southeast Asia	162	203	272	25.3%	67.9%

Source: IEA 2022.

bcm by 2050,<sup>13</sup> while Global LNG Hub pegs LNG capacity at 850 bcm by 2050 – a significant proportion of this supply is expected to come from North America.<sup>14</sup>

### 1.3. Canada's LNG Potential

Canada has the potential to be a significant supplier to meet global energy demand. In 2022 Canada produced 17.3 bcf/day of natural gas,<sup>15</sup> and is the sixth largest producer of natural gas globally.<sup>16</sup> Canada also has an additional 1,373 trillion cubic feet of natural gas resources still available for future production.<sup>17</sup>

While Canada is not yet a significant LNG exporter, it does contribute approximately 7% of total U.S. natural gas supply.<sup>18</sup> Some Canadian exports are used as feedstock into U.S. LNG liquefaction facilities, whose export volumes have increased from virtually zero in 2015 to 10.6 bcf/d in 2022.<sup>19 20</sup> While there is potential to see increased Canadian natural gas volumes to meet U.S. LNG demand, there is not sufficient pipeline capacity to substantially take advantage of this opportunity over the long term.<sup>21</sup> Moreover, in shipping natural gas to the U.S. Gulf Coast,

Canada misses out on the incremental jobs, economic activity and government revenues associated with developing an LNG industry (as discussed in section 4 of this report). From a global market perspective, Canadian LNG would provide a more affordable and competitive alternative to meet demand in key markets such as Asia. According to the Canadian Energy Regulator:

“Canadian West Coast projects are closer to prime Asian markets than existing U.S. facilities in the Gulf Coast/East Coast region by about 5,000 nautical miles and do not require passage through the Panama Canal. This proximity to Asia is a key advantage over U.S. Gulf Coast-based LNG project offerings. Canada is also about 1,000 nautical miles closer to Asia than significant west African liquefaction players like Nigeria.”<sup>22</sup>

A number of LNG projects are advancing off the coast of British Columbia and could be completed by the end of the decade, with potential production totalling 6.4 bcf/day (Table 3).

**Table 3: Current and Proposed BC LNG projects**

Project	Production (bcf/d)	Timeline	Status
LNG Canada Phase 1	1.87	2025	Under Construction <sup>23</sup>
Woodfibre LNG	0.3	2027	Construction Expected in 2023 <sup>24</sup>
Cedar LNG	0.4	2027	Final Investment Decision expected in Q3 2023 <sup>25</sup>
Ksi Lisims	1.6	2028	Expected to undergo BC Environmental review <sup>26</sup>
Tilbury LNG Expansion	0.4	2028	Undergoing Environmental Review <sup>27</sup>
LNG Canada Phase 2	1.87	~2030	Final Investment Decision to be determined

Source: Shell Canada, Ksi Lisims, Cedar LNG, Woodfibre LNG, 2023

LNG Canada phase one is under construction and expected to be completed in 2025, Woodfibre is expected to have construction commence later this year, and Cedar LNG has all environmental approvals in place and is expected to make a final investment decision (FID) in 2023.

## 2. Benefits of Canadian LNG

Increasing the supply of Canadian LNG can have significant benefits for global populations due to its comparative emissions intensity, affordability and energy security attributes relative to other forms of energy that would serve as substitutes for Canadian LNG.

### 2.1. Environmental Benefits

Coal, oil and natural gas make up nearly 80% of the global energy mix, and are expected to continue to comprise at least 62% by 2050 (Table 4).<sup>28</sup>

**Table 4: World Energy Supply - Stated Policy Scenario (EJ)**

	2021	2030	2040	2050
Total	624	673	708	740
Renewables	12%	17%	24%	29%
Natural Gas	23%	22%	21%	20%
Oil	29%	29%	28%	27%
Coal	26%	22%	18%	15%
<b>Total Hydrocarbon Fuels</b>	<b>79%</b>	<b>74%</b>	<b>67%</b>	<b>62%</b>

Source: IEA 2022

**Table 5: Pounds of CO<sub>2</sub> emitted per million British thermal units (Btu) of energy for hydrocarbon fuels**

Coal (anthracite)	228.6
Coal (bituminous)	205.7
Coal (lignite)	215.4
Coal (sub-bituminous)	214.3
Diesel fuel and heating oil	161.3
Gasoline (without ethanol)	157.2
Propane	139.0
<b>Natural gas</b>	<b>117.0</b>

Source: American Geosciences Institute. 2023

Coal, oil and natural gas are all abundant and energy dense resources, although natural gas is among the highest in terms of energy density.<sup>29 30</sup> Natural gas also emits the lowest pounds of CO<sub>2</sub> per million btu for all hydrocarbon fuels (Table 5), and is nearly half the level of anthracitic coal.<sup>31</sup>

Because of this, natural gas is widely regarded as an emissions efficient substitute for coal, and a significant low-emission fuel in the context of a transforming energy mix. According to Sustainability Magazine:<sup>32</sup>

“Natural gas is a plentiful source of energy and the greenest of the mainstream fossil fuels. It is portable, can be shipped as a liquid, and is cheap. It is likely to maintain or even grow as an energy source in the

short term as the world moves away from other fossil fuels due to its cleaner-burning properties...

...The world has so far consumed almost 2% of its natural gas reserves with a little over 50 years of natural gas left at the current consumption level of 132,290,211,000 cubic feet or 17,527 cubic feet of natural gas per capita.”

In terms of its actual impact on global GHGs, both the United States and the EU have undertaken significant efforts to reduce energy consumption from coal by increasing consumption of natural gas and renewable energy sources. The result has been meaningful reductions in total GHG emissions (23% and 17% respectively) (Table 6, Figures 3 and 4).<sup>33</sup>

While growth in capacity for wind, solar and other energy sources has been significant, these sources continue to comprise a small proportion of the energy mix (11% in EU and 7.5% in the U.S.), and also require a backstop energy source to ensure their continued reliability to meet demand – which is a role that can be filled by natural gas given its abundance, favourable emissions and affordability attributes.

There is significant opportunity to apply this proven approach more meaningfully going forward, particularly in countries such as China and India which rely heavily on coal as the leading source of their energy mix at 55% and 57% respectively, which is highly correlated to their GHG emissions (Figures 5 and 6).

Total global emissions from electricity and heat are 14,378 MT, of which coal comprises 73%.<sup>34</sup> At constant emissions to energy production rates, switching from coal to natural gas could reduce global emissions from this sector by up to 4,502 MT, or 31%.

Canadian LNG, in particular, is among the most beneficial LNG from an emissions intensity perspective (Figure 7). In fact, “taking into account all emissions from production, transportation and combustion, LNG produced on Canada’s West Coast would create 65% fewer greenhouse gases (GHGs) than coal when used to generate electricity.”<sup>35 36</sup>

According to the Royal Bank of Canada, “building out LNG capacity to its full potential...could reduce net global emissions by as much as 211 MtCO<sub>2</sub>e...and would attract more than \$200 billion in investments.”<sup>37 38</sup>

The opportunity and imperative for Canada could not be more compelling. According to Dominic Barton, former Canadian Ambassador to China.

“In China, up to 60 per cent of the energy provided is through coal. They are a growing economy, and their citizens need access to energy for heat and quality of life. Natural gas is a very good transition fuel because it’s much, much cleaner than coal, and renewables simply can’t meet this need.

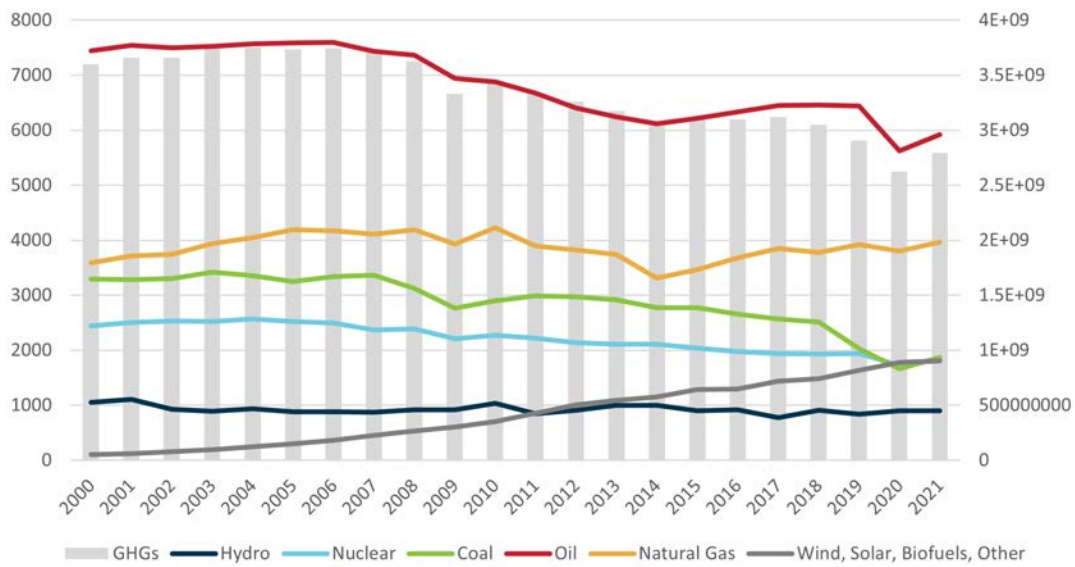
Canada is the source of some of the cleanest natural gas fuel on the planet. We have a very important role in helping other countries with transition by supplying clean natural gas.”

**Table 6: Per Cent Change in Energy Consumption and GHGs, 2000-2021**

		Coal	Oil	Natural Gas	Wind, Solar & Other	Hydro	Nuclear	GHG
EU	<b>2000-21 % change</b>	-43.2%	-20.4%	10.5%	1,608%	-14.5%	-24.7%	-22.5%
	<b>2021 share</b>	11.5%	36.3%	24.3%	11.1%	5.5%	11.3%	
US	<b>2000-21 % change</b>	-53.3%	-7.9%	31.6%	1,479%	-16.4%	-8.7%	-16.8%
	<b>2021 share</b>	11.4%	38.2%	32.2%	7.5%	2.6%	8.0%	

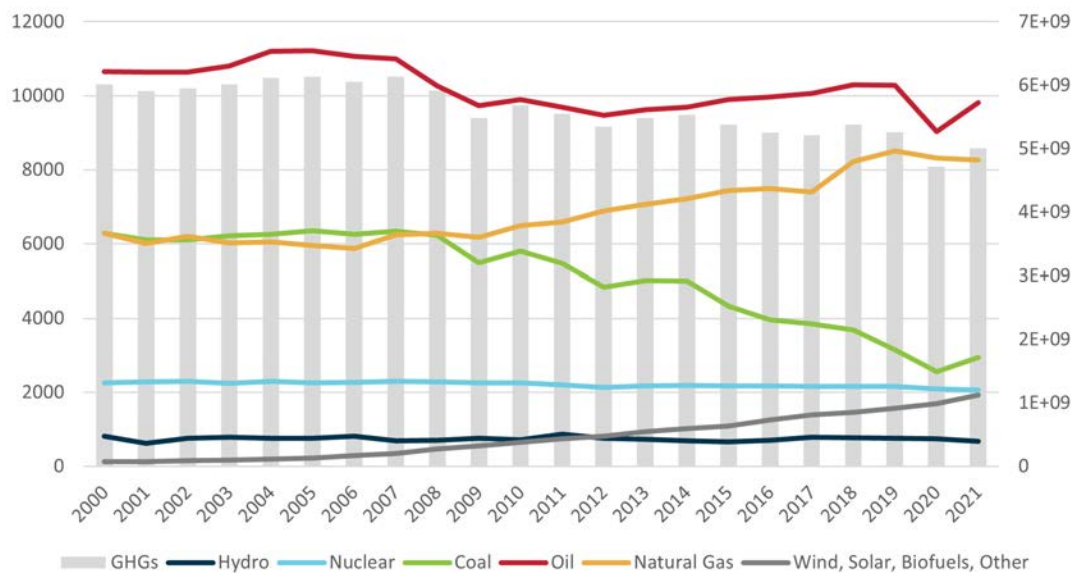
Source: Our World in Data 2023

Figure 3: EU Energy Mix (TWh) & GHGs (T)



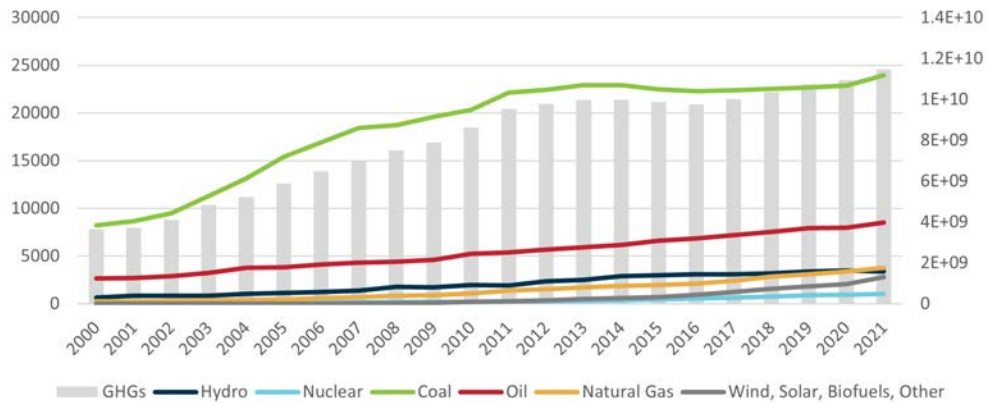
Source: Our World in Data 2023

Figure 4: US Energy Mix (TWh) & GHGs (T)



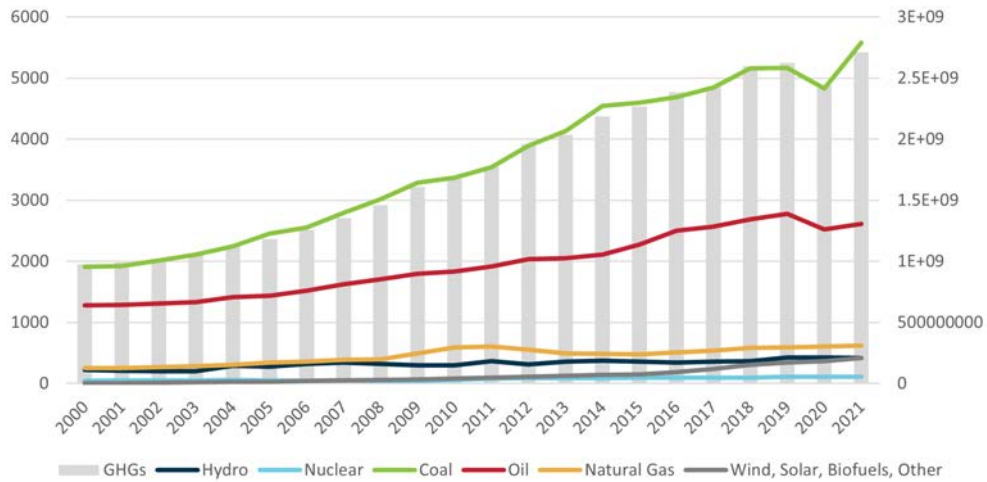
Source: Our World in Data 2023

Figure 5: China Energy Mix (TWh) & GHGs (T)



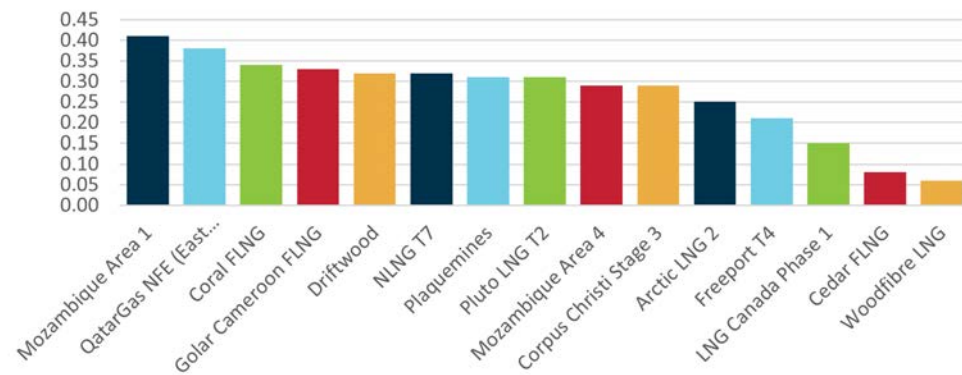
Source: Our World in Data 2023

Figure 6: India Energy Mix (TWh) & GHGs (T)



Source: Our World in Data 2023

Figure 7: Selected LNG Project Operational Liquefaction Emissions Intensity (T of CO<sub>2</sub>-E/T of LNG)\*



Source: Rystad Energy research and analysis, various public disclosures and environmental impact statements



**Table 7: World Bank Commodities Price Data (The Pink Sheet)**

	2020	2021	2022	2020-2021 % Change	2021-2022 % Change
Coal, Australia \$/mt	60.8	138.1	344.9	127.1%	149.7%
Coal, South Africa \$/mt	65.7	119.8	240.6	82.3%	100.8%
Crude oil, Brent \$/bbl	42.3	70.4	99.8	66.4%	41.8%
Crude oil, Dubai \$/bbl	42.2	68.8	97	63.0%	41.0%
Crude oil, WTI \$/bbl	39.3	68	94.4	73.0%	38.8%
Index 2010=100	45.5	130.7	281.6	187.3%	115.5%
<b>Natural gas, Europe \$/MMBtu</b>	<b>3.24</b>	<b>16.12</b>	<b>40.34</b>	<b>397.5%</b>	<b>150.2%</b>
Natural gas, U.S \$/MMBtu	2.01	3.85	6.37	91.5%	65.5%
Liquefied natural gas, Japan \$/ MMBtu	8.31	10.76	18.43	29.5%	71.3%

Source: World Bank 2023

According to Robert Johnston, Executive Director with the Centre on Global Energy Policy at Columbia University:<sup>39</sup>

“Canadian natural gas is attractive to buyers in that it offers an ESG aligned product that is competitive with other sources of supply in the global market. Southeast Asian countries such as Japan, Singapore and Taiwan already consider ESG factors when evaluating their sources of supply and Canadian natural gas would be a welcome option for these countries.

Further, getting Canadian LNG into growing Asian markets to displace coal and backstop renewables is aligned with Canadian environmental and economic goals, but needs to be a priority for all levels of government if it is going to happen.”

## 2.2. Affordability Benefits

Affordability is another key benefit of LNG, and a key factor driving energy consumption decisions globally. Natural gas is used primarily for electricity generation, but also for residential and commercial heating and cooling systems, as a fuel/ raw material in industrial processes,

and as a transportation fuel.<sup>40</sup> Approximately 40% of global natural gas consumption is in power generation.<sup>41</sup>

Natural gas is an affordable energy source, comparable in costs and abundance to other energy sources such as coal and oil. Because of its affordability and abundance, along with its lower emissions intensity, natural gas has contributed an increasing share of global electricity production over time (from 14% in 1985 to 23% in 2021).<sup>42</sup> However, since the Russian invasion of Ukraine, commodity prices have increased substantially – particularly natural gas prices in Europe (Table 7).<sup>43</sup>

As a consequence, 2022 gas demand declined substantially in key global markets. In Europe, natural gas recorded its steepest drop in history - declining by over 70 bcm in 2022.<sup>44</sup> Prices drove efforts on fuel-switching and forced production curtailments across most gas and energy intensive industries – which substantially and adversely impacted the economic prosperity and competitiveness of European industries, as well as the employment and quality of life of citizens.

Asia’s natural gas consumption decreased by 2% as a result of LNG prices and COVID disruptions. More substantively, “India’s LNG imports dropped by 17% in

2022, the steepest fall on record and the first decline covering two consecutive years in India's two-decade history as an LNG importer. Price-driven fuel-switching played the leading role in suppressing LNG demand."<sup>45</sup>

The decline in LNG consumption due to a lack of affordability is a troubling trend. Not only are countries limiting energy access to their industries as a result of high prices, but they are also switching to higher emitting and less secure sources of energy. Coal consumption in each of China, India, the U.S. and the EU has increased since 2020 (Table 8).<sup>46</sup> Europe and India in particular are expected to increase their coal consumption by 20% and 24%, respectively, between 2020 and 2023.

Canadian natural gas can play a significant role in addressing these challenges. According to McKinsey & Company, North America has natural gas resources that can meet more than 30 years of demand, at a cost below \$3/MMBtu (Figure 8).<sup>47</sup>

North American LNG can provide energy to European customers at a price below \$8/MMBtu (Figure 9).<sup>48</sup> This is one fifth of the 2022 European price, and half the 2021 price (Table 7 Above).

Providing this additional natural gas supply will stabilize energy and natural gas feedstock prices, which will in turn reduce "prices for the fertilizer, steel, cement, plastic, and glass industries."<sup>49</sup>

According to Victor Thomas, President and CEO of the Canada-India Business Council:

"India's is the fastest growing large economy globally, and it is now the most populous country on earth. While India has long term net-zero goals, it needs to meet its growing population needs, and energy affordability and reliability are paramount in this regard.

India is a very price sensitive energy market, so when LNG prices skyrocket due to geopolitical disruptions, it will look to other sources for supply. Forty per cent of India's oil now comes from Russia. It used to be 2%. While there are longer-term reliability, security of supply, and geopolitical dynamics at play, prioritizing energy affordability at scale is simply the reality of meeting the needs of the world's most populous and large growing economy.

Canada's LNG industry can be a form of insurance against price and access instability from unsafe and unreliable suppliers. The more that Canada can do to supply affordable natural gas to the global energy market, and with it bring greater stability and higher environmental and ethical standards, the better the world will be."

### Canadian Affordability Benefits

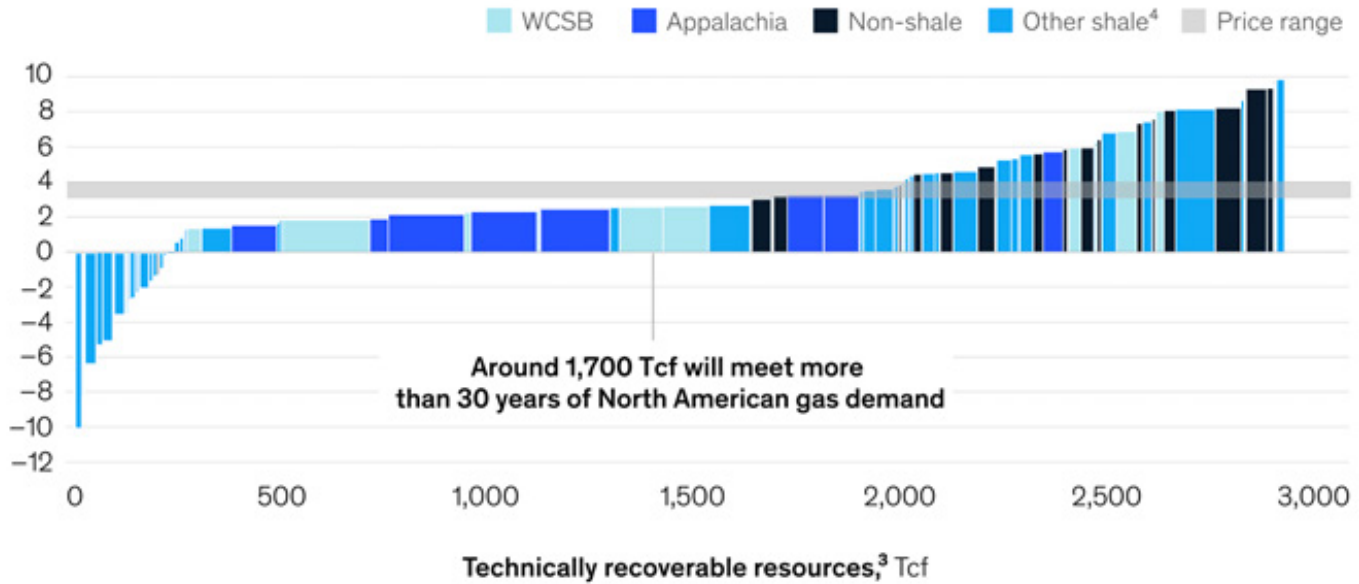
The affordability benefits of natural gas to Canada are also significant. Natural gas has proven to be a critical element of Canada's energy mix. In 2021 natural gas had the lowest delivered cost of any energy form at just \$12.05 per GJ, lower than electricity (\$38.69),

**Table 8: Coal Consumption by Region 2020- 2023F (Mt)**

	2020	2021	2022	2023F	2020-2023F % Change
China	4045	4230	4209	4252	5.1%
India	936	1053	1130	1160	23.9%
US	430	495	478	459	6.7%
EU	392	447	476	472	20.4%
World Total	7510	7947	8007	8033	7.0%

Source: World Bank 2023

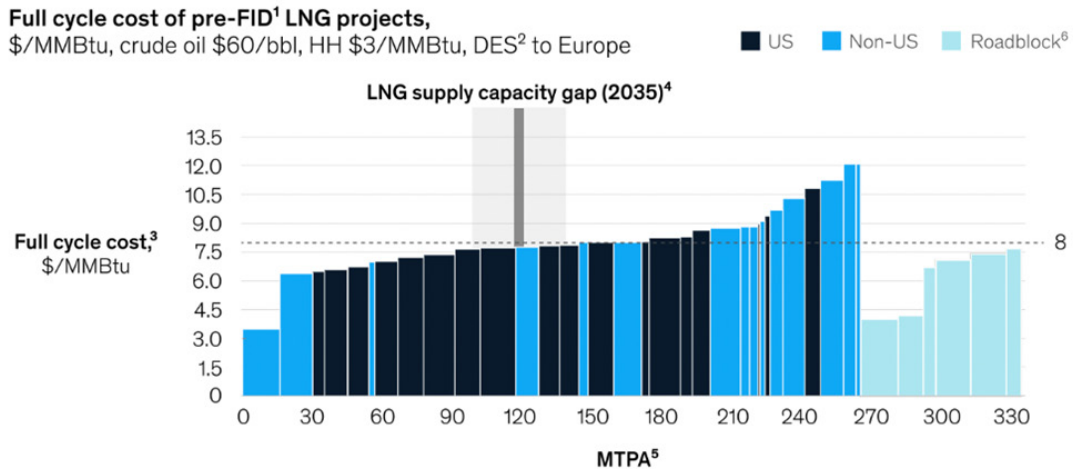
Figure 8: North America 2021 Half-Cycle Break-Even Price Curve (\$/MMBtu)



<sup>1</sup>Covers all NA gas basins with break-even price below \$10/MMBtu.  
<sup>2</sup>Break-even price normalized to Henry Hub. Assumes \$62/bbl WTI and 15 percent IRR. Excludes finding and land costs (includes drilling and completion costs and all operating costs).  
<sup>3</sup>Assumes size of production area based on basin acreage, well density, and average EUR capture rate.  
<sup>4</sup>Includes shale gas formations and light tight oil formations.  
 Source: McKinsey Energy Insights North American supply model

Source: World Bank 2023

Figure 9: Full Cycle Cost of Pre-FID LNG Projects



<sup>1</sup>Includes pre-FID projects selected in the funneling process.  
<sup>2</sup>Delivery ex-ship.  
<sup>3</sup>Capital-expenditure costs included.  
<sup>4</sup>Global LNG demand in 2035 (reference case +/- 5 percent) minus available LNG sent out from the currently existing and under-construction plants.  
<sup>5</sup>Assumed effective send out capacity (nameplate capacity x95 percent); million tons per annum.  
<sup>6</sup>Projects currently facing severe difficulties in terms of technology sanction or stakeholder alignment.  
 Source: Gas intelligence model, McKinsey Energy Insights; LNG cost curve of the future, McKinsey Energy Insights

Source: World Bank 2023

propane (\$36.72), and heating oil (\$31.89).<sup>50</sup> From an electricity generation perspective, studies from across the country have confirmed the essential reliability, affordability and emissions benefits of natural gas as a key source of electricity generation.<sup>51</sup> In terms of new generation, the CD Howe Institute found that the carbon adjusted levelized costs of major hydroelectricity projects such as Site C in BC, Keeyask in Manitoba and Muskrat Falls in Labrador exceed those of combined cycle natural gas turbines (CCGT).<sup>52</sup> “Relative to large hydro projects, the roll-out of CCGT generation can be more flexibly timed (and paired with environmental initiatives) to meet demand as it materializes.”

### 2.3. Energy Security Benefits

The Russian invasion of Ukraine has created substantial geopolitical supply and demand disruptions. Notably, the recent G7 price caps and EU import bans applied to Russian petroleum products are displacing Russian supply into the EU, creating opportunities for other sources of supply in meeting EU energy needs long term (Figure 10).<sup>53 54</sup>

While Russia focuses on establishing new linkages for its natural gas products that were intended to flow to Europe (likely towards Asia), its share of internationally traded natural gas could fall from 30% to 15% by 2030, which would be displaced by the U.S. and Middle East

(Figure 10).<sup>55</sup> In fact, the United States has already become a significant supplier of Europe’s natural gas – providing two-thirds (43 bcm) of Europe’s incremental LNG imports in 2022 alone.<sup>56</sup>

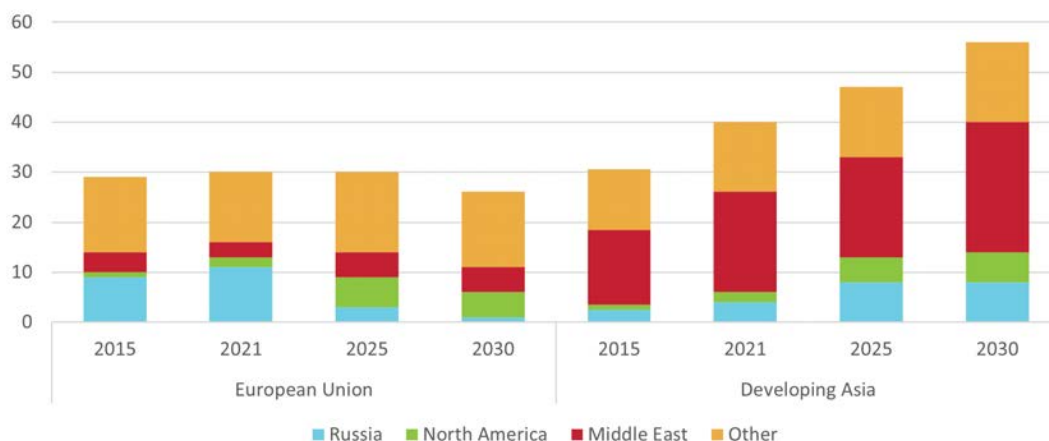
That said, countries such as India and China have increased their imports of discounted Russian oil by 40% and 20% respectively.<sup>57</sup> These countries are experiencing significant demand for energy, and are expected to do so for the foreseeable future.<sup>58</sup> Accessing affordable sources of sufficient supply is a key priority for these countries over the long term. Not only does this present an opportunity for Canadian suppliers, but there are also concerning geopolitical ramifications for the world if Russia is able to build stronger energy trade linkages than Canada and its allies into growing Asian markets on a long-term basis.

Consequently, Canada not only has an opportunity, but an imperative to contribute additional LNG supplies to global markets. The key will be for Canada to position itself to provide the supply.

According to Witold Dzielski, Polish Ambassador to Canada:<sup>59</sup>

“We would like to see Canadian gas flowing in European pipelines as quickly as possible. This is important for diversification of our energy mix, and for the security of Poland and the whole of Europe.

Figure 10: Crude Oil and Natural Gas Imports to the EU and Emerging Market and Developing Economies in Asia by Origin (STEPS)



Source: International Energy Agency 2022

The war in Ukraine is far from finished. Ukrainians need international support, countries in the region, including Poland, need international support. We need Canadian support in the context of energy, (and) to do much as possible to diversify the energy mix.

So, my request and hope for the Canadian government is to consider and open as many avenues as possible for energy cooperation. Natural gas is a very important source of energy for our region and much more could still be done.”

### Canadian Security Benefits

The development of Canada’s LNG industry is also beneficial from a domestic energy security perspective. LNG represents the key growth driver for the Canadian upstream industry, and having a robust upstream natural gas industry with deep supply chains and infrastructure capacity creates an energy security benefit that provides assurances of reliable and accessible energy for Canada’s consumption needs. This is particularly notable from an industrial demand and energy consumption

perspective. As of 2021, natural gas became the leading source of energy consumption in the country (Figure 11).<sup>60</sup>

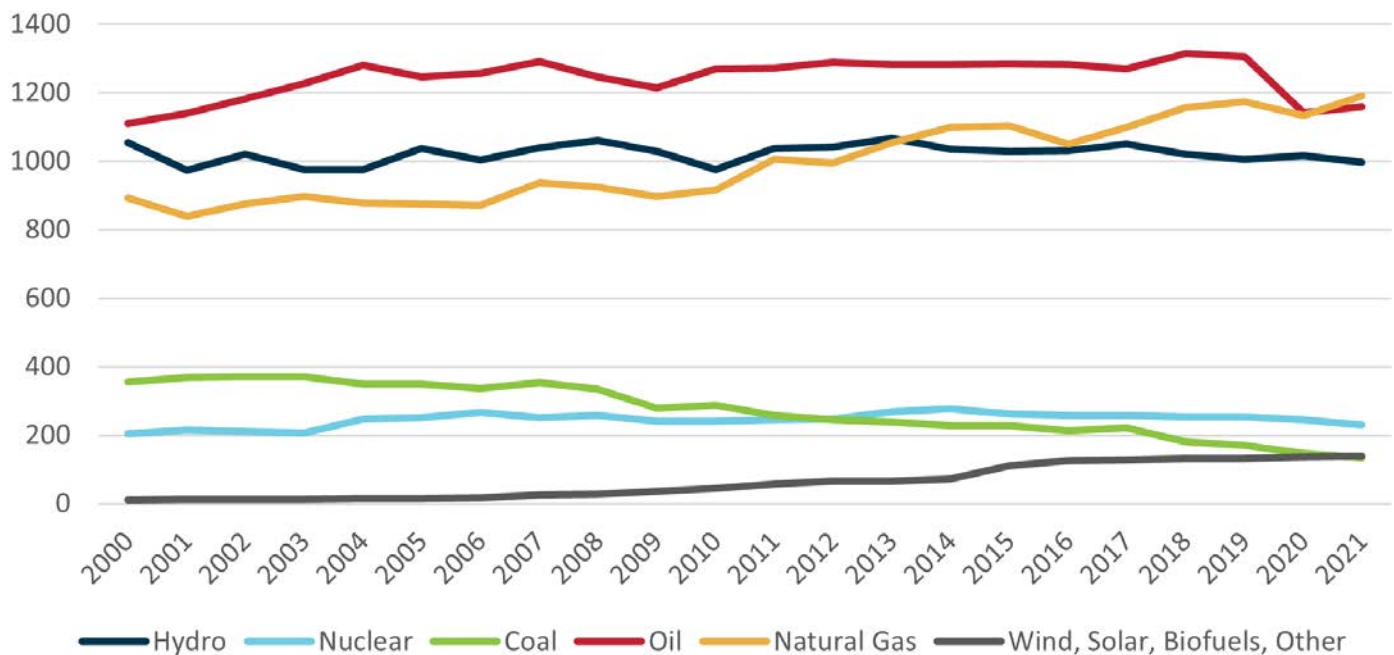
## 3. Economic Benefits to Canada

The benefits to Canadians of LNG development are substantial and diverse, and include increased economic activity and government revenues across the country, high quality employment opportunities, and benefits to Indigenous communities.

### 3.1. Benefits to Canadians and Governments

The LNG economic opportunity is compelling for the Canadian economy as a whole. If the majority of proposed LNG projects proceed, it would represent approximately 45 million tonnes of LNG per year (6 bcf/d). In terms of the economic impact, the construction, operational upstream, midstream and facility investments would create \$10.2 billion in annual GDP, \$3.6 billion in government revenues and 77,600 jobs across the country on an annual basis (Table 9).

Figure 11: Canada Primary Energy Consumption by Source



Source: Our World in Data 2023

**Table 9: Annual Economic Impact of Proposed LNG Projects (2023 dollars)**

	<b>GDP (Millions)</b>	<b>Govt Revenue (Millions)</b>	<b>Employment</b>
BC	\$7,400	\$1,800	57,300
AB	\$1,500	\$120	7,400
SK	\$72	\$7	640
MB	\$71	\$11	800
ON	\$920	\$130	8,700
QC	\$200	\$ 60	2,200
Rest of Canada (ROC)	\$56	\$6	640
Federal	NA	\$1,500	NA
Total	\$10,200	\$3,600	77,600

Source: Derived by Verum Consulting from Conference Board of Canada<sup>61</sup>

Provincially the economic impacts would be the most substantive in British Columbia (\$7.4 billion) followed by Alberta (\$1.5 billion). BC would see the greatest number of jobs (57,300), followed by Ontario (8,700), and then Alberta (7,400). In terms of government revenues, BC would earn \$1.8 billion, followed by the federal government at \$1.5 billion. The economic value chain benefits of Canadian LNG would have a deep impact on a national scale. According to Dave McHattie, Vice-President, Institutional Relations with Tenaris:

“LNG Canada alone is estimated to increase steel demand by 100,000 tonnes per year. A significant proportion of this demand is met by Canadian steel producers – many of whom are based in Ontario and whose viability is largely linked to the upstream oil and gas industry. In fact, Canada is the fourth largest market for upstream steel in the world, and a hub of steel producers globally. In the absence of the oil and gas industry, this hub would not exist and all of the economic activity and jobs would move to other countries.

The incremental LNG activity also creates capacity and expertise in the upstream services sector, which leads to innovation and efficiencies in drilling and

extracting the resource, and develops expertise in the extraction of other minerals and energy sources within Canada to meet evolving energy needs.

There are even deeper value chain impacts when considering the market for liquids produced as a result of LNG drilling. Examples include domestic petrochemical facilities and oil sands producers, who rely on diluent to blend with produced bitumen so that it will flow via pipeline.”

Beyond these linkages are the economic benefits and activities relating to other sectors such as engineering construction, finance and professional services, wholesale trade, remediation and transportation among others, which are distributed across the country.<sup>62</sup>

### **3.2. Benefits to Canadian Energy Workers**

Not only are a significant number of jobs created as a result of increased LNG investment, but these jobs are high quality. A recent study commissioned by North America’s Building Trades Unions (NABTU) analyzed the quality and benefits of job opportunities in oil and natural gas construction compared to the renewable energy sector.<sup>63</sup>



The key findings include:

- Energy sector jobs and energy sector construction jobs provide those without a college education a vital pathway to middle class careers and living standards.
- Tradespeople working in energy construction report that they consider projects in oil and natural gas industries to have better wages, benefits, and opportunities than renewables projects.
- The oil and natural gas industries offer projects with longer durations than those in renewables industries, which means steadier income and more consistent benefits.
- The industry offers better project variety, skill development, and project consistency compared to the wind and solar industries.

This is consistent with the profile of Canadian wages by industry (Figure 12).<sup>64</sup> Oil and gas average weekly earnings are the highest of any industry in the country. In fact, in 2022, oil and gas wages were approximately 40% higher than metal ore mining and electric power generation (the second and third highest paid industries).

According to Sean Strickland, Executive Director of Canada’s Building Trades Unions:<sup>65</sup>

“The unionized trades and construction workers have been involved in the natural gas industry in Canada since its inception. We’ve built much of the infrastructure related to natural gas industry and it employs thousands of workers right across Canada and puts bread on the table for thousands of families.

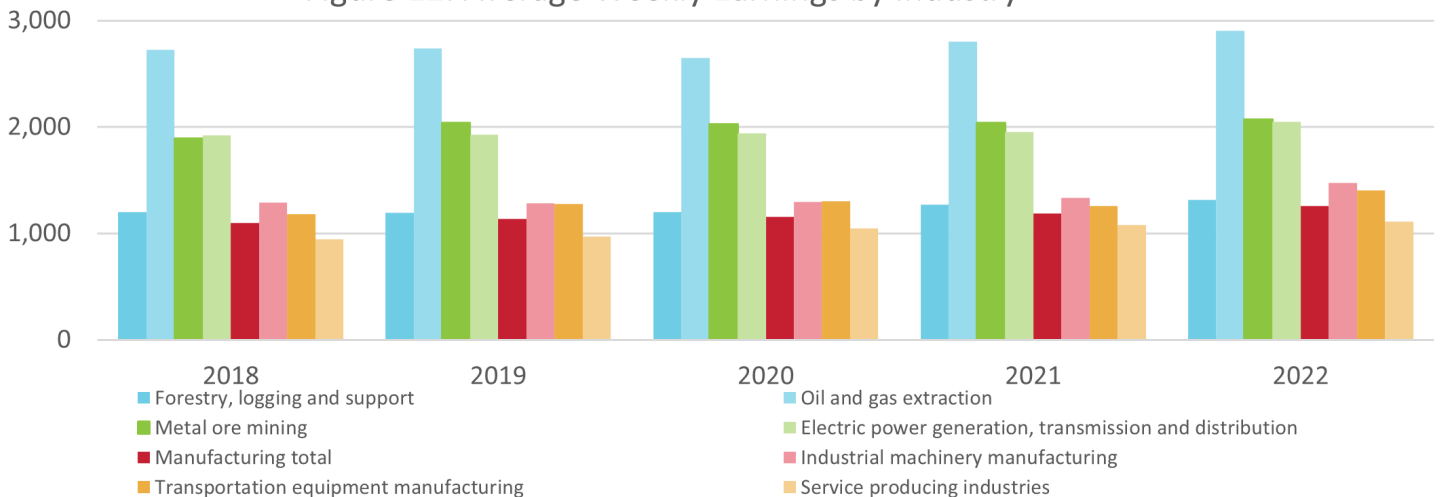
When it comes to gas and LNG, we need to look at ways in which we can expand the resource that we have in Canada and provide more economic opportunity not only for our members, but help decarbonize other countries on the planet.

The future of the natural gas industry in Canada is critically important to the overall economic future of Canada. We have an abundance of natural gas and we need to get that gas to the rest of the world.”

### 3.3. Benefits to Indigenous Communities

In 2023, Energy for a Secure Future conducted an extensive analysis of how Indigenous peoples are participating in and benefiting from natural gas and LNG projects in Canada.<sup>66</sup>

Figure 12: Average Weekly Earnings by Industry



Source: Statistics Canada. 2023. Table 14-10-0204-01 Average weekly earnings by industry, annual

Key findings include:

- Indigenous peoples in Canada make almost three times more income on average in the oil and gas sector than other industries.
- All major LNG projects in BC involve formal benefits agreements with Indigenous nations, and half involve Indigenous ownership negotiations or agreements.
- First Nations are directly involved in upstream gas production. Between 2019-2021, royalties were assessed for gas production on 47 nations.
- A number of nations own their own oil and gas upstream assets, while others are involved in the oilfield services side. Canada is home to hundreds of Indigenous businesses and thousands of Indigenous workers who supply the natural gas sector with services.
- While jobs, business contracts and royalties are still important foundations for Indigenous economies, four trends in the natural gas sector demonstrate a new era in Indigenous involvement in energy development.
  - Indigenous-led major projects, where Indigenous nations are project proponents.
  - Major Indigenous equity options in projects involving natural gas pipelines, LNG terminals and carbon capture projects.
  - An Indigenous agreement to reconcile downstream and upstream impacts and benefits, as shown in the Haisla, Nisga'a and Metlakatla Nations' MOU with Halfway River First Nation.
  - The first legally binding Indigenous-led environmental assessment in Canada, which saw the Squamish First Nation become both a partner and an environmental regulator of Woodfibre LNG.

*“ Our communities are not separate from the world, what happens in Asia or Europe affects us - projects like Cedar LNG can offer a global emissions reduction solution. This will create positive benefits for the world and for our communities.”*

- Crystal Smith, Chief Councillor, Haisla Nation

## 4. Summary and Recommendations

Clearly Canadian LNG presents a significant and compelling case in support of its development to meet global energy, environmental, affordability, and security needs. It also creates compelling possibilities for economic prosperity in our country. What is needed is the right level of focus and support from governments to take advantage of this opportunity. The federal government has developed strategies and significant policy initiatives that encourage the development of critical minerals, hydrogen, emerging energy technologies and emissions reduction investments.<sup>67</sup> However, despite its significant benefits, LNG is not comparatively prioritized. A comprehensive and strategic approach that recognizes the global and national benefits of Canadian LNG and encourages its development is needed – from a policy, regulatory, and economic competitiveness perspective. Based on the analysis presented in this report and insight from the informant interviews, this report offers the following recommendations:

1. Take a full value proposition approach to Canada's LNG opportunity. Our allies are seeking reliable energy partners who provide the secure and affordable supply of the fuels they need. Canada is well positioned to be that supply while helping to lower global emissions, creating high quality jobs and advancing reconciliation. These considerations should underpin a strategic approach and prioritization of LNG development in all of our federal energy policies – including the regulatory environment, international relations, fiscal and climate policy, and in our approach to sustainable finance – recognizing both the global and national ESG benefits of Canadian LNG.

“ The federal government has recently intensified its commitment to industrial policy and investment in a range of emerging energy technologies such as EV manufacturing, critical minerals mining, clean tech manufacturing investment and low carbon hydrogen. A similar approach for low emission type LNG projects would bolster the prospects for more project development with comparable benefits for global GHG reduction through fuel-switching and displacement of other natural gas sources with higher methane intensity.”

- Robert Johnston, Executive Director at the Center on Global Energy Policy at Columbia University

2. Create and nurture an effective, timely and predictable regulatory framework for advancing LNG projects. The regulatory approval process for major energy projects in Canada is largely viewed as lengthy, burdensome, uncertain and uncompetitive relative to other jurisdictions.<sup>68</sup> Canada needs a regulatory framework that is timely, efficient, predictable, reliable and encourages investment, while also adhering to our high ESG standards.

“ There are countries and global investors that look at the Canadian LNG opportunity and think it just makes a lot of sense. But our biggest challenge is permitting. Can we build it? We need a process that gets things built while still respecting the rights of the traditional owners and of stakeholders that are concerned about overall impacts.”

- Dominic Barton, Chair, Rio Tinto

“ We need to produce all of the new energy sources of the future, as well as our traditional energy sources like natural gas and oil, but we have to operate in a regulatory environment that has some certainty to it and does not drag on indefinitely. If the regulatory environment doesn't change, we will lose this opportunity and we can't afford to do that.”

- Sean Strickland, Executive Director, Canada's Building Trades Unions

3. Work with allies, including the United States, a key energy delivery partner, as well as current and potential customers in Europe and Asia to recognize and credit Canada for the environmental benefits of Canadian LNG displacing higher emitting energy sources in international markets. Total global emissions from electricity and heat are 14,378 mega-tonnes (MT), of which coal comprises 73%. Switching from coal to natural gas could reduce global emissions from this sector by up to 4,502 MT, or 31%.

“ We have to move towards a global mindset, beyond the national targets looked at in the Paris Agreement. For example, if Canada exports LNG our emissions will go up and we will be penalized for it, while global emissions will go down. This is the wrong approach, and the world suffers as a result. Canada has a bigger role to play in terms of global emissions reduction and international frameworks need to recognize and enable this.”

- Dominic Barton, Chair, Rio Tinto

## 5. About Verum Consulting

This report was prepared by Verum Consulting. Verum is a public policy, economics, government affairs, and stakeholder engagement consultancy. We work with a breadth of clients to develop principled, evidence-based policy positions and government and stakeholder engagement strategies that help shape public policy and regulatory design to achieve results. We have experience working with governments at all levels in various jurisdictions across the country.

Verum Consulting is led by Ben Brunnen, Principal & Founder. Ben is an executive leader with a proven track record for conducting economic and public policy analysis and developing and advancing government affairs and stakeholder engagement initiatives in jurisdictions across Canada for over 20 years. Ben is a Senior Fellow at the CD Howe Institute and holds a Master's Degree in Public Administration and a Bachelor's Degree in Economics.

Ben is a Partner at Garrison Strategy Limited and served as the Vice President of Oil Sands, Fiscal & Economic Policy at the Canadian Association of Petroleum Producers. During his tenure, Ben advanced priorities related to oil sands competitiveness, emissions policy, regulatory efficiency, ESG and production forecasting. Ben also served as the Director of Policy, Government Affairs & Chief Economist at the Calgary Chamber of Commerce where he led the economic, policy and government affairs functions for all three levels of government. Ben has worked in a number of organizations including the BC Public Service, the Canada West Foundation, and as a consultant with associations, Indigenous organizations, municipalities, businesses and academic institutions.

## References

- <sup>1</sup> International Energy Agency. 2023. Oil Market Report. March. Available at: <https://www.iea.org/reports/oil-market-report-march-2023>
- <sup>2</sup> International Energy Agency. 2023. Gas Market Report. Q1-2023. Available at: <https://iea.blob.core.windows.net/assets/c6ca64dc-240d-4a7c-b327-e1799201b98f/GasMarketReportQ12023.pdf>
- <sup>3</sup> International Energy Forum and S&P Global. 2023. Upstream Oil and Gas Investment Outlook. Available at: <https://www.ief.org/focus/ief-reports/upstream-investment-report-2023>
- <sup>4</sup> International Energy Agency. 2022. World Energy Outlook. P 42. Available at: <https://iea.blob.core.windows.net/assets/830fe099-5530-48f2-a7c1-11f35d510983/WorldEnergyOutlook2022.pdf>
- <sup>5</sup> International Energy Forum and S&P Global. 2023. Upstream Oil and Gas Investment Outlook. Available at: <https://www.ief.org/focus/ief-reports/upstream-investment-report-2023>
- <sup>6</sup> Our world in Data. Energy Mix by Source. Available at: <https://ourworldindata.org/energy-mix>
- <sup>7</sup> According to the IEA, “the Stated Policies Scenario (STEPS) shows the trajectory implied by today’s policy settings. The Announced Pledges Scenario (APS) assumes that all aspirational targets announced by governments are met on time and in full, including their long-term net zero and energy access goals. The Net Zero Emissions by 2050 (NZE) Scenario maps out a way to achieve a 1.5 °C stabilisation in the rise in global average temperatures, alongside universal access to modern energy by 2030.” (Notably, in 2050, natural gas represents 20% under STEPS, 14% under APS, and 8% under NZE). World Energy Outlook, 2022. P 20.
- <sup>8</sup> IEA. 2022. World Energy Outlook. P 453. Available at: <https://iea.blob.core.windows.net/assets/830fe099-5530-48f2-a7c1-11f35d510983/WorldEnergyOutlook2022.pdf>
- <sup>9</sup> IEA. World Energy Outlook. 2022. Pp 377. Available at: <https://iea.blob.core.windows.net/assets/830fe099-5530-48f2-a7c1-11f35d510983/WorldEnergyOutlook2022.pdf>
- <sup>10</sup> International Energy Agency. 2023. Gas Market Report. Q1-2023. P 9. Available at: <https://iea.blob.core.windows.net/assets/c6ca64dc-240d-4a7c-b327-e1799201b98f/GasMarketReportQ12023.pdf>
- <sup>11</sup> International Energy Agency. 2023. Gas Market Report. Q1-2023. P 10. Available at: <https://iea.blob.core.windows.net/assets/c6ca64dc-240d-4a7c-b327-e1799201b98f/GasMarketReportQ12023.pdf>
- <sup>12</sup> IEA. 2022. World Energy Outlook. P 382. Available at: <https://iea.blob.core.windows.net/assets/830fe099-5530-48f2-a7c1-11f35d510983/WorldEnergyOutlook2022.pdf>
- <sup>13</sup> S&P Global. 2021. LNG Market Outlook. Available at: <https://www.spglobal.com/commodityinsights/en/ci/products/lng-market-outlook-demand-forecast.html>

<sup>14</sup> Global LNG Hub. 2023. Global LNG liquefaction capacity is set to expand by over 36%. Available at: <https://globallnghub.com/global-lng-liquefaction-capacity-is-set-to-expand-by-over-36.html>

<sup>15</sup> Canadian Energy Regulator. 2023. Marketable Natural Gas Production in Canada. Available at: <https://www.cer-rec.gc.ca/en/data-analysis/energy-commodities/natural-gas/statistics/marketable-natural-gas-production-in-canada.html>

<sup>16</sup> Oil and Gas Investing. 2023. Top 10 Natural Gas Producers by Country. Available at: <https://investingnews.com/top-natural-gas-producers/>

<sup>17</sup> Canadian Gas Association. 2023. Natural Gas Facts. Available at: <https://www.cga.ca/natural-gas-statistics/natural-gas-facts/#:~:text=How%20much%20natural%20gas%20resource,the%20use%20of%20natural%20gas%3F>

<sup>18</sup> Energy Information Agency. 2022. Natural gas explained: Natural gas imports and exports. Available at: <https://www.eia.gov/energyexplained/natural-gas/imports-and-exports.php#:~:text=Most%20of%20U.S.%20natural%20gas,of%20total%20natural%20gas%20imports>

<sup>19</sup> Tourmaline Oil announced a 15-year supply agreement with Cheniere Energy for LNG exports, to start in 2023. Cheniere Energy also agreed to a 15-year supply deal with ARC Resources in May 2022, to start in 2027. Available at: <https://lngir.cheniere.com/news-events/press-releases/detail/224/cheniere-corpus-christi-stage-iii-and-tourmaline-sign> and <https://lngir.cheniere.com/news-events/press-releases/detail/247/cheniere-corpus-christi-stage-iii-and-arc-resources-sign>

<sup>20</sup> Energy Information Agency. 2023. Liquefied U.S. Natural Gas Exports. Available at: [https://www.eia.gov/todayinenergy/detail.php?id=55741#:~:text=In%20our%20March%20STEO%2C%20we,Bcf%2Fd\)%20next%20year](https://www.eia.gov/todayinenergy/detail.php?id=55741#:~:text=In%20our%20March%20STEO%2C%20we,Bcf%2Fd)%20next%20year)

<sup>21</sup> Pipeline and Gas Journal. 2022. US, Canada Natural Gas Output Could Feel Growing Pains In 2023. Available at: <https://pgjonline.com/news/2022/december/us-canada-natural-gas-output-could-feel-growing-pains-in-2023>

<sup>22</sup> National Energy Board. 2017. Canada's Role in the Global LNG Market Energy Market Assessment. P18 Available at: <https://www.cer-rec.gc.ca/en/data-analysis/energy-commodities/natural-gas/report/archive/2017-lng-market/2017lngmrkt-eng.pdf>

<sup>23</sup> Shell Global. LNG Canada. Available at: <https://www.shell.com/about-us/major-projects/lng-canada.html#:~:text=LNG%20Canada%20will%20initially%20consist,tonnes%20of%20LNG%20per%20year>

<sup>24</sup> Canadian Energy Centre. 2023. Woodfibre LNG Plans Construction Kick-off. Available at: <https://www.canadianenergycentre.ca/woodfibre-lng-plans-construction-kick-off/#:~:text=Woodfibre%2C%20with%20a%20completion%20date,coal%2Dfired%20power%20in%20Asia>

<sup>25</sup> Cedar LNG. 2023. Cedar LNG Receives BC Environmental Approval. Available at: <https://www.cedarlng.com/cedar-lng-receives-b-c-environmental-approval-and-signs-memorandum-of-understanding-with-arc-resources-ltd/>

<sup>26</sup> The Globe and Mail. 2023. Ksi Lisims LNG set to Undergo BC-Led Environmental Review. Available at: <https://www.theglobeandmail.com/business/article-ksi-lisims-lng-set-to-undergo-bc-led-environmental-review/>



<sup>27</sup>Government of British Columbia Environmental Assessments. Tilbury Phase 2 LNG Expansion. Available at: <https://www.projects.eao.gov.bc.ca/p/5df7f1bfb7434b002164961c/project-details>

<sup>28</sup> IEA. World Energy Outlook. 2022. P 435. Available at: <https://iea.blob.core.windows.net/assets/830fe099-5530-48f2-a7c1-11f35d510983/WorldEnergyOutlook2022.pdf>

<sup>29</sup>Energy Education. Fuel Energy Density. Available at: [https://energyeducation.ca/encyclopedia/Energy\\_density](https://energyeducation.ca/encyclopedia/Energy_density)

<sup>30</sup> Phys Org. 2018. Renewable energy sources can take up to 1000 times more space than fossil fuels. Available at: <https://phys.org/news/2018-08-renewable-energy-sources-space-fossil.html>

<sup>31</sup> American Geosciences Institute. 2023. How much carbon dioxide is produced when different fuels are burned? Available at: <https://www.americangeosciences.org/critical-issues/faq/how-much-carbon-dioxide-produced-when-different-fuels-are-burned>

<sup>32</sup> Sustainability Magazine. 2022. Top 10 energy sources: what are they and who has the most? Blaise Hope. Available at: <https://sustainabilmag.com/net-zero/top-10-energy-sources-what-are-they-and-who-has-the-most-emissions-net-zero-oil-coal-wind-solar-nuclear>

<sup>33</sup> Our World in Data. 2023. Greenhouse Gas Emissions and Energy Mix. Available at: <https://ourworldindata.org/co2-and-greenhouse-gas-emissions> and <https://ourworldindata.org/energy-mix>

<sup>34</sup> International Energy Agency. 2022. World Energy Outlook. P 439. Available at: <https://iea.blob.core.windows.net/assets/830fe099-5530-48f2-a7c1-11f35d510983/WorldEnergyOutlook2022.pdf>

<sup>35</sup> Canadian Association of Petroleum Producers. 2019. How does Canadian LNG stack up versus coal for GHGs? Available at: [https://context.capp.ca/infographics/2019/infographic\\_canadian-lng-vs-coal-2/](https://context.capp.ca/infographics/2019/infographic_canadian-lng-vs-coal-2/)

<sup>36</sup> In the Journal of Cleaner Energy Production article *Greenhouse-gas emissions of Canadian liquefied natural gas for use in China: Comparison and synthesis of three independent life cycle assessments*, (Volume 258, 10 June 2020, 120701), the authors studied the GHG benefits of Canadian LNG in displacing coal for electricity production in China. The authors found that the GHG emissions of Canadian LNG to China for power and heat generation could result in a 34%–62% reduction could be achieved per kWh of power generated. Available at: <https://www.sciencedirect.com/science/article/abs/pii/S0959652620307484>

<sup>37</sup> Royal Bank of Canada. 2023. Canada's Conundrum: Three Ways To Address The World's Gas & Climate Crises. Available at: <https://thoughtleadership.rbc.com/canadas-conundrum-three-ways-to-address-the-worlds-gas-climate-crises/>

<sup>38</sup> The emissions trade off, however, is that the Canadian sector's emissions increase by 66%.

<sup>39</sup> These reflect Robert Johnston's personal views and not those of the University or the Centre.

<sup>40</sup> U.S. Energy Information Administration. Natural Gas Explained. Available at: <https://www.eia.gov/energyexplained/natural-gas/use-of-natural-gas.php#:~:text=The%20commercial%20sector%20uses%20natural,combined%20heat%20and%20power%20systems>

<sup>41</sup> International Energy Agency. 2022. World Energy Outlook. P. 45. Available at: <https://iea.blob.core.windows.net/assets/830fe099-5530-48f2-a7c1-11f35d510983/WorldEnergyOutlook2022.pdf>

<sup>42</sup> Our World in Data. 2023. Share of Electricity from Gas. Available at: <https://ourworldindata.org/fossil-fuels>

<sup>43</sup> World Bank. 2023. Pink Sheet. Available at: <https://www.worldbank.org/en/research/commodity-markets>

While prices are expected to moderate in 2023, they will remain elevated relative to 2021 levels.

<sup>44</sup> International Energy Agency. 2023. Gas Market Report. Q1-2023. P. 32. Available at: <https://iea.blob.core.windows.net/assets/c6ca64dc-240d-4a7c-b327-e1799201b98f/GasMarketReportQ12023.pdf>

<sup>45</sup> International Energy Agency. 2023. Gas Market Report. Q1-2023. P. 34. Available at: <https://iea.blob.core.windows.net/assets/c6ca64dc-240d-4a7c-b327-e1799201b98f/GasMarketReportQ12023.pdf>

<sup>46</sup> International Energy Agency. 2022. Global coal consumption, 2020-2023. Available at: <https://www.iea.org/data-and-statistics/charts/global-coal-consumption-2020-2023>

<sup>47</sup> McKinsey & Company. 2022. How North American natural gas could alleviate the global energy crisis. Available at: <https://www.mckinsey.com/industries/oil-and-gas/our-insights/how-north-american-natural-gas-could-alleviate-the-global-energy-crisis>

<sup>48</sup> McKinsey & Company. 2022. How North American natural gas could alleviate the global energy crisis. Available at: <https://www.mckinsey.com/industries/oil-and-gas/our-insights/how-north-american-natural-gas-could-alleviate-the-global-energy-crisis>

<sup>49</sup> McKinsey & Company. 2022. How North American natural gas could alleviate the global energy crisis. Available at: <https://www.mckinsey.com/industries/oil-and-gas/our-insights/how-north-american-natural-gas-could-alleviate-the-global-energy-crisis>

<sup>50</sup> Canadian Gas Association. Natural Gas Facts. Available at: <https://www.cga.ca/natural-gas-statistics/natural-gas-facts/#:~:text=How%20much%20natural%20gas%20resource,the%20use%20of%20natural%20gas%3F>

<sup>51</sup> See IESO 2021. Decarbonization and Ontario's Electricity System. Available at: <https://www.ieso.ca/en/Learn/The-Evolving-Grid/Natural-Gas-Phase-Out-Study>

See AESO. 2022. AESO Net-Zero Emissions Pathways Report. Available at: <https://www.aeso.ca/future-of-electricity/net-zero-emissions-pathways/#:~:text=AESO%20Net%2DZero%20Report&text=The%20report%20reviews%20potential%20supply,and%20supply%20and%20transmission%20costs>

<sup>52</sup> CD Howe. 2019. A.J. Goulding, Jarome Leslie. Dammed If You Do: How Sunk Costs Are Dragging Canadian Electricity Ratepayers Underwater. Available at: <https://www.cdhowe.org/public-policy-research/dammed-if-you-do-how-sunk-costs-are-dragging-canadian-electricity-ratepayers-underwater>

<sup>53</sup> S&P Global. 2023. OPEC+ crude oil production drops in March as sanctions hit Russian output: Platts survey. Available at: [https://www.spglobal.com/commodityinsights/en/market-insights/latest-news//041123-opec-crude-oil-production-drops-in-march-as-sanctions-hit-russian-output-platts-survey?\\_its=JTdCJTlydmlkJTlyJTNBjTlyZGJiZTEzMGEtOWNiMi00Y2VILWE3YjltMDhiYzIxM2YxOGE2JTlyJTJDJTIyc3RhdGUIMjIIM0EIMjJybHR%2BMTY4MTQ4MjYwMn5sYW5kfjJfMTA4MDNfdXRtXzc5MzFkY2Y3MDIjMjY3NmZMDQ1MGNjZjAwYzVhZkZlJTlyJTdE](https://www.spglobal.com/commodityinsights/en/market-insights/latest-news//041123-opec-crude-oil-production-drops-in-march-as-sanctions-hit-russian-output-platts-survey?_its=JTdCJTlydmlkJTlyJTNBjTlyZGJiZTEzMGEtOWNiMi00Y2VILWE3YjltMDhiYzIxM2YxOGE2JTlyJTJDJTIyc3RhdGUIMjIIM0EIMjJybHR%2BMTY4MTQ4MjYwMn5sYW5kfjJfMTA4MDNfdXRtXzc5MzFkY2Y3MDIjMjY3NmZMDQ1MGNjZjAwYzVhZkZlJTlyJTdE)

<sup>54</sup> International Energy Agency. 2022. World Energy Outlook. October. Pp54-57. Available at: <https://iea.blob.core.windows.net/assets/830fe099-5530-48f2-a7c1-11f35d510983/WorldEnergyOutlook2022.pdf>

<sup>55</sup> International Energy Agency. 2022. World Energy Outlook. October. P 57, 56. Available at: <https://iea.blob.core.windows.net/assets/830fe099-5530-48f2-a7c1-11f35d510983/WorldEnergyOutlook2022.pdf>

<sup>56</sup> Other swing suppliers include: Qatar (5 bcm), Egypt (5 bcm), Norway (3 bcm), Angola (2 bcm), Russia (2 bcm) and Trinidad and Tobago (2 bcm). International Energy Agency. 2023. Gas Market Report. Q1-2023. P 13. Available at: <https://iea.blob.core.windows.net/assets/c6ca64dc-240d-4a7c-b327-e1799201b98f/GasMarketReportQ12023.pdf>

<sup>57</sup> International Energy Agency. 2023. Oil Market Report. March.

<sup>58</sup> International Energy Agency. 2021. Energy in India Today. Available at: <https://www.iea.org/reports/india-energy-outlook-2021/energy-in-india-today>

<sup>59</sup> CGA Energy Magazine “An Interview with Polish Ambassador Witold Dzielski, Available at: <https://www.cga.ca/energy-magazine-post/an-interview-with-polands-new-ambassador-to-canada-witold-dzielski/> (Issue 2, 2022)

<sup>60</sup> Our World in Data. 2023. Energy Mix. Available at: <https://ourworldindata.org/energy-mix>

<sup>61</sup> Conference Board of Canada. 2020. A rising Tide: the Economic Impact of B.C.’s LNG Industry. Available at: [https://www.conferenceboard.ca/wp-content/uploads/woocommerce\\_uploads/reports/10763\\_IB\\_Rising-Tide.pdf](https://www.conferenceboard.ca/wp-content/uploads/woocommerce_uploads/reports/10763_IB_Rising-Tide.pdf)

<sup>62</sup> Conference Board of Canada. 2020. A rising Tide: the Economic Impact of B.C.’s LNG Industry. P. 13. Available at: [https://www.conferenceboard.ca/wp-content/uploads/woocommerce\\_uploads/reports/10763\\_IB\\_Rising-Tide.pdf](https://www.conferenceboard.ca/wp-content/uploads/woocommerce_uploads/reports/10763_IB_Rising-Tide.pdf)

<sup>63</sup> North American Building Trades Unions. 2020. NABTU Issues Two New Studies Showing the Great Opportunities and Job Quality Importance of Energy Construction. Available at: [https://nabtu.org/press\\_releases/two-new-energy-construction-studies/](https://nabtu.org/press_releases/two-new-energy-construction-studies/)

<sup>64</sup> Statistics Canada. Table 14-10-0204-01 Average weekly earnings by industry, annual <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410020401>

<sup>65</sup> CBTU is comprised of 40 affiliated unions, representing every kind of skilled tradesperson in the construction industry - 600,000 members coast to coast.

<sup>66</sup> Energy for a Secure Future. 2023. Ownership and Beyond: How Indigenous Peoples Are Shaping a More Secure Energy Future. Prepared by Heather Exner-Pirot & Zachary Authier. Available at: <https://energysecurefuture.ca/paper/ownership-and-beyond-how-indigenous-peoples-are-shaping-a-more-secure-energy-future>

<sup>67</sup> See: Government of Canada. 2023. Budget 2023: A Made-In-Canada Plan. Available at: <https://www.budget.canada.ca/2023/pdf/budget-2023-en.pdf>

Government of Canada. 2022. 2030 Emissions Reduction Plan: Clean Air, Strong Economy. Available at: <https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/emissions-reduction-2030.html>

Government of Canada. 2020. A Hydrogen Strategy for Canada. Seizing the Opportunities for Hydrogen: A call to Action. Available at: [https://natural-resources.canada.ca/sites/nrcan/files/environment/hydrogen/NRCan\\_Hydrogen-Strategy-Canada-na-en-v3.pdf](https://natural-resources.canada.ca/sites/nrcan/files/environment/hydrogen/NRCan_Hydrogen-Strategy-Canada-na-en-v3.pdf)

Canadian Critical Minerals Strategy. 2022. Available at: <https://www.canada.ca/en/campaign/critical-minerals-in-canada/canadian-critical-minerals-strategy.html>

<sup>68</sup> Examples of studies and commentary on Canadian regulatory efficiency and effectiveness include:

Business Council of Canada. 2023. Accelerating major project approvals gives Canada a competitive advantage. Available at: <https://thebusinesscouncil.ca/publication/accelerating-major-project-approvals-gives-canada-a-competitive-advantage/>

Canadian Energy Research Institute. 2020. Competitiveness of Canada's Regulatory Framework for the Oil and Gas Sector. Available at: <https://www.policyschool.ca/cei-canadian-energy-research-institute/>

Oxford Institute for Energy Studies. 2019. Canadian LNG Competitiveness. Available at: <https://www.oxfordenergy.org/wpcms/wp-content/uploads/2019/12/Canadian-LNG-Competitiveness-NG-156.pdf>

Globe and Mail. 2023. Ring of Fire project at risk due to red tape and cumbersome consultation process, billionaire owner says. Available at: <https://www.theglobeandmail.com/business/article-ring-of-fire-forrest-trudeau-letter/>

## Interviews:

- Dominic Barton, Chair, Rio Tinto and former Canadian Ambassador to China
- RJ Johnston, Executive Director at the Center on Global Energy Policy at Columbia University, Founder Eurasia Group
- Dave McHattie, Vice President, Institutional Relations with Tenaris
- Crystal Smith, Chief Councillor, Haisla Nation
- Sean Strickland, Executive Director, Canada's Building Trades Unions
- Victor Thomas, President and CEO, Canada India Business Council