# TURNING TIDES

## The economic risks of B.C.'s LNG expansion in a changing energy market

Maeve O'Connor

Carbon Tracker Initiative

Analyst Report | October 2024

## About Carbon Tracker

The Carbon Tracker Initiative is a team of financial specialists making climate risk real in today's capital markets. Our research to date on unburnable carbon and stranded assets has started a new debate on how to align the financial system in the transition to a low carbon economy.

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# Table of Contents

# 1 Key Findings

- **The LNG market is likely to be oversupplied by the end of this decade** as a glut of new production comes online from recently sanctioned projects
- **LNG demand out to 2040 under the IEA's fast, moderate, and slow transition scenarios is met by supply from existing projects;** all new projects (from 2024 onwards) are at risk of generating lower returns than anticipated at the point of investment.
- **British Columbia's (B.C.) unsanctioned LNG projects lie far up the global cost curve for LNG;** we find that significant volumes can be supplied at lower prices from producers like Qatar, the US, and Mozambique.
- **All of B.C.'s proposed LNG projects are at risk of generating lower than expected returns under a fast, moderate and slow transition scenario.**
    - All but two – Ksi Lisims and Tilbury Phase 1B - are at risk under even under Shell's more bullish view of future LNG demand.
- **B.C.'s production will ramp up as global LNG production plateaus around its highest point** – the province will not have a first mover advantage, and its output will be competing on a highly competitive global market.
- **B.C. will be a late entrant to an LNG market dominated by lower-cost, more established incumbents with better opportunities for economies of scale;** investors should duly account for these factors when approaching sanctioning decisions.
- **The challenges facing B.C.'s nascent LNG industry offer a case study for investors** looking to enter the industry: an accelerating transition and consequent decline in demand for LNG could negatively impact LNG project economics.
- **Policymakers in B.C. should be aware that long term fiscal revenue streams from LNG are far from guaranteed;** large-scale investment in LNG carries an opportunity cost versus investing in a clean energy system which would generate long-economic growth as the energy transition accelerates.

# 2 Introduction

It is becoming increasingly clear that fossil fuels will play a much smaller role in global energy systems in years to come: cheaper, domestically-produced renewable energy sources now account for 30% of global electricity generation, and the world is approaching a crucial tipping point whereby fossil energy generation begins to decline in absolute terms.[1] Coupled with accelerating electric vehicle adoption and the electrification of industrial processes, these trends mean that peak fossil fuels is growing ever closer; the IEA predicts that demand for oil, gas, and coal will all peak before 2030.[2]

### Some producers are prioritizing gas and LNG as recognition grows that oil demand will fall

Oil and gas producers now need to contend with a shrinking market for their traditional products.[3] In response, some companies are shifting focus to gas and Liquefied Natural Gas (LNG) production:[4] both are increasingly promoted as "transition fuels" for economies transitioning from (particularly) coal to renewables. The fact remains, however, that the energy transition will erode demand for gas (piped and LNG), albeit at a slightly slower pace than oil: any window that there may be for gas to act as a transition fuel is shortening.[5]

LNG is an opportunity for gas producers to access much wider markets than they would have traditionally, where gas is traded bilaterally between buyers and suppliers via fixed pipeline infrastructure. Liquefying the gas enables it to be transported via tanker, effectively creating a global market for gas. The industry's recent push into LNG has seen a surge in buildouts of new LNG plants, and global production capacity is expected to increase by c.50% by 2030.[6]

In the face of this massive industry push into LNG, it is imperative for investors and policymakers to assess both the assumptions underlying the putative investment case and the risks involved should they be miscalculated.

### Proponents of LNG cite an investment case underpinned by increasing demand and insufficient existing supply

There are two key assumptions that underpin the investment case for new LNG projects:

i) Demand for LNG will rise, most notably in Asia
ii) Supply from already sanctioned LNG projects is insufficient to meet future demand.

Discerning the extent to which these assumptions hold true is critically important for corporates when deciding whether to sanction new LNG projects. Investing in new LNG projects whose output is not needed to fulfil future demand, or which will be outcompeted on the global LNG markets, could result in investments generating lower-than-expected returns. State investors in export projects may expose public finances to lower-than-anticipated future revenues, while importing countries building

[1] Ember, World passes 30% renewable electricity milestone (07/05/24)
[2] IEA, World Energy Outlook (2023)
[3] See Carbon Tracker, Navigating Peak Demand (2023) for a full discussion on oil and gas company strategies in the face of declining demand for oil and gas.
[4] Bloomberg, A $290 Billion Investment Cements Natural Gas's Relevance for Decades (11/01/24)
[5] IEA, World Energy Outlook (2023)
[6] IEEFA, Global LNG Outlook 2024-2028 (2024)

new regasification terminals may forego an opportunity to develop less at-risk energy sources, like solar PV and wind, coupled with storage.

It is not only LNG plants themselves which are exposed to effects of transition risk: the infrastructure built to support terminals – like pipelines and tankers – are also exposed to various risks as a result of falling demand for LNG (Box 1).

**BOX 1: RISKS TO MIDSTREAM LNG INFRASTRUCTURE**

In addition to the general demand substitution risks facing the oil and gas industry, LNG operators must also contend with a set of risks which are particularly relevant to midstream infrastructure.[7] These include:

- **Policy risk** – the engineering, construction, and operation of LNG assets is heavily regulated. Risks of further policy action could increase as climate action accelerates, e.g., the US government's decision to halt new LNG export licences, effectively putting 17 planned projects on pause.[8] Other regulatory risks include higher carbon taxes, stricter emissions performance standards, and sanctions for environmental breaches.
- **Development risk** – New or additional LNG terminals may require new or increased capacity pipelines. Effectively 'single use' infrastructure, the pipelines' economic value could decline alongside the profitability of the terminal itself.
- **Contractual risk** – as buyers shift away from long-term 'take-or-pay' agreements towards short term, market-based pricing mechanisms and purchase agreements, the likelihood of securing long term, stable revenues decreases.[9]
- **Physical risk** – LNG assets are usually built in coastal locations which can be at high risk of damage from rising sea levels and extreme weather events in the future. A substantial share of global LNG capacity is located in such areas, which include the Pacific Northwest and virtually all of South-East Asia.[10]
- **Transportation risk** – a related but distinct risk is to maritime trade routes, which can be affected not only by extreme weather events but also by geopolitical factors.[11] Such disruptions could result in rerouting, shipment delays, and, for companies that own rather than charter LNG carriers, higher operating costs.

## The nascent LNG industry in British Columbia is a case study in the transition risks inherent in LNG investments

British Columbia (B.C.) in Western Canada is at the cusp of expanding its nascent LNG export industry, a strategy for which there have been plans since the early 2010s.[12] One large LNG

[7] Carbon Tracker, Midstream Running Dry (2023)
[8] White House, FACT SHEET: Biden-Harris Administration Announces Temporary Pause on Pending Approvals of Liquefied Natural Gas Exports (26/01/24); FT, Joe Biden halts permits for LNG projects under climate campaign pressure (26/01/24)
[9] S&P Global, LNG buyers seek to dismantle rigid long-term contract structures in flexibility push (28/09/23)
[10] See BBC, What are El Nino and La Nina, and how do they change the weather? (16/04/24); ASaP, LNG Terminals over the world: Complete list and map 2024 (n.d.).
[11] OIES, LNG Shipping Chokepoints: The Impact of Red Sea and Panama Canal Disruption (2024)
[12] There is a small amount of existing LNG production in B.C., mainly for marine fuel.

terminal is to commence operations by mid-2025,[13] two more have been sanctioned,[14] and there are further plans for three more projects or project expansions.

An LNG industry has been promoted as means for producers to monetise dry gas reserves from the Montney Formation, even as North American demand for gas falls. Policymakers have weighed in on both sides, with some emphasizing the potential of the industry to bring economic benefits to the region,[15] while others question the compatibility of a new fossil fuel-based industry with the province's (and the country's) climate and environmental commitments.[16]

This report examines the risks to an LNG industry in B.C. To do so, we first examine the future supply and demand dynamics of an LNG market under different paces of transition and find that all new LNG projects are at risk under even a slow transition scenario. We then examine the cost competitiveness of projects in B.C. versus other producers, finding that B.C. LNG is outcompeted on price. Sanctioning such high-cost projects in B.C. could have stark implications for investors.

LNG terminals are massive[17] capital-intensive infrastructure projects with long payback periods[18] and even longer lifespans: while the oil and gas industry may attest that LNG is a transition-proof fuel, the reality is that such investments, like all fossil fuels investments, are increasingly exposed to significant transition risks as energy systems develop, and risk becoming financially stranded.

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[13] Offshore Energy, Canada's first large-scale LNG export facility closing in on start-up date (09/07/24)
[14] Cedar LNG, Cedar LNG Announces Positive Final Investment Decision (25/06/24)
15 See e.g.., BC United's pledge to "go all-in on LNG", BC United, Hidden B.C. government report reveals CleanBC will kill 200,000 jobs, cut services and make British Columbians poorer (21/11/23)
[16] E.g. the BC Green Party opposes LNG development, see BC Greens, LNG is not our future [accessed 11/06/24]
[17] E.g., LNG Canada is the largest private investment in Canadian history. LNG Canada, Launching an Entirely New Canadian Industry (07/03/24)
[18] IEA, World Energy Outlook 2023 (2023)

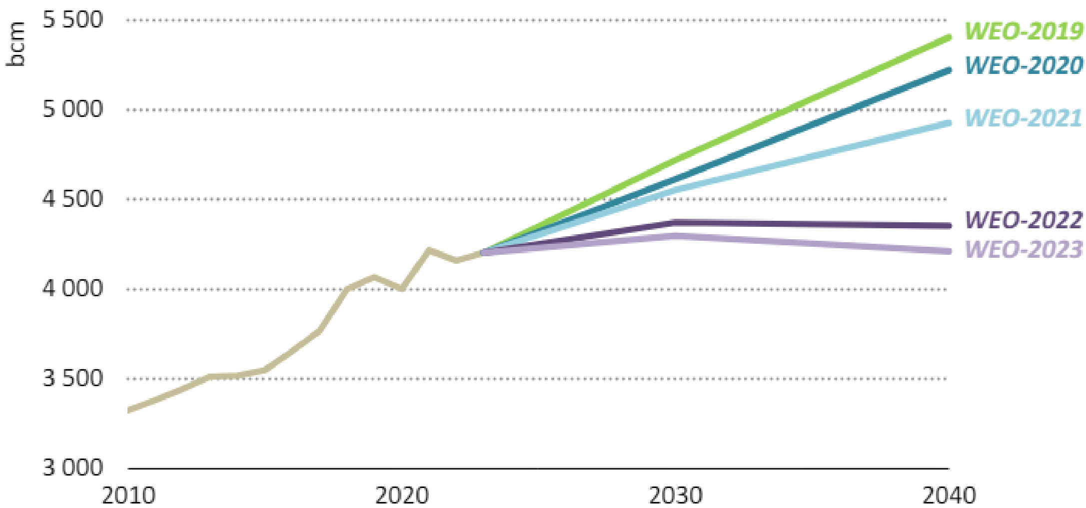
# 3 Challenging Key LNG Investment Assumptions

Here, we challenge two of the key assumptions that underpin the positive investment case for new LNG projects both in British Columbia and elsewhere: that demand for LNG will increase in the future, and that more production is needed to meet future demand.

## 3.1 Assumption 1: Natural gas demand will grow

Underpinning much of the recent investment in LNG has been an assumption that demand for natural gas as an energy source will grow over the next decades. However, demand projections from both the industry and forecasting agencies indicate otherwise: for instance, bp's Outlook for gas demand in 2040 (in their highest-demand scenarios) has been revised downwards by c.17% between 2019 and 2023,[19] and the IEA has also revised its forecasts of gas demand down significantly since 2019 (Figure 1); the agency now expects gas demand to reach a plateau by 2030.

**FIGURE 1: DOWNWARD REVISIONS IN IEA CENTRAL NATURAL GAS DEMAND FORECAST, 2019-2023**




*Source: IEA, World Energy Outlook 2023. Notes: bcm per annum; 1 bcm = 35.315 bcf[20]; 2040 range equal to c.147,500 – 189,700 bcf.*

These downward revisions in overall natural gas demand have fed through to estimations of future LNG demand. Even industry players with vested interests in LNG demand growth have revised their expectations of future demand downwards: Shell recently cut its forecasted range for LNG demand in 2040 by as much as 14% (depending on the scenario), and the company now expects global LNG demand to peak in the 2040s.[21]

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[19] The company's 2019 forecast saw gas demand reach c. 5400bcm in 2040; in 2023, the company's New Momentum scenario (which is the company's highest demand scenario) forecasts gas demand in 2040 at c. 4500bcm. bp, Energy Outlook 2019 (2019) p.95; bp Energy Outlook 2023 (2023), p.49

[20] bp, Statistical Review of World Energy (2022)

[21] Shell's 2023 forecast forecasts LNG demand in the range of c. 650-720Mpta; in 2024 that was revised down to c. 620-680Mtpa; Shell, LNG Outlook 2023 (2023), Shell, LNG Outlook 2024 (2024)

### Gas price volatility has minimized LNG's appeal to some importing nations…

Asia is commonly cited as a key growth market for LNG exporters and many recently sanctioned projects are explicit in targeting the region.[22] Policymakers in Asian importing markets, however, are increasingly reassessing their LNG strategy: the surge in global gas prices in 2022 demonstrated that dependence on volatile gas markets can threaten both an importer's economic growth, and the security and stability of national energy grids. Carbon Tracker explored this issue in a 2022 report, Stop Fuelling Uncertainty, which offers a market-by-market analysis of power sector economics in Asia and the risk implications of increased dependency on LNG.

Pakistan, for example, announced in 2023 that it would halt the construction of new LNG-fired power plants following the surge in global LNG prices in 2022.[23] Thailand's state-owned power utility became deeply indebted in 2022 after it was forced to subsidise expensive imports; it is now targeting a 50% increase in production at certain domestic gas fields to reduce exposure to LNG markets.[24]

### …where LNG faces stiff price competition from coal and renewables

Gas price volatility could help to tip the policy balance further in favour of renewables, which are now cheaper sources of power than gas and LNG in many Asian markets.[25] The levelized cost of energy (LCOE) from solar PV, for example, is already lower than gas in some jurisdictions and is forecast to decline further in the coming decades; no such reductions are expected for the cost of gas.[26] Renewables and nuclear power are already eroding power sector LNG demand in Japan and South Korea (the world's second and third largest LNG importers)[27] a trend which is set to accelerate: in South Korea, LNG's proportion of the energy mix is expected to fall from 27% in 2023 to 9% in 2036.[28]

Coal is the other key energy source in Asia; one which LNG is often touted to replace. The relative emissions benefit of burning LNG versus coal is disputed, and ultimately depends on exceptionally tight control of methane emissions across the LNG value chain[29]Emissions notwithstanding, coal-to-gas switching will be inhibited by pricing, as LNG is more expensive than coal.[30] China, for example, positions coal as a more cost-effective, and more secure, source of energy.[31]

Responding to concerns around price competition in the LNG market, some producers have suggested that producing cargoes of LNG with lower emissions intensity will act as a comparative advantage and allow their products to earn a premium. However, many of the markets on which producers are relying to absorb these cargoes are home to particularly price-sensitive buyers like

[22] See e.g., Pembina Pipeline, Pembina Pipeline Corporation Announces Significant Milestones Achieved on Cedar LNG (04/04/24); Ksi Lisims LNG, Project Overview [accessed 12/07/24]
[23] Reuters, Exclusive: Pakistan plans to quadruple domestic coal-fired power, move away from gas (14/02/23)
[24] Bloomberg, Thailand to Boost Gas Production in Bid to Avoid New Price Shock (15/08/23)
[25] Wood Mackenzie, Solar inflation reverses as renewable costs in Asia reach all-time low (29/02/24)
[26] Zero Carbon Analytics, Bullish Asian gas demand forecasts eroded by renewable surge (26/04/24)
[27] Statista, Leading importing countries of liquefied natural gas worldwide in 2023 [accessed 08/08/24]
[28] IEEFA, Global LNG Outlook 2024-2028 (2024)
[29] Carbon Tracker, Kind of Blue (2024)
[30] Reuters, Shell's lofty ambitions for Asian LNG demand face price hurdle (15/02/24)
[31] IEEFA, Shell's latest LNG outlook underestimates barriers to demand growth in Asia (20/02/24)

India and Pakistan, where decarbonisation is a lower priority – such importers are unlikely to pay a premium for lower emissions LNG.[32]

**Uncertain future demand makes securing project financing challenging; equity investors or governments may be approached to fill funding gaps**

Certainty around future demand is an integral part of financing LNG infrastructure, as developers have historically relied on long-term contracts with buyers to secure investment for a project.[33] These long-term fixed contracts are increasingly difficult to secure as buyers now seek greater flexibility around the terms and duration of purchase agreements or turn to the spot market for more favourable cargo pricing.[34]

These conditions mark a significant change from historic financing conditions and could pose challenges not only for companies hoping to develop new terminals, but also for those with projects currently under construction. Should projects be unable to secure needed project financing, investors could be called upon to inject more equity to the complete the project, or indeed governments may be approached to step in with (further) subsidies to bridge the financing gap.

## 3.2 Assumption 2: More supply is needed to meet future demand

Like the oil market, the LNG industry has historically operated in cycles: when supply is low, prices rise, and new projects are enticed to market. The gas price spikes in the wake of Russia's invasion of Ukraine in 2022 began such a cycle, with many new projects being sanctioned in 2022/3.[35]

**LNG markets in the near-term will likely be oversupplied by current projects...**

These projects will begin to come online from late 2024, and will contribute to the c.37 Mtpa (1,780 bcf/year)[36] of supply being added in 2025 alone; global LNG production capacity is forecast to increase by c.40% to 667 Mtpa (32,000 bcf/year) by the end of 2028.[37] Much of this additional supply will come from projects in the US and Qatar (Figure 2).

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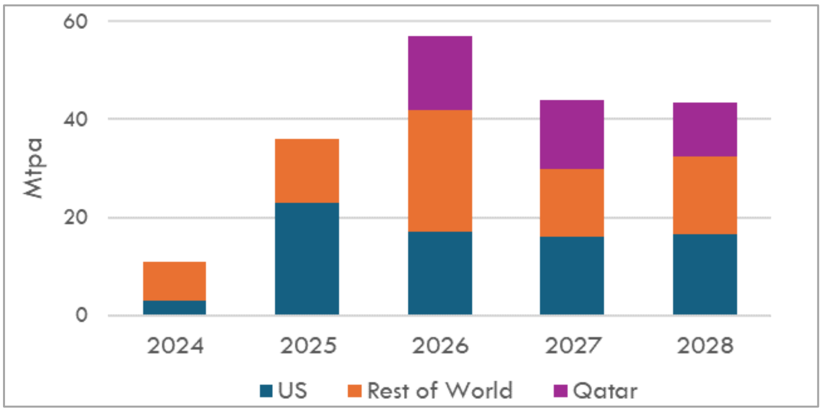
32 Carbon Pulse, "No appetite" for carbon neutral LNG as buyers too price sensitive, oil major says (12/03/24)
33 Banks, for example, will often only agree to project financing if a large portion (up to 80%) of the plant's output is pre-sold under long-term contracts with reputable buyers although, even under these terms, lenders cannot entirely mitigate exposure to price risk, as the price agreed under LNG sale-and-purchase agreements can be indexed to gas market prices.
34 S&P Global, LNG buyers seek to dismantle rigid long-term contract structures in flexibility push (28/09/23)
35 Rystad Energy cites 17 projects sanctioned in 2022 and 2023.
36 1Mt = 48.028bcf, bp, Statistical Review of World Energy (2022)
37 IEEFA, Global LNG Outlook 2024-2028 (2024)

**FIGURE 2: ADDITIONS TO GLOBAL LNG SUPPLY 2024-2028**




*Source: IEEFA. Notes: 1Mt = 48.028bcf*

The key question for investors and producers then becomes: will these recently sanctioned projects, and indeed future developments, be required to meet future demand? Many market analysts are now forecasting that the capacity coming online in the mid-2020s will result in a glut in the LNG market, putting downward pressure on prices and future revenues.[38] If gas demand follows a moderate transition trajectory, two out of every three projects currently under construction are at risk of failing to recoup their initial investment (Box 2).[39]

**BOX 2: LNG PROJECT CAPITAL AT RISK UNDER IEA SCENARIOS**

Gas demand peaks in all IEA scenarios before 2030, leaving little to no headroom for LNG supply growth.[40]

**Slow transition (2.4˚C) – Stated Policies Scenario (STEPS):** LNG markets are supplied from existing/pipeline projects until at least 2040. LNG projects which are currently under construction can expect to recover their initial capital investment.

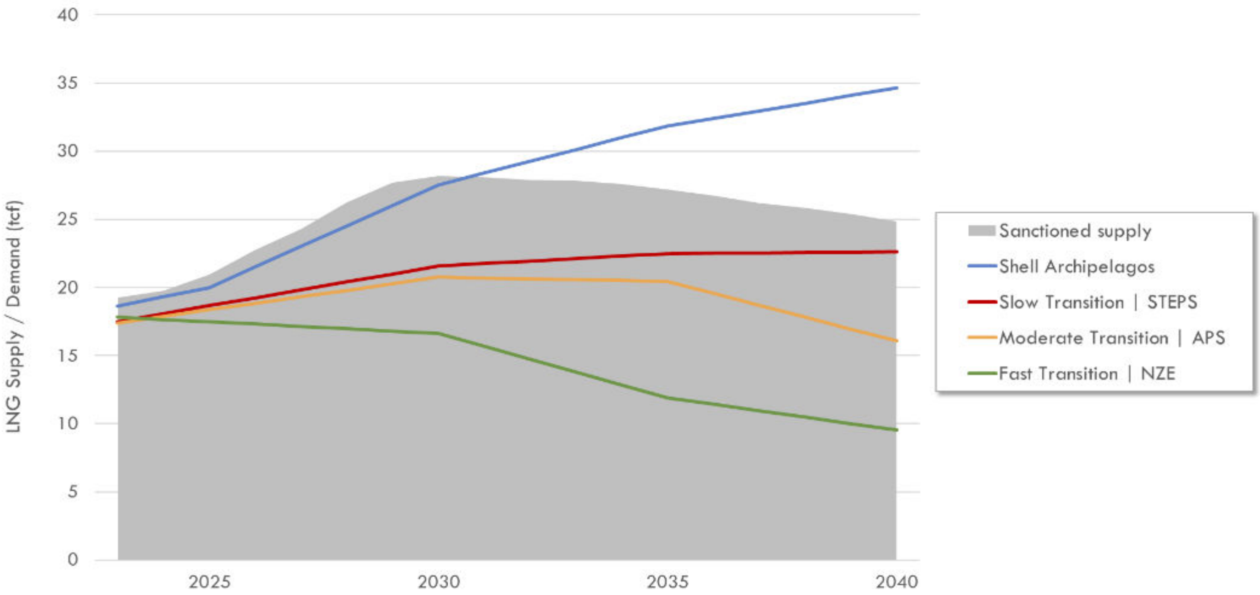
**Moderate transition (1.7˚C) - Announced Pledges Scenario (APS):** LNG demand peaks by 2030; supply from existing projects and projects under construction are sufficient to meet demand. 66% of projects currently under construction risk failing to recoup their initial capital investment.

**Fast transition (1.5˚C) - Net Zero Emissions by 2050 Scenario (NZE):** foresees a glut of LNG supply from mid-2020s straining profitability for both existing and recently commissioned projects. Projects currently under construction are not necessary - 70% could fail to recoup their initial investment.

Indeed, we see that **LNG demand under the IEA's slow, moderate, and fast transition scenarios is satisfied by projects which have already been sanctioned** (Figure 3). All unsanctioned projects are therefore at risk of generating lower returns than anticipated at the point of investment. We also use Shell's Archipelagos scenario for a more bullish view on future LNG demand; under Archipelagos, demand is satisfied by supply from existing projects out to 2030, with a supply gap opening up thereafter.

[38] See e.g., IEA, World Energy Outlook 2023 (2023); IEEFA Global LNG Outlook 2024-2028 (2024), Oxford Institute for Energy Studies, A New Global Gas Order? (Part 1) (2023)
[39] IEA, World Energy Outlook 2023 (2023)
[40] IEA, World Energy Outlook 2023 (2023)

**FIGURE 3: LNG MARKET SUPPLY FROM ALREADY-SANCTIONED PROJECTS VS DEMAND SCENARIOS**




*Source: Rystad Energy, IEA, Shell*

# 4 Case Study: British Columbia LNG

Plans to develop an LNG export industry have been in motion in British Columbia (B.C.) for over two decades. The political environment has been broadly supportive of the initiative through the years, and several policy mechanisms to encourage the development of LNG have been introduced.[41] That being said, B.C. LNG has been the subject of intense scrutiny, both over its viability as an industrial strategy and over its potential impact on the climate and local environment.

Canada's most prolific gas reserves are located in the Montney formation in the North East of B.C.[42] Much of the revenue from production in the Montney comes from the production of Natural Gas Liquids (NGLs), which are an integral part of the oil sands production process in neighbouring Alberta.[43] NGL production, however, generates a byproduct: natural (or "dry") gas. The industry is then faced with the problem of how to monetise this dry gas.

The market for dry gas, which is transported via pipeline, is limited to Canada and the USA.[44] Due to the ramp up in dry gas production, however, the regional market is facing a supply glut.[45] Using this gas instead to produce LNG on the west coast makes it much easier for companies to export gas to a market which is global.

The viability of such a strategy to monetise dry gas reserves, however, depends on B.C.'s LNG exports being competitive in the global markets. This is a crucial consideration for investors particularly as, as discussed in Chapter 3, conditions in the global LNG markets are only likely to grow more challenging in the future.

### A number of new LNG projects are approaching approval…

Thus, the investment case to be made for new LNG projects in B.C. has become increasingly tenuous and investors need to consider the prudency of constructing new terminals or expanding existing ones. Tilbury is the only plant currently operating in the province, and there are plans to expand it. Three more (LNG Canada Phase 1, Cedar LNG, and Woodfibre) are under construction or sanctioned and two – Ksi Lisims and LNG Canada Phase 2 – are approaching sanctioning in the next few years. First nations communities are partners on two projects: Ksi Lisims and Cedar LNG (Table 1).

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[41] Including subsidised electricity rates for LNG facilities and an extension of export licencing terms from 25 to 40 year (see BC Government, Terms finalized for LNG customers using BC Hydro system (2014)
[42] Canada Energy Regulator, Market Snapshot: Evolving technology is a key driver of performance in modern gas wells: a look at the Montney Formation, one of North America's biggest gas resources (25/04/18)
[43] The Narwhal, The resource B.C. is piping to Alberta that nobody is talking about (08/08/18)
[44] Some gas Canadian gas which is piped to the US is then exported as LNG. Deloitte, Oil and gas price forecast (2022)
[45] Rystad Energy, Western Canada needs more LNG to deal with natural gas oversupply (15/01/24)

**TABLE 1: EXPORT LNG PROJECTS IN BRITISH COLUMBIA**

| Project | Phase | Stage | Export Volumes (Mtpa) | Ownership |
|---|---|---|---|---|
| LNG Canada | Phase 1 | Sanctioned - under construction | 14 | Shell* - 40%<br>Petronas - 25%<br>Mitsubishi Corp - 15%<br>PetroChina - 15%<br>Korea Gas - 5% |
| | Phase 2 | Unsanctioned - regulatory approval | 14 | |
| Ksi Lisims Floating LNG | Phase 1 | Unsanctioned - regulatory review | 12 | Western LNG* - 33%<br>Nisga'a Nation - 33%<br>Rockies LNG Partnership** - 33% |
| Tilbury LNG | Phase 1^ | Sanctioned - operational | 0.25 | FortisBC* - 100% |
| | Phase 1B | Unsanctioned - proposed | 0.65 | |
| | Phase 2 | Unsanctioned - proposed | 2.5 | |
| Cedar Floating LNG | Phase 1 | Sanctioned^^ | 3.3 | Pembina Pipeline* - 50%<br>Hasila Nation - 50% |
| Woodfibre LNG | Phase 1 | Sanctioned - under construction | 2.1 | Pacific Energy* - 70%<br>Enbridge - 30% |

*Source: Rystad Energy, company reporting. Notes: * denotes operator; ** Rockies LNG Partnership includes Advantage Energy, Birchcliff Energy, CNRL, Murphy Oil, NuVista Energy, Ovintiv, Paramount Resources, Peyto Exploration, Tourmaline, Veren, Whitecap Resources, and Woodside. ^Tilbury Phase 1 primarily produces LNG for domestic use. ^^Cedar FLNG took FID in late June 2024, after this analysis was carried out. We note that JX LNG Canada and a consortium of Indigenous Nations have proposed a 2.7 Mtpa project, Summit Lake PG LNG.*

### … but B.C.'s LNG projects are higher cost than many other producing nations

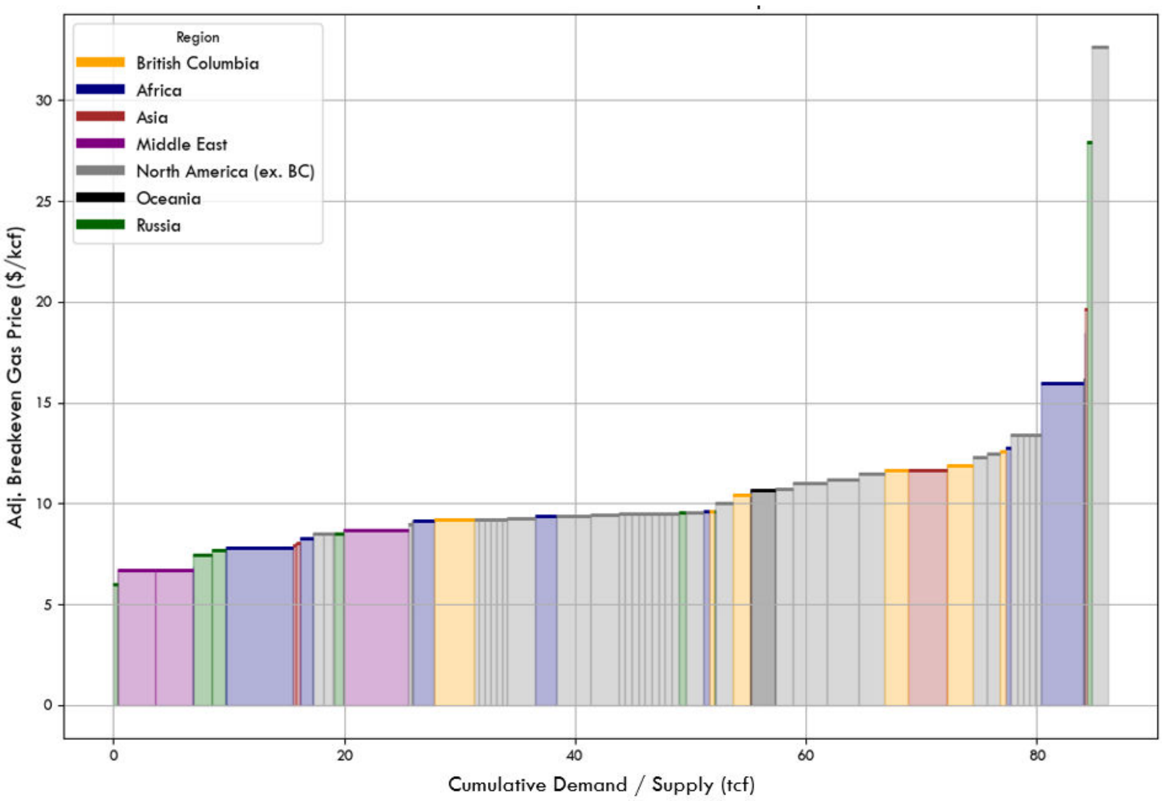
To assess the relative competitiveness of B.C.'s projects, we take all potential LNG projects across the world to create a cost curve of future LNG supply. Our least cost methodology uses data on LNG supply from Rystad Energy.

We first assess if regional gas markets' demand (sourced from the IEA) is met from supply from sanctioned assets. In such markets, the marginal breakeven price for gas projects is zero. Where further gas supply is needed, we apply a cost curve methodology and assume that lowest cost unsanctioned assets will go ahead until market demand is met, at which point we derive a marginal breakeven price. Unsanctioned assets above this marginal breakeven price may have a higher risk of lower-than-expected returns, hence becoming stranded assets. See our website for full methodology and details on adjustments and redirected supply flows.

We find that B.C.'s projects lie far up the global cost curve (Figure 4). Projects in Qatar, the UAE, the US, and Mozambique have the potential to supply c.28 tcf of LNG to global markets over the next three decades at lower cost than B.C. Unsanctioned LNG projects in B.C. have a unit cost which is 26% greater that than the global average.[46]

[46] The average unit cost of unsanctioned projects in B.C. is 26% greater than the average unit cost of unsanctioned projects which we model to fit within the Shell Archipelagos scenario.

**FIGURE 4: COST CURVE OF GLOBAL UNSANCTIONED LNG EXPORT TERMINALS**




*Sources: Rystad Energy, IEA, CTI analysis. Note: Analysis as of May 2024.*

## All of B.C.'s new LNG Projects are at risk, even under a slow transition

As established in Section 3 (Figure 3), LNG demand under each of the IEA's NZE, APS, and STEPS is fulfilled by projects which have already been sanctioned. In other words, all new/unsanctioned projects are not needed under the IEA's scenarios - see demand lines where cumulative supply is equal to zero, Figure 5.

These include unsanctioned projects in B.C.: given future supply from existing projects meets demand under most transitions, then – unless there is significant unanticipated demand – the LNG price over the lifetime of projects in B.C. is not likely to be sufficient for projects to deliver hurdle rate returns.[47] Our findings are consistent with the IEA's (Box 2), which warn that proposed projects which are not currently under construction are at risk of failing to recoup their initial investment.

To assess project viability under a more bullish view of future demand, we also model B.C.'s projects under Shell's Archipelagos scenario under which, per Figure 3, there is some space for new projects. We find that three of B.C.'s proposed projects – Cedar LNG, LNG Canada Phase 2, and Tilbury LNG Phase 2 - are sufficiently high cost that they may not be competitive under a higher demand scenario (Figure 5; see Table 2 for summary).

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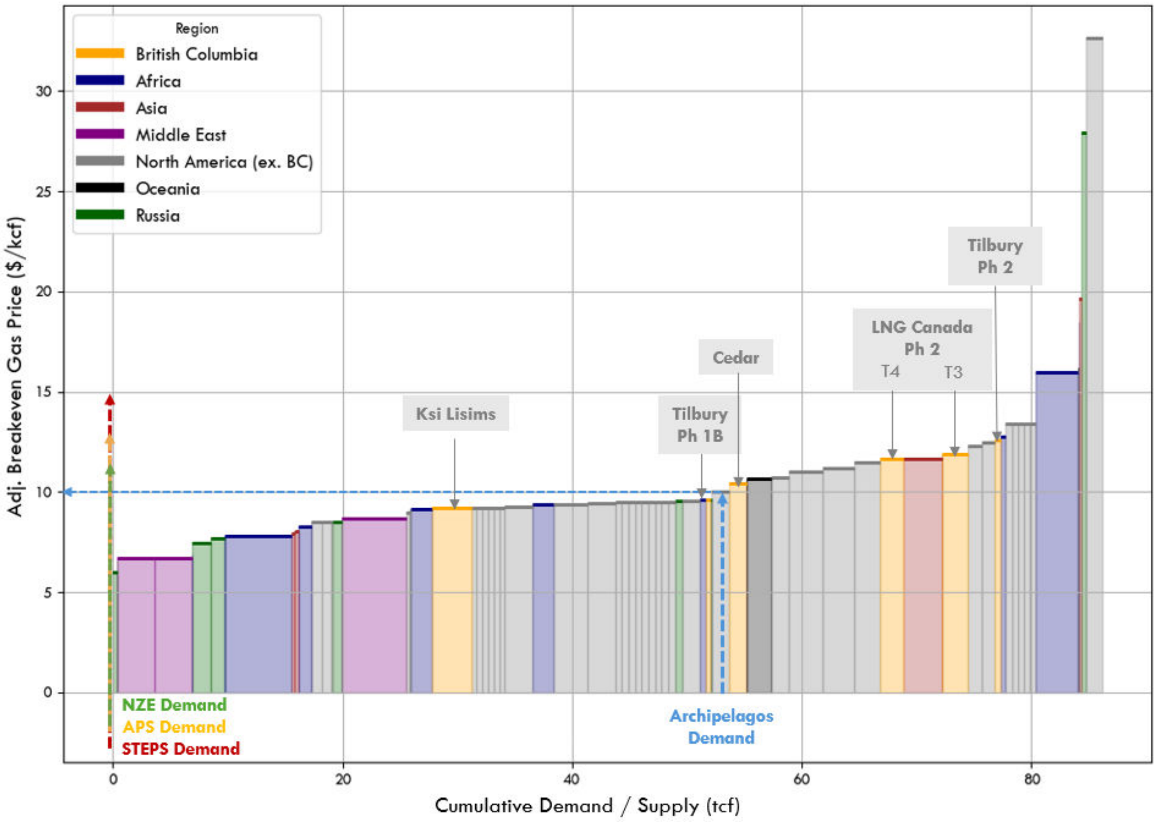
[47] Our modelling assumes a 15% IRR which is in line with industry's general return targets. Firm's own hurdle rates may vary somewhat.

**FIGURE 5: GLOBAL LNG COST CURVE: PROJECTS AT RISK UNDER DIFFERENT SCENARIOS**




*Sources: Rystad Energy, IEA, Shell, CTI analysis. Notes: Analysis of unsanctioned projects as of May 2024; Cedar LNG has since been sanctioned.*

It is notable that our modelling finds that LNG Canada Phase 2, on which Shell is a lead partner, falls outside of Shell's own high LNG demand scenario. Recall that, in Section 3, we noted that Shell has recently revised downwards its forecast of LNG demand in 2040 by up to 14%. Further downward revisions would shift the dashed blue line in Figure 5 further to the left; LNG Canada Phase 2 would fall even further outside of Shell's own scenario.

We find that the curve has a rough plateau in its centre; Ksi Lisims, one of B.C.'s largest projects, falls towards the beginning of this flat part of the curve, with Tilbury Phase 1B towards its end. Ksi Lisims is only marginally cheaper than a large cohort of North American (mainly US) projects. These projects include Commonwealth LNG (which its operators are expecting to sanction in 2025, despite the Biden administration's pause on export licences[48]) and CP2 LNG (in Louisiana) which has recently received regulatory approval.[49]

[48] LNGPrime, Commonwealth LNG pushes back FID to H1 2025 (29/02/24)
[49] LNGPrime, FERC approves Venture Global's CP2 LNG project (27/06/24)

**TABLE 2: SUMMARY OF UNSANCTIONED PROJECTS AT RISK UNDER DIFFERENT DEMAND SCENARIOS**

| | Project potentially viable under… | | | |
|---|---|---|---|---|
| **Project** | **NZE**<br>*Fast Transition*<br>1.5°C | **APS**<br>*Moderate Transition*<br>1.7°C | **STEPS**<br>*Slow Transition*<br>2.4°C | **Shell Archipelagos**<br>*High LNG Demand*<br>2.2°C |
| **Cedar LNG** | ✗ | ✗ | ✗ | ✗ |
| **Ksi Lisims LNG** | ✗ | ✗ | ✗ | ✓ |
| **LNG Canada Phase 2** | ✗ | ✗ | ✗ | ✗ |
| **Tilbury Phase 1B** | ✗ | ✗ | ✗ | ✓ |
| **Tilbury Phase 2** | ✗ | ✗ | ✗ | ✗ |

*Source: Rystad Energy, IEA, Shell, CTI analysis. Notes: Analysis of unsanctioned projects as of May 2024; Cedar LNG has since been sanctioned; we note that the temperature warming outcome of Shell's Archipelagos scenario is lower than that of STEPs, which may be attributed to the fact that Archipelagos sees faster declines in oil demand and coal production.*[50]

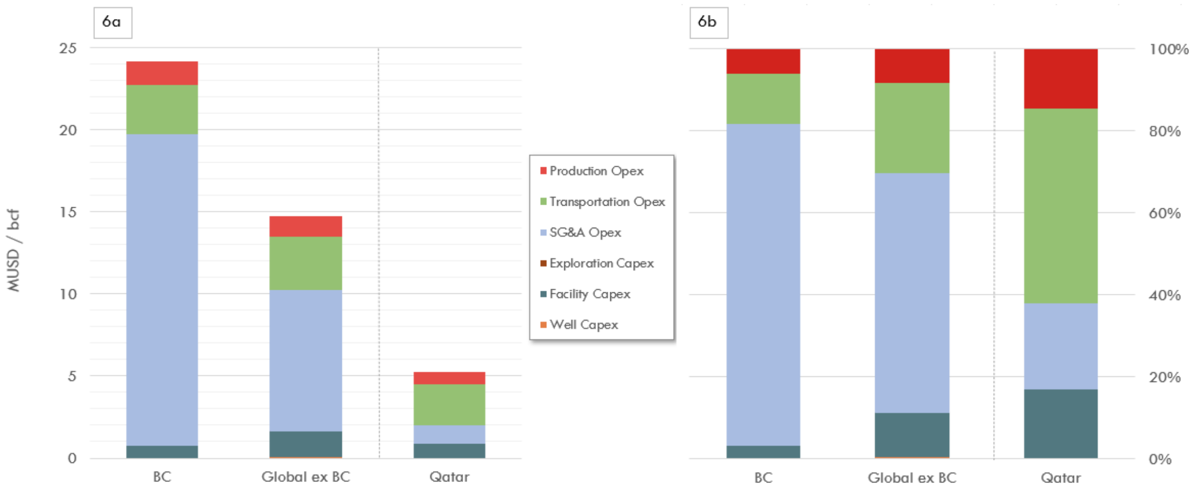
## Projects in B.C. have signficantly higher capex and opex costs than the global average

LNG projects are highly capital-intensive assets which require large amounts of upfront investment. The proposed terminals in B.C. – particularly greenfield projects - are no exception; LNG Canada Phase 1 will be the largest private sector investment in Canadian history, with an initial cost estimate of CAD$40bn.[51] Pembina Pipeline recently announced a revised cost estimate of US$3.4bn for the Cedar LNG project,[52] a 42% increase on the project's initial US$2.4bn price tag.[53]

Our analysis of global LNG projects finds that that B.C.'s unsanctioned projects have significantly greater associated costs compared with the global average: producing 1 bcf of LNG in B.C. costs on average USD$24mn, compared with an average of c.USD$15mn for projects elsewhere in the world (Figure 6).

[50] See Shell, Energy Security Scenarios (2023) and IEA, World Energy Outlook 2023 (2023)
[51] Government of Canada, Government of Canada confirms support for largest private investment in Canadian history (24/06/19)
[52] Pembina Pipeline Corporation, Pembina Pipeline Corporation Announces Significant Milestones Achieved on Cedar LNG (04/04/24)
[53] Pembina Pipeline Corporation, Haisla Nation Partners with Pembina Pipeline Corporation in Proposed Cedar LNG Project (08/06/21)

**FIGURE 6: COSTS OF LNG PRODUCTION – B.C. VS GLOBAL IN (A) ABSOLUTE AND (B) PROPORTIONATE TERMS**




*Sources: Rystad Energy. Notes: includes unsanctioned projects only; excludes costs associated with taxes. Costs and production for underlying projects cover the period from 2024-2100. Global ex BC excludes projects in B.C. and includes projects in Qatar.*

Qatar, a key low-cost competitor in the LNG markets, has a unit cost of production which is almost 80% lower than that of B.C.'s (Figure 6a). While the amount on facility capex, production opex, and transportation are broadly similar between the two producers, Qatar has significantly lower Selling, General & Administrative (SG&A) operational expenses.

SG&A expenses include staff costs and benefits, as well as professional expenses like insurance and legal costs,[54] and account for almost 80% of the unit costs of production in B.C. (Figure 6b). This likely reflects Canada's labour costs being materially higher than elsewhere – SG&A opex comprises c.60% of the unit cost of global projects, but are much greater in B.C. on an absolute basis.

## Considerations for Investors and Policymakers

**Projects in B.C. lie far up the Global LNG cost curve** and risk not being competitive on increasingly challenging global LNG markets.

**There is no guarantee of longer-term returns from LNG projects.** LNG exporting can incur large profits in periods of high prices, but these must be weighed against the continued risk of depressed and limited demand.

**Be aware that future fiscal revenues may not materialise** and that developing LNG projects will increase the exposure of public finances to the transition risk inherent within the fossil fuel markets. Carbon Tracker has explored these risks in our Petrostates series, finding that fossil fuel derived government revenues will be at risk under even a moderately paced transition.

[54] Rystad Energy (2024)

## 4.1 Other considerations for B.C. project economics

**B.C. LNG investments are exposed to changes in oil demand; long-term contracts are essential to reduce risk**

The locked-in nature of LNG production exposes investors to a high degree of duration risk: LNG production can theoretically continue indefinitely, so long as there is feed gas supply; there is therefore no natural hedge against transition risk.

NGLs are the primary driver of value and production in the Montney. The price of NGLs is highly positively correlated with the oil price;[55] future declines in the oil price could therefore negatively impact the price commanded by, and revenues from, production in the Montney. Consequently, the economics of dry gas production in the Montney could become less attractive, given the risk of failing to generate the returns required to justify continued production.

Should production then fall, then the volumes of associated dry gas that are expected to be feed gas for B.C.'s LNG facilities would also fall and may need to be sourced from elsewhere. The nature of the gas production in the Montney, therefore, exposes B.C.'s LNG producers not only to risks from transition-induced destruction of gas demand, but also to those relating to oil demand.[56]

Current long-term take or pay contracts will act as somewhat of a hedge for LNG producers against potential deterioration in the production economics of the Montney's reserves,[57] however when contracts need to be renewed in several decades time, market conditions and well economics for Montney producers could look very different then they do now. Moreover, if owners of the operators are on both sides of the LNG feed gas supply contracts – Pembina Pipeline Corporation, e.g., are supplying a significant amount of the feedgas for their own LNG plant – the risk is potentially amplified.[58]

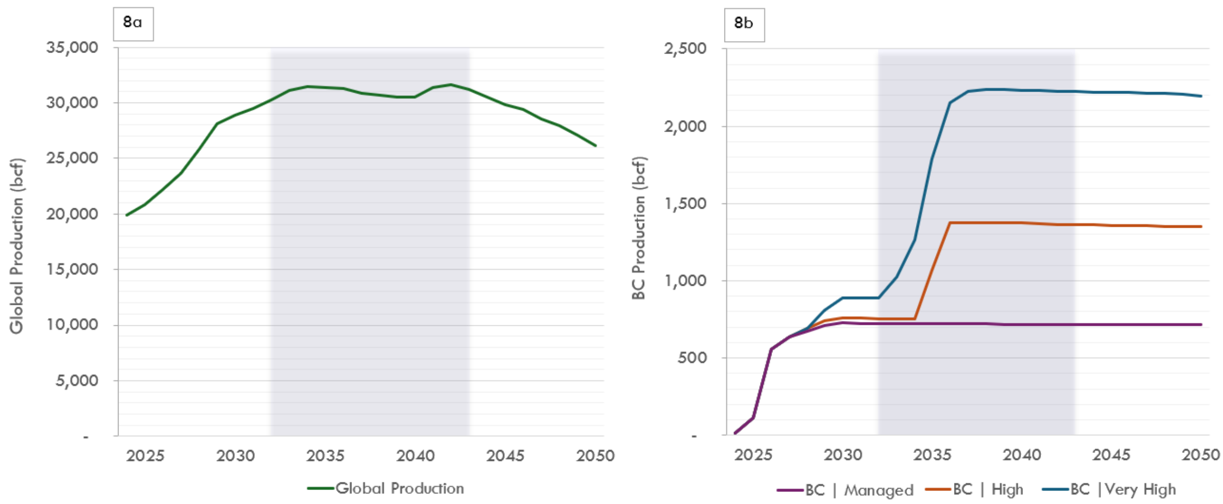
**B.C. LNG is a late entrant to a global LNG market dominated by incumbent operators**

Most of B.C.'s LNG projects have been granted 40-year export licences and return projections will likely depend on there being customers for each project's output for decades to come. In this way, investing in new LNG projects now is tantamount to a play on the LNG over the coming decades, and B.C. will be a new entrant to a market dominated by a few large, established LNG producers.

Figure 7a shows that global production will begin to plateau around its peak in the mid-2030s (grey shaded area). Production from B.C.'s already sanctioned projects will peak before this global uptick (Figure 7b, purple line). However, new projects sanctioned – whether in line with a high or very high investment case – will come online from 2036, well into the plateau in global production. As such, new B.C. LNG projects will be late entrants to a market dominated by incumbent producers.

[55] Jadidzadeh A and Serletis A, Oil prices and the natural gas liquids markets (2022)
[56] For a full discussion of the implications of peaking oil demand on the oil and gas sector see Carbon Tracker, Navigating Peak Demand (2023)
[57] Cedar LNG, for example, has a 20-year agreement in place for its feedgas from the Montney, Pembina, Cedar LNG Announces Positive Final Investment Decision (25/06/24)
[58] Pembina, Cedar LNG Announces Positive Final Investment Decision (25/06/24).

**FIGURE 7: GLOBAL LNG PRODUCTION VS B.C.**




*Source: Rystad Energy, Shell, CTI analysis. Notes: Global production shown under a high investment case; shaded area represents the plateau in global production. Global excludes production from B.C. See appendix for an outline of projects which are included in each investment case.*

Such producers would have the advantage in a lower LNG price future; they also have the potential to make conditions for high-cost, low-market share producers even more challenging if they ramp up production in order to maximise revenues from gas reserves ahead of further contractions in demand. Qatar appears to be pursuing such a strategy: QatarEnergy has been expanding its LNG capacity since 2018, and the company's most recent expansion plans will raise its production capacity to 142 Mtpa by 2030 (+82% vs 2018).[59]

### Declining future gas prices will put downward pressure on future revenues…

A glut of new supply coming to market, combined with demand trending downward in global LNG markets, could see LNG prices fall in the future. Investors should ensure that their expectations vis-à-vis the pace of the energy transition are duly accounted for when modelling project economics, and governments making decisions about providing financial support for these projects should be aware of the of potential impact of lower demand on project viability. Project economics should be sensitivity tested against a faster-than-expected energy transition, which drives lower-than-expected LNG volumes and lower-than-expected price.

### …which could also see decommissioning liabilities brought forward

Decommissioning obligations (or asset retirement obligations, AROs) are an important component of the project economics of fossil fuel infrastructure. Decommissioning takes place at the end of an asset's life and the associated costs are discounted over the lifetime of an asset. If an asset has a long lifespan – as is the case in of an LNG facility – the decommissioning cost is punted into the future and discounted away.

However, if the asset is forced to shut in early, due to lower than expected future demand for its output or due to a change in the regulatory/policy environment, then the decommissioning liability is brought forward in time and therefore increases in present value terms.[60] There comes a point in

[59] Rystad Energy, Qatar's new North Field expansion plans to eliminate LNG deficit by 2030 (26/02/24)
[60] See Cabon Tracker, Event Horizon (2022) for a full discussion of decommissioning obligations.

time at which the costs of decommissioning an asset are greater than its net future cashflows and the project moves from being an asset to a liability.

It is imperative that investors ensure that decommissioning obligations are duly accounted for when modelling the potential returns from an LNG investment, and that they are sensitivity tested against different low demand scenarios. If producers fail to hold back sufficient cash to fund a project's retirement, then the cost of doing so could fall on the state.

### Investors have long held concerns about the economic viability of LNG projects in B.C.

Doubts emerged over the viability of an LNG industry in B.C. as soon as project planning commenced.[61] There have been over 20 LNG projects proposed in since 2012, but most have been shelved (Table 3).[62] Concerns raised by both companies and investors have lain primarily with the economic and return prospects of potential projects in B.C. that they are not particularly cost competitive on the global LNG markets. ExxonMobil, for example, signalled that it was shelving WCC LNG to focus on its more competitive LNG projects elsewhere in the world. [63]

**TABLE 3: SHELVED LNG PROJECTS IN BRITISH COLUMBIA**

| Project | Status | Export Volumes (Mtpa) | Company |
|---|---|---|---|
| Stewart LNG | Presumed cancelled, no activity since 2014 | 30 | Canada Stewart Energy Group |
| WCC LNG | Cancelled Dec 2018 | 30 | ExxonMobil Imperial Oil |
| Aurora LNG | Cancelled Sep 2017 | 24 | CNOOC; INPEX; JGC Holdings Corp |
| Kwispaa LNG | Suspended Feb 2019 | 24 | Steelhead LNG; Huu-ay-aht Nation |
| Orca LNG | Presumed cancelled, no update since 2015 | 24 | Unknown |
| Prince Rupert LNG | Cancelled Mar 2017 | 21 | BC Group (Shell) |
| Discovery LNG | Presumed cancelled, no update since 2016 | 20 | Rockyview Resources |
| Grassy Point LNG | Cancelled Mar 2018 | 20 | Woodside Energy |
| Kitsault Energy | Presumed cancelled, no updates since 2015 | 20 | Kitsault Energy |
| Kitimat LNG | Presumed cancelled, Woodside withdrew in 2021, Chevron in 2019 | 18 | Chevron; Woodside |
| Pacific Northwest LNG | Cancelled Jul 2017 | 18 | Petronas; Sinopec; Japex, Indian Oil Corp; Brunei Energy Services |
| NewTimes Energy | Presumed cancelled, no update since 2016 | 12 | NewTimes Energy |
| Malahat LNG | Cancelled late 2017 | 6 | Steelhead LNG, Malahat Nation |
| Triton LNG | Suspended May 2016 | 2.5 | Altagas, Idemitsu Kosan |
| Watson Island | Presumed cancelled, no update since 2014 | 1 | Watson Island LNG Corporation |
| Douglas Channel | Presumed cancelled, no update since 2016 | 0.9 | AltaGas; Idemitsu Kosan; Électricité de France; Exmar |

*Sources: Sightline Institute, GEM.Wiki, company reporting. Note: projects ordered by export volume*

[61] See, e.g., Gunton et. al, Evaluating British Columbia's economic policies for liquefied natural gas development (2021)
[62] Sightline Institute, 2019 Sightline Report Update: Mapping BC's LNG Proposals (2019)
[63] Reuters, ExxonMobil shelves Canada LNG export project (20/12/18)

In addition to the risks outlined above, it should be noted that LNG is not a "low-carbon" energy source, as much of the industry's marketing would lead investors to believe. Ksi Lisims LNG, for example, is proposed to be a "net zero LNG export facility", but the facility's putative status as such will rely on extensive use of carbon offsets. In reality, LNG is a carbon intensive fuel which is exposed to a similar degree of transition risk as oil and dry gas. Investors should not be led to believe that LNG projects are "green" and therefore will be shielded from demand destruction as the transition accelerates.

It is also important to consider the strategic implications of investing in LNG for B.C.'s wider transition plans, which carries an opportunity cost for developing a resilient domestic energy system built off of genuinely low-carbon energy sources, like renewables. Indeed, LNG facilities will likely put a strain on B.C.'s existing electricity grid and hydropower generation. Most of the proposed LNG projects, with the exception of LNG Canada Phase 1, intend to fully electrify operations at some point. Doing so would require c. 43 TWh of electricity, equivalent to 69% of B.C.'s total electricity demand in 2022.[64]

### Considerations for Investors & Policymakers

- **Declining global oil demand could put strain on production economics in the Montney** which could affect the cost of feedgas for B.C. LNG plants.
- **Consider that B.C. will be a late entrant to an LNG market dominated by (often large) incumbent producers** which could act as a strategic disadvantage, particularly if market conditions grow more challenging.
- **Ensure decommissioning liabilities are duly accounted for** and have been modelled against low demand futures as any acceleration could eat into project returns.
- **Be aware that new LNG projects could put considerable strain on B.C.'s existing power infrastructure.**

[64] Clean Energy Canada, An Uncertain Future (2024)

# 5 Appendix:

## 5.1 Least cost methodology

For a full description of the least modelling which underpins the analysis presented here, see Carbon Tracker's Oil and Gas Least Cost Methodology

## 5.2 LNG investment cases

We use investment cases to illustrate different cases of industry behaviour around sanctioning decisions. These essentially offering a view of production which are dependent on how conservative (or not) companies are in sanctioning new projects. These cases are used in the production data presented in Figure 7.

1. **Managed:** Includes only projects which have been already sanctioned
2. **High:** Includes sanctioned projects + unsanctioned projects inside Shell Archipelagos
3. **Very High:** includes sanctioned projects + all unsanctioned projects

In the case of global production, we present the high investment case as it is reasonable to assume that more new projects will be sanctioned, but it disregards the very high-cost projects which fall outside of the Shell Archipelagos scenario.

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