Fracked Ferries

a report by **Stand.earth** Research Group

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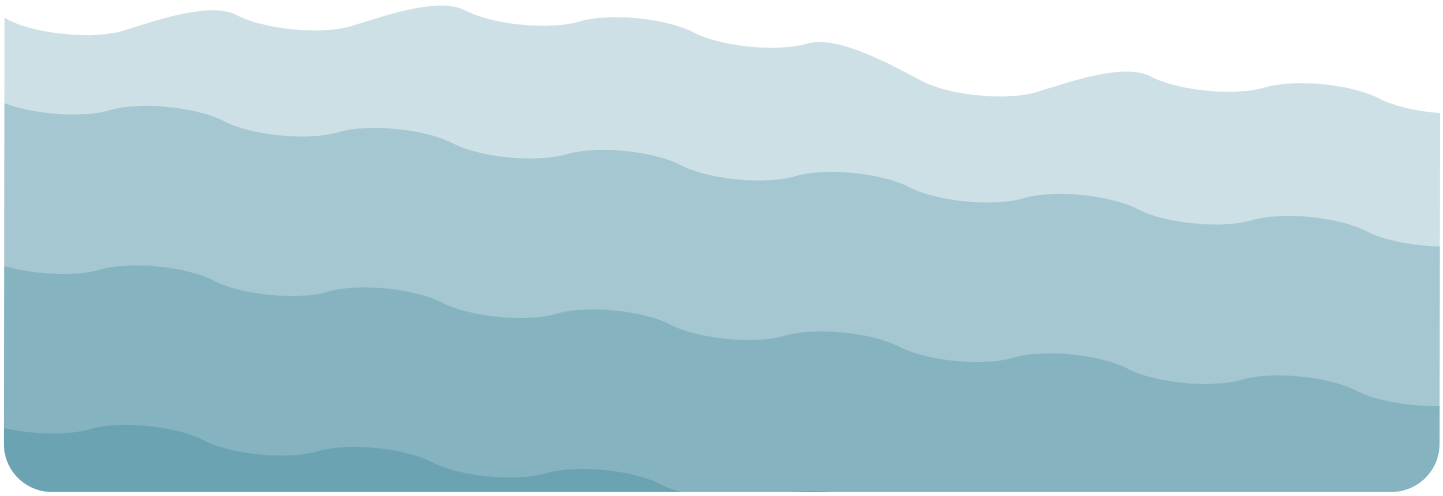

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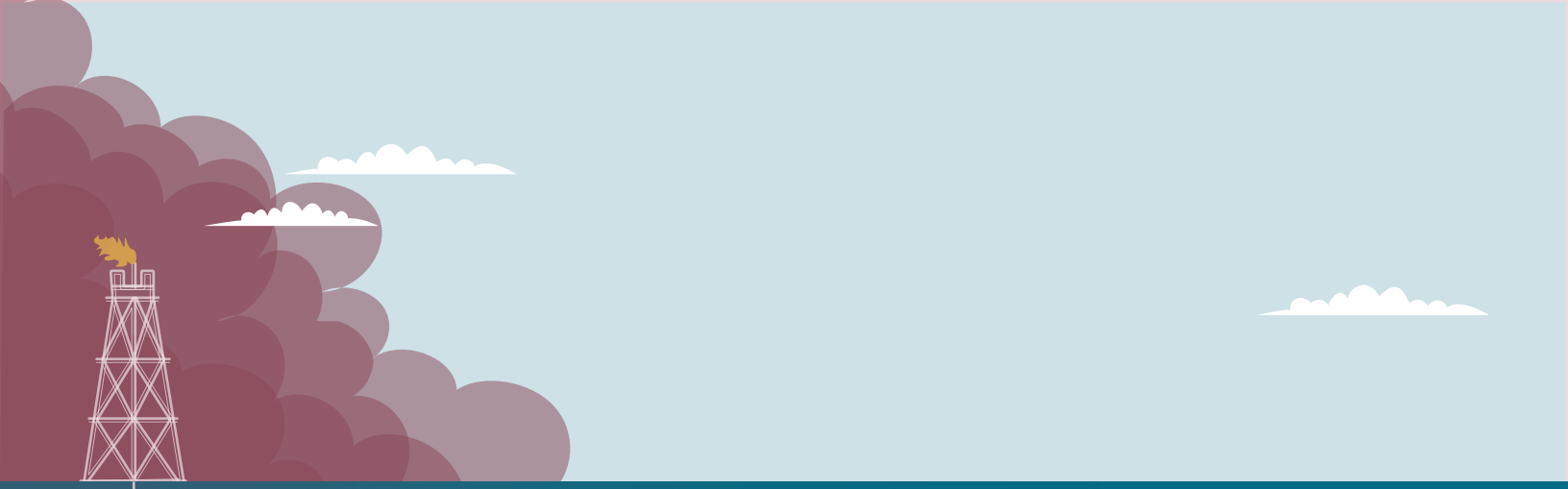
Executive Summary

BC Ferries is an important part of the fabric of British Columbia's (B.C.'s) coastal society, serving many types of communities. These ferries not only move goods but also provide a core transportation service to connect communities. However, BC Ferries uses liquefied natural gas (LNG), extracted through hydraulic fracturing—better known as fracking—in its LNG-powered ferries. LNG is primarily methane, which is a climate **super pollutant and responsible for almost one third of global warming.**[1] **Worse, BC Ferries is planning to expand the use of LNG in its fleet.** This is deeply concerning at a time when the climate crisis is already impacting B.C.:

> **fracked ferries are not a climate solution.**

The climate crisis is already impacting B.C. Events like the 2021 heat dome,[2] flooding in the Sumas Prairie in 2021,[3] and the year-over-year record-breaking wildfire seasons[4] were not only emergencies that required an urgent response, but were made more likely by increasing greenhouse gas pollution. Action must be taken now to reduce pollution in order to prevent future worst-case scenarios.

That begins with rapidly phasing out fossil fuels, including methane, and ending the practice of hydraulic fracturing



Fracking is a commonly used method to extract methane.[5]

Fracking uses large amounts of fresh water,[6] causes localized earthquakes,[7] and has an incredibly negative impact on the environment,[8] including public health and climate impacts. Methane emissions are the most rapidly growing greenhouse gas from the shipping sector,[9] and reported emissions tend to be underestimates compared to measurements in the real world.[10]

The essential services BC Ferries provides to the entire region will be needed for the foreseeable future. Its fuel supply chain, from well to wake, must be brought into alignment with greenhouse gas reduction goals to help mitigate the worst impacts of climate change.

Many solutions and options exist for the shipping sector despite its reputation for being hard to decarbonize, and BC Ferries is ideally placed to lead the charge. A BC Ferries vessel will likely make multiple stops in each four-hour period and may even pause for cleaning or restocking as the day proceeds; those stops provide the opportunity for charging or switching batteries. Ferries around the world are already showing that electrification is not only possible but desirable.

BC Ferries is ignoring the opportunity cost of not investing in electrification, and instead continuing down a path of fossil fuel dependency. Its LNG use and resulting methane pollution will need to be halted as pollution reduction milestones in 2030 and 2050 approach. **Rather than invest in further LNG expansion, BC Ferries should electrify its routes. If it electrifies, it will reduce pollution, avoid the risk of stranded assets, and propel the shipping sector toward a climate-safe world.**

LNG CAPABLE BC FERRY ROUTES AND VESSELS

- LNG CONVERSION CANDIDATES
- LNG CAPABLE

⑪ Prince Rupert – North Coast (Prince Rupert) to Skidegate – Graham Island (Skidegate)
- Northern Expedition
- Northern Adventure

⑩ Port Hardy – Vancouver Island (Bear Cove) to Prince Rupert – North Coast (Prince Rupert)
- Northern Expedition
- Northern Adventure

⑰ Powell River – Sunshine Coast (Westview) to Comox – Vancouver Island (Little River)
- Salish Orca

⑨ Tsawwassen – Metro Vancouver (Tsawwassen) to Southern Gulf Islands
- Salish Eagle
- Salish Heron

⑤ Victoria – Vancouver Island (Swartz Bay) to Southern Gulf Islands
- Salish Raven

① Victoria – Vancouver Island (Swartz Bay) to Southern Gulf Islands
- Coastal Celebration
- Spirit of British Columbia
- Spirit of Vancouver Island

Introduction

THE CLIMATE CRISIS REQUIRES IMMEDIATE ACTION

The climate crisis is already impacting British Columbia (B.C.). Events like the 2021 heat dome,[11] flooding in the Sumas Prairie in 2021,[12] and the year-over-year record-breaking wildfire seasons[13] were not only emergencies that required an urgent response but events that were made more likely by increasing greenhouse gas (GHG) pollution. Action must be taken now to reduce pollution in order to prevent future worst-case scenarios.

GHGs are not limited to carbon dioxide (CO_2) (sometimes called simply "carbon"). Methane (CH_4) is a powerful GHG, 80 times more potent over a 20-year time frame and 30 times stronger over a 100-year time frame than CO_2.[14] As of January 2024, NASA's website listed methane as responsible for almost a third of global warming.[15]

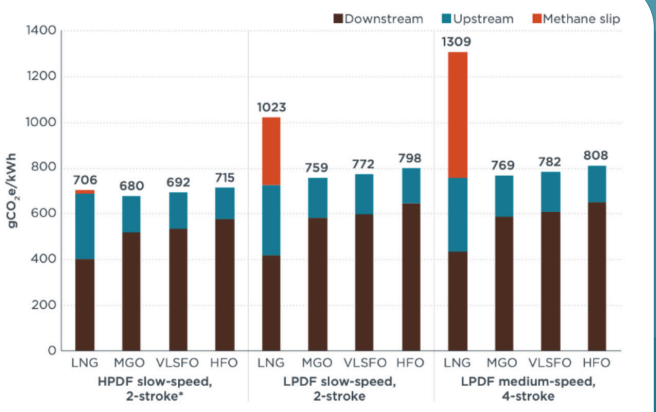
Methane is the primary constituent in liquefied natural gas (LNG). Addressing methane emissions is critical due to its fast and powerful warming actions in the atmosphere. The Intergovernmental Panel on Climate Change (IPCC) has stated that a 30% absolute reduction in global methane emissions across all sectors by 2030 is required if we are to limit global warming to 1.5°C.

OCEANGOING SHIPS

While oceangoing vessels often operate out of sight, beyond the horizon, in fact, the shipping sector is a major contributor to global GHG emissions.[16] If the shipping sector were a country, it would be the sixth-largest emitter of GHGs, with emissions comparable to Brazil and Japan,[17] and its emissions are growing. Globally, over 90% of traded goods are at one point moved[18] over the waves. Methane emissions are the most rapidly growing GHG from the shipping sector. According to the International Maritime Organization's Fourth GHG study, methane emissions from ocean shipping increased a staggering 151%–155% between 2012 and 2018, even though the use of LNG as a marine fuel had only grown by 28%–30% in the same period.

Methane pollution, in particular, has not been well tracked because it occurs so frequently by accident, often through a hard-to-detect gaseous fuel spill. **Figure 1 shows how accidental leaks (technically referred to as fugitive emissions or methane slip) make up a huge share of the GHG pollution coming from ships.**

FIGURE 1



*SSD has similar life-cycle emissions as HPDF for conventional fuels.

Figure 8. Life-cycle GHG emissions by engine and fuel type, 20-year GWP, higher methane scenario

Life-cycle GHG emissions by engine and fuel type using the 20-year global warming potential—the higher methane scenario

SOURCE Pavlenko, Nikita, Bryan Comer, Yuanrong Zhou, Nigel Clark, and Dan Rutherford.. 2020. "The Climate Implications of Using LNG as a Marine Fuel (Working paper 2020-02)." International Council on Clean Transportation. January 2020. https://theicct.org/sites/default/files/publications/Climate_implications_LNG_marinefuel_01282020.pdf

Methane is seemingly a difficult substance to keep inside pipes, engine blocks, and storage containers.[19] Unburned methane is found around engine blocks, in the plume, throughout venting, around pipes and joints, and all along the supply chain from the fracking field to the wake of the ship. As a result, reported emissions tend to be underestimates compared to measurements in the real world.[20] Relatively small methane emissions can have an outsized impact on the climate because methane is an exceptionally potent pollutant.

In its gaseous form, methane takes up a lot of space, making it impractical for use as a fuel. It is for this reason that the gas is chilled to about -160°C to create LNG, a liquid, minimizing space requirements for its storage, transportation, and use.

BC FERRIES

BC Ferries is a former B.C. crown corporation operating roll-on/roll-off ferry vessels around the coastal regions of B.C. It is a critical component in the movement of goods, people, and vehicles around the province and region.

BC Ferries serves many types of communities, not only moving goods and providing transportation but also facilitating critical regional connections. The essential services BC Ferries provides to the entire region will be needed for the foreseeable future, and so must be brought into alignment with GHG reduction goals.

The increasing use of LNG as a marine fuel has been met with resistance from environmental and consumer protection groups.[21] BC Ferries is among the groups claiming that LNG is a climate solution, when in reality, its use is increasing methane pollution and expanding harmful extraction practices.

METHANE EXTRACTION – FRACKING

Hydraulic fracturing (fracking) is an “unconventional” method of fossil fuel mining but is the primary methane extraction method in B.C. [22] The fracking process involves the injection of fluids laced with chemicals and sand, at high pressure,[23] deep into deposits to release fossil methane gas. Fracking uses large amounts of fresh water,[24] causes localized earthquakes,[25] and has an incredibly negative impact on the environment,[26] including public health and climate impacts.

FRESH WATER

Extracting fossil fuels via hydraulic fracturing is a water-intensive process. Each operation can use between 5,000 and 30,000 cubic metres[27] or two to 12 Olympic swimming pools’ worth of water. It is well documented that fracking negatively impacts drinking water,[28] from acquiring water for use to disposing of used waters.[29] Of particular concern is that in B.C., fracking’s wastewaters are disposed of in such a way that they are removed from the water cycle,[30] meaning that water scarcity may be compounded by these industrial practices. **In a province facing repeated droughts,[31,32] and a future likely filled with more,[33] the water usage for fossil fuel extraction via fracking is deeply concerning.**

HUMAN HEALTH AND AIR POLLUTION

Air emissions from fracking are harmful to public health and ecosystems. **Fracking produces pollutants[34] that directly harm the area around wells and are precursors to other pollution, such as ground-level ozone. This not only impacts the region, but also stretches across the globe.**

Community science has shown elevated levels of air pollution,[35] which correlate with health impacts experienced by those living nearby. Community science efforts suggesting that the magnitude of localized pollution may not be fully captured by existing government monitoring programs corroborate other research indicating that pollution from oil and gas extraction is not adequately monitored or studied.[36]

Fracking is an intense extraction process requiring lengthy preparation and equipment delivery to

the well site. **It is noteworthy that air pollution impacts have been found even during the pre-extraction phase of fracking,**[37] **prior to the most intense period of monitoring.**

Methane is a known and powerful precursor to tropospheric ozone.[38] There are two broad types of ozone, the main difference being the location of the gas. Stratospheric ozone is located in the upper regions of the atmosphere, is important in blocking out harmful ultraviolet rays, and is often called "good ozone," whereas tropospheric or ground-level ozone is located relatively close to the ground and is often called "bad ozone."[39]

Ground-level ozone has increased globally since the beginning of the Industrial Revolution. This health-harming pollutant will continue to rise with the expansion of fracking and the use of LNG, despite reductions in other precursors.[40]

Ground-level ozone is harmful to human, ecosystem, and crop health.[41] It can stifle the energy production process in vegetation, such as forests and crops, and reduce growth. Ground-level ozone exposure can also increase plants' vulnerability to disease, insects, and severe weather. This can impact the makeup of the forest, water, and nutrient cycles.[42]

Each year, one million premature human deaths are attributed to ozone exposure.[43] **As is often the case with industrial pollution, fetuses, children, and the elderly are at the greatest risk from exposure to fracking pollution.** Proximity to oil and gas wells during pregnancy correlates with lower birth weights.[44] Pregnant women in areas of B.C. surrounded by fracking sites were found to have higher pollution levels than those in other parts of Canada.[45] Children living near fracking sites have a significantly higher risk of developing childhood leukemia[46] Elderly persons living in close proximity to or downwind from fracking sites have also been found to have a statistically significant increase in mortality from fracking-related air pollution.[47]

CLIMATE IMPACTS

Methane escapes from tanks, equipment like compressors,[48] and from engine blocks on marine vessels,[49] as previously discussed. Because of the fugitive nature (i.e., accidental release) of many of these emissions, coupled with previous inventories and measurement methods, much of the methane that is released is unaccounted for.[50] As a result, the GHG footprint of fracking is much higher than currently suggested, regardless of the use case of the methane extracted.

The Montney Formation, which straddles the Alberta–B.C. border, is a hot spot for fracking, as its unconventional structures prevented the extraction of gas until advancements in fracking technology opened them to development.[51] **That formation has been identified as Canada's largest carbon bomb,**[52] **which humanity needs to keep contained in the ground if we are to avert more of the hyper-destructive climate event that marked the beginning of the 2020s.**

BC FERRIES

BC Ferries operates a diverse fleet of vessels purpose-built for a combination of routes and nominal capacity. Vessels on longer and more in-demand routes tend to be larger and have more frequent schedules, while smaller vessels operate on routes that are shorter or less used. Different routes are served by different types (or classes) of vessels. For example, the Southern Gulf Islands are served by the Salish Class vessels, which are propelled by dual-fuelled LNG engines and both travel between islands and cross the Strait of Georgia. The Lower Mainland and Vancouver Island are connected by large ferries such as those in the Spirit Class, which are propelled by dual-fuelled LNG engines. The Central and North Coast are served by the Northern Sea Wolf, and by the Northern Expedition and Northern Adventure, which have been identified as candidates to be powered by LNG.

In 2019, BC Ferries released the first version of the Clean Futures Plan (CFP),[53] laying out its path to reducing GHG emissions by 24% by 2030, using 2007 as a base year.[54] **The company acknowledges the need to reduce GHG emissions and improve sustainability, calling for electrification and long-term investment away from fossil fuels, and yet it is investing in LNG.** The plan relies heavily on the use of LNG, which the company claims to be a "clean" fuel, and on the use of fuel blends—mixtures of petroleum and biodiesel in varying percentages, such as B15 and B20.

Methane emissions are under increasing scrutiny, as are emissions from the shipping sector. The Global Methane Pledge, launched in 2021, pushes the global community to reduce methane emissions by 30% in 2030 from 2020 levels.[55] The 2023 International Maritime Organization Strategy

on Reduction of GHG Emissions from Ships explicitly includes reducing methane emissions as a step toward the goal of reducing total GHG emissions by 30% from 2008 levels and reaching net-zero in 2050.[56]

There was also an update to the CFP 2019, which was released in 2022 but fails to mention the Global Methane Pledge.[57] BC Ferries has recently put its plans for electrification of vessels on a slower path.[58] Three of the Island Class vessels have been identified as candidates for electric hybrid investment since 2020,[59] but only received an investment in hybrid electric technology in late 2023.[60] In February of 2024 BC Ferries released concept designs for seven more hybrid vessels to replace six major vessels, but have yet to announce a final investment or a confirmed timeline for fully electric operations.[61]

Stand researchers were unable to conduct an in-depth analysis of emissions and fuel use due to significant discrepancies in available data. A request for information (based on the Freedom of Information and Protection of Privacy [FOIPP] Act) was submitted in September 2023 to request the calculations for the figures reported in the CFP 2019.[62] **A comparative analysis of the data accessed through FOIPP and the publicly reported figures in the BC Ferries CFP 2019 revealed significant discrepancies. For example, the amount of LNG projected to be used in 2030 is approximately 15 million diesel litre equivalent (DLE).** According to the CFP, this would be a decrease from the 25 million DLE used in 2020. However, the FOIPP data showed that LNG consumption for fiscal year 2023 is approximately 28 million DLE (FOIPP Request 24-022), which shows that LNG consumption is currently increasing. More details of the comparison between CFP and FOIPP-requested data are in Appendix D. The data discrepancies make confirming the success of the CFP very difficult. It should be noted here that this report is intended to be the first in a series, and any updates or responses from BC Ferries will be addressed in those further reports.

The Salish Class, consisting of four dual-fuelled vessels that serve the Southern Gulf Islands, and two of the Spirit Class's large vessels, which serve across the Strait of Georgia connecting the Lower Mainland with Vancouver Island, have been converted to use LNG as a fuel at least in part. The Northern Expedition and Northern Adventure vessels were identified as likely candidates for LNG conversion in 2020.[63] **The CFP from BC Ferries recognizes the need to get off LNG—but time frames are important given the fast-acting and potent polluting power of methane in the atmosphere.**

The CFP does not address the issues of methane pollution from well to wake. The CFP must be updated to include global goals for pollution reduction and address methane released directly into the atmosphere.

LNG CAPABLE BC FERRY ROUTES AND VESSELS

LNG CONVERSION CANDIDATES
LNG CAPABLE

(11) Prince Rupert – North Coast (Prince Rupert) to Skidegate – Graham Island (Skidegate)
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- Northern Adventure

(10) Port Hardy – Vancouver Island (Bear Cove) to Prince Rupert – North Coast (Prince Rupert)
- Northern Expedition
- Northern Adventure

(17) Powell River – Sunshine Coast (Westview) to Comox – Vancouver Island (Little River)a
- Salish Orca

(9) Tsawwassen – Metro Vancouver (Tsawwassen) to Southern Gulf Islands
- Salish Eagle
- Salish Heron

(5) Victoria – Vancouver Island (Swartz Bay) to Southern Gulf Islands
- Salish Raven

(1) Victoria – Vancouver Island (Swartz Bay) to Southern Gulf Islands
- Coastal Celebration
- Spirit of British Columbia
- Spirit of Vancouver Island

Fracked Ferries

FRACKING IS HOW B.C. EXTRACTS "NATURAL" GAS

While conventional production of gas in B.C. has declined over time, unconventional production has increased. The BC Oil and Gas Commission reported that unconventional gas zones accounted for 88.9% of annual gas production in B.C. as of December 2021.[64] **If gas is coming from B.C., it is most likely from fracking. As gas use is expanded, fracking has further increased.** See Appendices A and C for further details and maps.

Choices and Their Consequences

BC Ferries sits at a crossroads—as does much of society. Choices we make today will impact the livability of the planet for generations to come. The 2023 IPCC reports have made it clear that no new fossil fuel projects can be built if global climatic warming is to be limited to 1.5°C. GHG emissions must peak by 2025 and then rapidly decline across all sectors. The IPCC found that global methane emissions need to be slashed by up to 53% by 2030 to meet a 1.5°C warming target.[65] **Ground-level ozone is a harmful pollutant whose levels will continue to rise with the expansion of fracking and the use of LNG, damaging ecosystems and human health.[66]**

Even methane sourced from waste or renewable sources is a potent GHG and still has the potential to pollute associated with fossil sources of methane. The World Bank found in 2021 that pathways for LNG as a marine fuel were limited and that investment should be avoided due to the likelihood of LNG infrastructure around the globe ending up as a useless and stranded asset.[67]

The technology for electrification is available to convert ferry systems like BC Ferries, such as those in the Chinese coastal fleet,[68] and other ferries operating around the world.

ELECTRIC FERRIES AROUND THE WORLD

Around the world, state and private ferry operators are moving their passenger and vehicle ferries to electric propulsion. Coastal ferries have been identified as likely candidates for electrification among shipping vessels,[69] as their purpose and route-built customization allow for the adoption of batteries and fast charging along routes.

Across the Salish Sea: Washington State Ferries going hybrid electric

Across the Salish Sea, Washington State Ferries (WSF) is converting its system to hybrid electric[70] and reducing fossil fuel dependency. Their plan does not include LNG and explicitly states that WSF aims to have an emission-free fleet by 2050. WSF goes on to note that moving from hybrid to fully electric vessels through retrofits and terminal infrastructure upgrades will reduce air pollution as well as GHGs and reduce noise pollution.

Case Studies on Electric Ferries From Around the World

Around the world, the case for all-electric ferries is growing as more ships on more routes are setting sail without needing to burn fuel.

In 2019, Denmark included in its services an electric ferry capable of carrying 30 vehicles and 200 passengers.[71] The ferry, named E-ferry Ellen, was considered a demonstration project highlighting battery technology possibilities and sent a signal to the European Union that e-ferries are viable.

In 2021 Norway included an electric ferry in its service route that can carry 600 passengers and 203 cars per crossing.[72] This ferry is similar in size to BC Ferries Salish Class vessels. Norway's climate plan aims for low- or zero-emission ships by 2030, a full 20 years earlier than WSF.

Outside Europe, an Australian manufacturer is delivering a fully electric vessel that will carry 2,100 passengers and 226 vehicles at up to 25 knots with a maximum range of 100 nm.[73] The vessel will travel between Argentina and Uruguay. This vessel was originally planned to be powered by LNG. The designer and customer decided that it would be best to instead demonstrate the revolutionary electric technology, rather than further locking in fossil fuel use.

China also has had an electric ferry in operation since 2019. The vessel is reported to carry up to 300 passengers and can travel for 8 hours at certain speeds.[74] Most of the Chinese coastal ferry fleet is already operating in a way that battery technology would support.[75]

B.C.'s Current Electricity Capacity

As of 2022, BC Ferries operated six diesel-hybrid electric Island Class ferries (Discovery, Aurora, Nagalis, K'ulut'a, Kwigwis, and Gwawis). In fiscal year 2023, these six still consumed around 4.4 million diesel litres based on data from one of our FOIPP requests, which can be found at FOIPP Request 24-022.

ELIMINATION OF METHANE, GROUND-LEVEL OZONE, AND AIR POLLUTION

Electrification is beneficial not only from a climate perspective but also to public health. Globally, fine particulate matter and ozone air-pollution deaths are estimated at over 8 million per year.[76] Phasing out fossil fuels could significantly reduce man-made sources of these pollutants and contribute to saving lives around the world. For example, in the Port of Seattle, full electrification of port operations and vessels would bring a 75% reduction in particulate matter (PM2.5),[77] with significant benefits for visitors and residents close to piers.

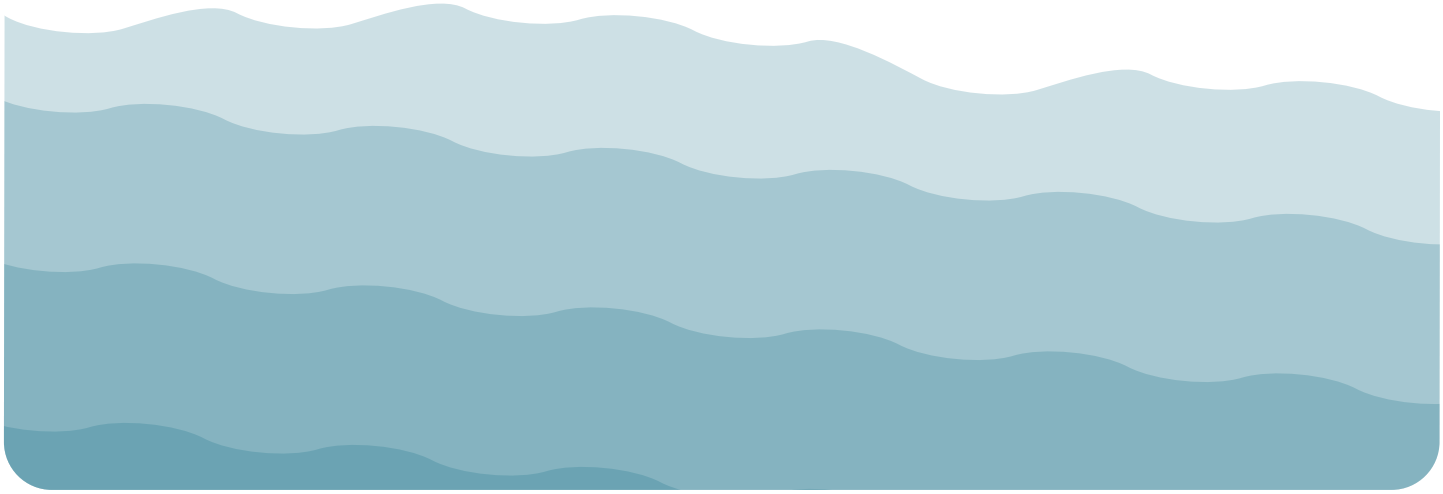
As previously mentioned, methane is a known and significant precursor to ground-level ozone, a significant contributor to global air pollution and human health problems. The reduction in methane emissions will help to prevent the formation of ground-level ozone. Methane reductions have global impacts, not just local ones. Targeting methane as the gas to reduce atmospheric emissions both tackles ozone prevention and helps avert the worst impacts of climate change.[78]

AVOIDING FOSSIL FUEL LOCK-IN

Canada has signed on to the Global Methane Pledge and is incentivizing the shipping sector with green corridors,[79] which are pushing technology past fossil fuels. BC Ferries predicts that the vessels it brings into service in 2024 will be in operation well after 2050, a momentous year for pollution-reduction targets on the pathway to a liveable climate.

The choice to retrofit vessels for LNG and hybrid-diesel fuels, rather than investing in all-electric ferries and supporting port infrastructure, will lock in fossil and polluting combustion fuels for decades to come. BC Ferries claims that its vessels have a 40 to 50-year operational expectancy,[80] meaning that a ferry brought into operation in 2025 is projected to be operational in 2075. This is 25 years after Canada[81] and the United Nations International Maritime Organization[82] have pledged to reach net-zero emissions.

The World Bank has predicted that LNG assets will become stranded in a climate-aligned world—both because of market forces and out of necessity to avert the worst impacts of climate change. If BC Ferries continues to purchase and retrofit vessels that burn LNG and other fossil fuels, it will either have a fleet of stranded assets or will be forced to spend significant sums to again retrofit these ferries in order to meet climate targets.



Conclusions

From fracking well to ferry dock, fracked gas ferries keep communities and ecosystems polluted.

The climate crisis is an “all hands on deck” emergency that requires both urgent and sustained actions to address it. Essential services and infrastructure investments must be made with zero-emissions technology in mind. Coastal communities depend on BC Ferries for a critical service, so BC Ferries must invest in zero-emissions technology.

BC Ferries has acknowledged the need to reduce GHG emissions and get away from fossil fuels in their CFP. BC Ferries currently operates a number of LNG-powered vessels that depend on fracking for fuel. BC Ferries has identified a future expansion of the use of liquefied fracked gas fuel, including new ships and retrofits, creating additional demand for ever more fracking.

Electrifying BC Ferries is more than possible with the technology available. Studies of similar ferry systems and examples of ships already operating are cutting through the choppy seas to chart the course for BC Ferries. As BC Ferries looks to overhaul systems after a tumultuous series of years, curtailing pollution and halting investment in LNG must be significant goals in that conversation.

We all have a responsibility to reduce global pollution; we also all benefit when global pollution is prevented.

Recommendations

1 STOP INVESTMENTS

BC Ferries and its funders and suppliers must stop investing in new LNG ships and retrofits and any expansion of existing LNG use. LNG as a marine fuel is a future stranded asset.

2 OVERHAUL THE SYSTEM, OVERHAUL THE CFP

Transportation is a major source of emissions in the global context. BC Ferries wrote the CFP prior to the establishment of the many international agreements on reducing emissions from the shipping sector. It needs to overhaul its plan in order to align with the pollution reduction targets to which Canada has committed. Emissions must be verifiable and match reported numbers. BC Ferries has the opportunity to reimagine the ferry system in light of a growing region, shifting population needs, and a climate-safe future.

3 PLAN TO ELECTRIFY

Plans must focus on electrification and fully support it, not simply take half measures or make empty gestures. Planning for “low carbon” emissions or partial fracked gas use is distracting and diverts investment and innovation from a needed focus on building ships and routes to be aligned with GHG reduction targets for 2030 and beyond.

Appendix A.

FortisBC Is the Exclusive Supplier of Liquified Natural Gas

FortisBC (Fortis) is the exclusive supplier of liquefied natural gas (LNG) to BC Ferries.[83] Fortis fuels BC Ferries via LNG trucks on deck, rather than a bunkering pier.[84] Fortis also gave CAD 6 million in incentive funding to BC Ferries to convert three ferries to LNG.[85] In addition, BC Ferries signed an exclusive contract for Fortis to supply 300,000 gigajoules of LNG per year for 10 years (equal to approximately 7.8 million litres of diesel or diesel litre equivalent in energy terms).

Fortis supplies LNG to BC Ferries from Fortis-owned facilities at Tilbury and Mount Hayes. Fortis does not extract the gas directly; it is purchased from external suppliers and then converted to LNG.[86] If BC Ferries purchases some gas on its own and sends it to Fortis to convert to LNG, we are unable to track that. The rest of Appendix A is about gas supply for Fortis. About three quarters of the gas comes from the Westcoast B.C. Pipeline (owned by Enbridge),[87] while the rest comes from a market hub in southern Alberta. The market hub on the Westcoast Pipeline that Fortis purchases the gas from is Station 2, located near Chetwynd.

We analyzed data from Rextag (Figure A1) to examine the relationship between the various pipelines owned and operated by Fortis, their connection to the Enbridge Westcoast B.C. pipeline, and the acreages (full list in Table A2) from where gas is "likely" being supplied to Fortis. We then combined data from Rextag on gas pipelines and acreages with a list of shippers from Enbridge Westcoast Energy Inc.'s index of customers[88] to get the top five potential suppliers of gas to Fortis (Table A1) and thus BC Ferries.

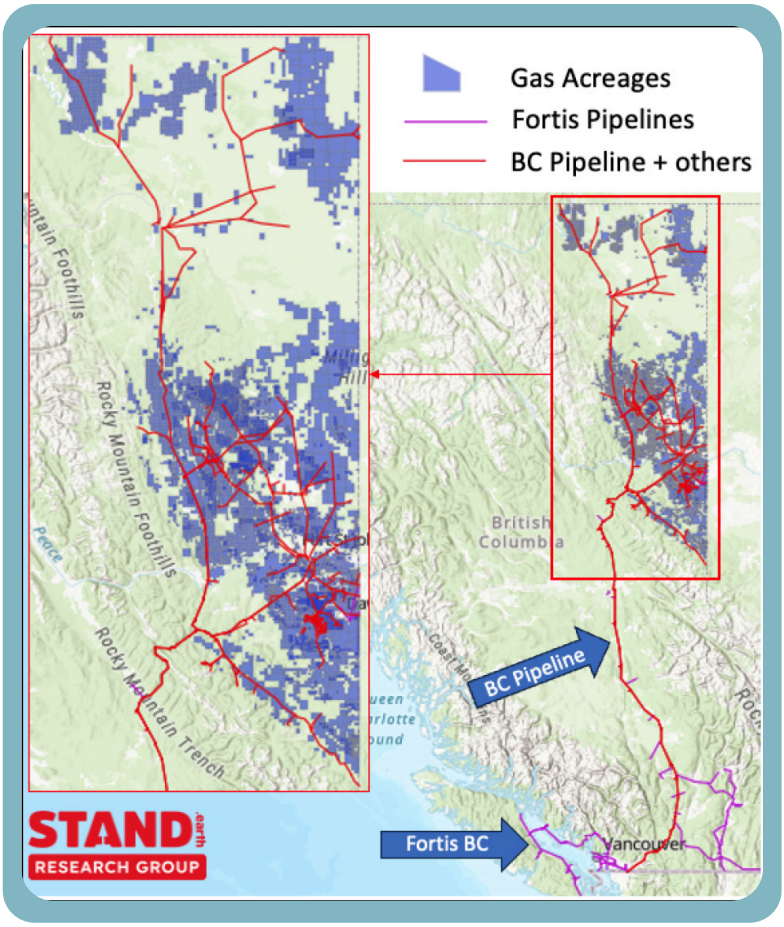


FIGURE A1.

Map showing the pipelines used to ship gas and the acreages from where it is likely being supplied in B.C.[89]

TABLE A1.

Operator	Square miles of acreages	Number of wells
Canadian Natural Resources	7,137	914
Tourmaline Oil Corp.	1,443	1,069
Cenovus Energy Inc.	1,360	70
Petronas Energy Canada Ltd.	1,347	810
Chevron Canada Limited	1,260	undisclosed

Top five gas suppliers to Fortis using the Enbridge Westcoast Pipeline, based on acreages and number of producing natural gas wells in B.C.

Appendix B.

Data Obtained Through the Freedom of Information and Protection of Privacy Act

We requested data from BC Ferries using the Freedom of Information and Protection of Privacy (FOIPP) Act. We put in two requests on September 7, 2023, and received data on November 22, 2023. The FOIPP Request 24-019 records relating to liquefied natural gas (LNG) and fuel consumption for fiscal year 2023 can be found online on the BC Ferries website.

Fuel use data for routes 10, 11, 26, and 28 in FOIPP 24-019 are missing. BC Ferries, when asked for clarification, replied in an email that "the person who created this analysis for the 2019 report is no longer with the company, and the figures have not been updated since that analysis. There is no indication why those routes were not included."

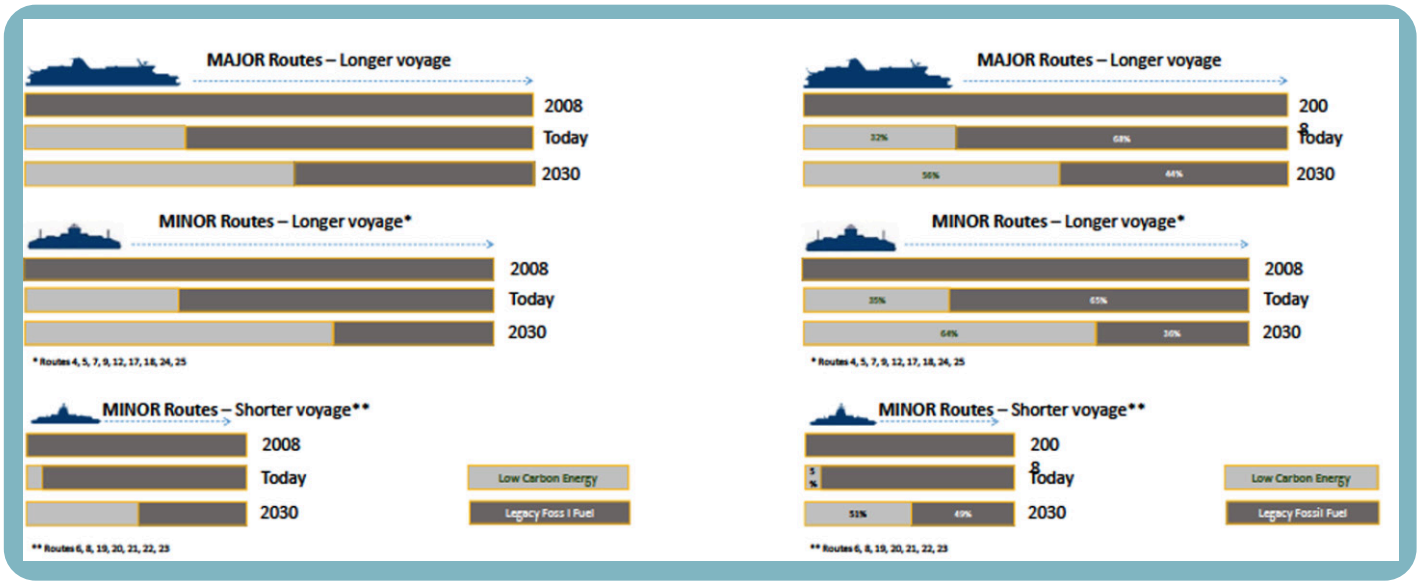
Below are screenshots of the data received for the FOIPP request, but the original data is available at the links listed above.

TABLE B1.

Fuel Type	Route	Sum of F2008	Sum of F2020	Sum of F2021	F2020 Consumption B5	F2020 Consumption R100	F2020 Consumption B15	F2020 Consumption LNG	% of Today Fuel that is LCE	F2030 B15	F2030 Electric	F2030 LNG	How much of F20 fuel w l be d splaced w th LCE n F30?
									TODAY (F20)				2 030
Major	01 - Tsawwassen - Swartz Bay	29 273 039	35 139 817	28 566 725	806 991			19 000 000	20 000 000	1 651 473		5 130 000	5 400 000
	02 - Horseshoe Bay - Nanaimo	21 578 960	21 724 988	14 473 856	1 086 249			-		3 258 748		-	
	03 - Horseshoe Bay - Langdale	7 284 699	7 865 114	7 143 669	393 256	5 000 000		-		1 179 767		-	
	0 - Nanaimo - Tsawwassen	20 091 546	22 615 450	22 570 849	1 130 773			-		2 81 068		8 075 000	8 500 000
Major Total		78 228 244	87 345 369	72 755 099	3,417,268	5,000,000	-	19,000,000	32%	8,271,055		13,205,000	56%
Minor Long	04 - Swartz Bay - Fulford Harbour	2 158 526	2 139 115	1 936 227	106 956			-		320 867		-	
	05 - Swartz Bay - Gulf Islands	5 021 648	5 122 090	5 227 123	256 104			-		474 215		1 960 654	2 063 846
	07 - Saltery Bay - Earls Cove	3 457 961	3 65 748	3 069 627	158 287			-		474 862		-	
	09 - Tsawwassen - Gulf Islands	3 930 538	3 595 366	2 501 846	8 988			3 415 598	3 595 66	26 965		-	
	12 - Mill Bay - Brentwood	55 854	224 237	176 266	11 212			-		33 636		-	
	17 - Comox - Powell River	3 401 146	2 897 705	2 688 508	7 244			2 752 820	2 897 705	21 733		-	
	8 - Texada Island - Powe l River	715 527	581 167	808 101	29 058			-		87 175	900 000		
	24 - Cortes Island - Quadra Island	450 831	585 332	596 984	29 267			-		87 800		-	
	25 - Alert Bay - Sointula - Port Mcneill	846 857	1 059 386	1 214 734	52 969			-		158 908	1 500 000		
Minor Long Total		20 038 888	19 370 146	18 219 415	660,086		-	6,168,418	35%	1,686,161	2,400,000	1,960,654	64%
Minor Short	06 - Vesuvius Bay - Crofton	672 828	535 201	774 714	26 760					80 280			
	08 - Horseshoe Bay - Snug Cove	2 891 131	2 645 990	2 786 845	132 300					396 899			
	19 - Gabriola Island - Nanaimo Harbour	1 121 519	938 520	953 183	46 926						938 520		
	20 - Thetis Island - Penelakut - Chemainus	546 321	453 932	442 572	22 697					68 090			
	21 - Denman Island - Buckley Bay	379 591	187 310	173 730	9 366						187 310		
	22 - Hornby Island - Denman Island	236 412	205 873	86 741	0 294					30 881			
	23 - Quadra Island - Campbell River	1 128 401	1 056 144	1 069 420	52 807						1 056 144		
Minor Short Total		6 976 203	6 022 970	6 87 205	301,148		-	-	5%	576,149	2,181,974	-	51%

Data for fuel consumption as received in FOIPP Request 24-019

FIGURE B1.



Details of figure on page 12 of BC Ferries' Clean Futures Plan 2019, as received in FOIPP Request 24-019

Appendix C.

Fracking in British Columbia

Data from Hart Energy Rextag Mapping and Data Services included a list of natural gas pipelines and natural gas acreages in British Columbia (B.C.). We then acquired a list of all shippers from the Enbridge Westcoast Energy Inc. index of customers.[90] Combining the two, we get Table C1 which lists the names of shippers using the Enbridge B.C. pipeline to ship gas and the acreages in square miles, respectively.

TABLE C1.

Operators who use the B.C. pipeline to ship gas

Operator	Acreages in B.C. (in square miles)
Canadian Natural Resources	7,137
Tourmaline Oil Corp.	1,443
Cenovus Energy Inc.	1,359
Petronas Energy Canada Ltd.	1,347
Chevron Canada Limited	1,260
Bonavista Energy Corporation	774
Arc Resources Ltd.	749
Ovintiv Canada ULC	526
Crew Energy Inc.	455
Conoco Phillips Canada Ltd.	446
Strathcona Resources, Ltd.	443
Shell Canada, Ltd.	436
Kelt Exploration Ltd.	406
Pacific Canbriam Energy Ltd.	313
ISH Energy Ltd.	261
Leucrotta Exploration Inc.	245
Storm Resources Ltd.	233
TAQA North Ltd.	218
Saguaro Resources Ltd.	200
Murphy Oil Corporation	158
Fireweed Energy Ltd.	102
Whitecap Resources Inc.	86
Todd Energy Canada Ltd.	65
Longshore Resources Ltd.	62
Tourmaline Oil Corporation	58
Tidewater Inc.	53
Convergent Energy & Power, LP	51
Aduro Energy, Inc.	51
Yoho Resources, Inc.	48
Canlin Energy Corporation	34
Leucrotta Exploration, Inc. (formerly)	25
Arc Resources, Ltd. (formerly)	16
Birchcliff Energy, Ltd.	11
Advantage Oil & Gas, Ltd.	2

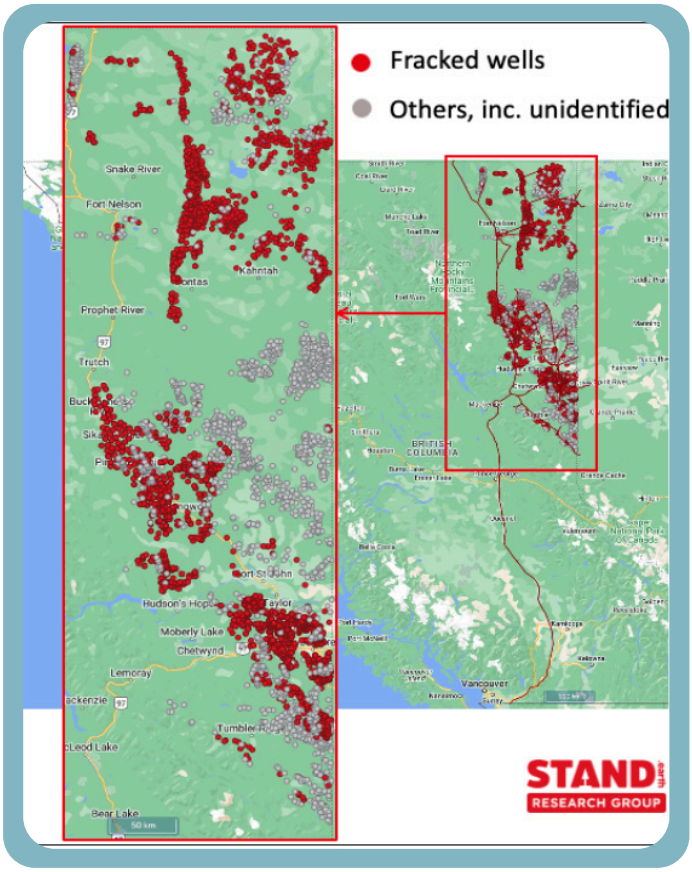


FIGURE C1.

DRAFT map showing all fracked and other wells in B.C.

Table C2. Operators who have fracked wells operating in B.C.

Operator	Number of producing wells
Tourmaline Oil Corporation	1,069
Canadian Natural Resources	914
Petroliam Nasional Berhad (PETRONAS)	810
Arcres	544
Shell Petroleum Company	463
Murphy Company	284
Crew	196
Cop	130
Cve Energy	70
Tecl	26
ISH Energy, Ltd.	21
Kelt LNG	15
Canlin	13
Yoho	9
Adu	3
Sukunka Natural Resources, Inc.	3
SPK Energy	2
Thermal Engineering International	1
~unknown~	2,518

TABLE C2.

Operators who have fracked wells operating in B.C.

Using the Rextag Energy Datalink, we estimate that 76% of currently active and producing natural gas wells in B.C. are fracked.[91]The actual number of fracked wells is likely much larger, as there are many wells whose trajectory (direction) of drilling is unknown in the dataset, and could thus be either fracked or conventional. Figure C2 shows the locations of all confirmed fracked wells belonging to operators using Enbridge's B.C. pipeline, which then flows to Fortis through Station 2.

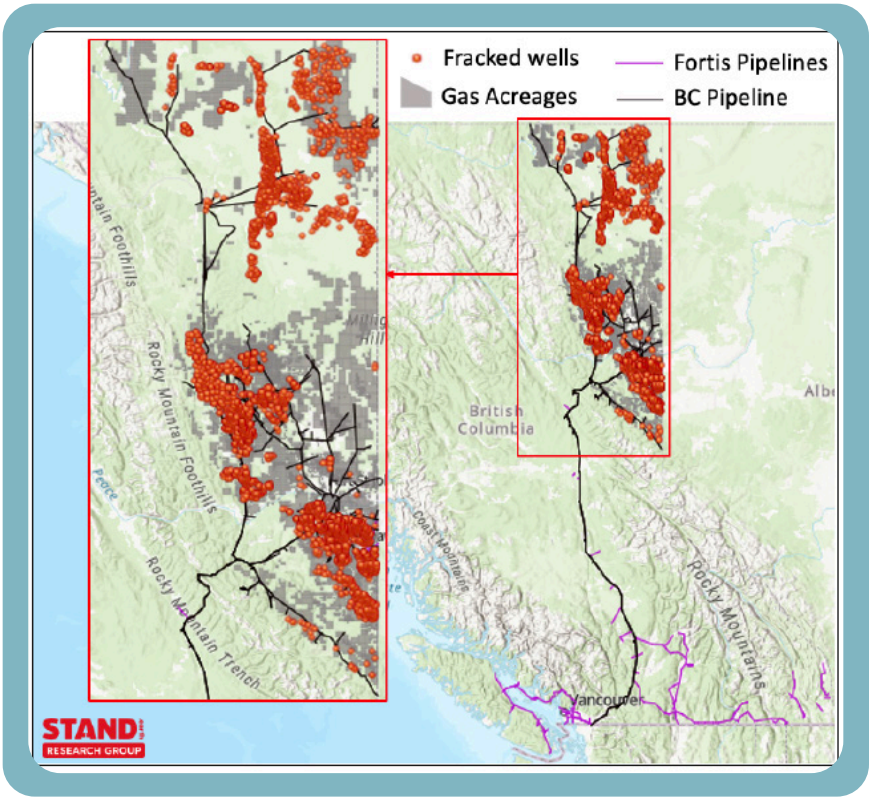


FIGURE C2.

Map showing the FortisBC and B.C. pipeline, acreages where gas is likely being sourced from, and confirmed fracked wells

Appendix D.

"Clean" Future Projections and Transparency

BC Ferries, in both its Clean Futures Plan (CFP) 2019 and the data obtained through the Freedom of Information and Protection of Privacy Act (FOIPP) Request 24-019 (hereby referred to as FOIPP 2023) includes liquefied natural gas (LNG) under "low carbon energy" (LCE). The FOIPP 2023 also includes diesel blends B5, B15, and B20 in LCE, which are mixtures of petroleum diesel and biodiesel.[92]

The data we received through the FOIPP 2023 did not match the data reported in CFP 2019 without multiple assumptions on fuel use in 2030, diesel blends, and so on. This mismatch has made an in-depth analysis difficult. When a follow-up clarification on some of these numbers was requested, BC Ferries was unable to provide it because of staffing issues (details in Appendix B).

Table D1 shows some of the discrepancies between the CFP 2019 and the FOIPP 2023 data. We estimated the approximate percentages for fossil fuel use, LNG, and other fuels for CFP 2019 from the figure on page 12.[93] The FOIPP 2023 has percentages for "legacy fossil fuels," which refers to marine diesel, and the rest dubbed as LCE, which includes LNG, "renewable" fuels, and electric and diesel blends (bio- and petroleum). We used the reported numbers to estimate percentages for each type of fuel listed in Table D1. There was no category for diesel blends in the CFP, so the CFP columns have been left blank for that category, but it is included in the FOIPP columns in Table D1. For the purposes of Table D1, and from what we have assumed from the information given, diesel blends include fuel types B5, B10, B15, and B20.

CFP Terminology	FOIPP Terminology	2019 CFP numbers	2020 FOIPP numbers	2030 CFP numbers	2030 FOIPP numbers
Major Routes					
Fossil Fuel	Legacy Fossil Fuels	68%	68.6%	30%	44%
LNG	"Low Carbon Energy" (LCE)	26%	21.8%	47%	56%
Biodiesel Blends[94]		-	3.9%	-	
"Renewable" Fuels		6%	5.7%	11%	
Electric		-	-	11%	
Minor Routes - Longer Voyage					
Fossil Fuel	Legacy Fossil Fuels	70%	64.7%	44%	36%
LNG	"Low Carbon Energy" (LCE)	24%	31.8%	34%	64%
Biodiesel Blends[94]		-	3.4%	-	
"Renewable" Fuels		6%	-	11%	
Electric		-	-	11%	
Minor Routes - Shorter Voyage					
Fossil Fuel	Legacy Fossil Fuels	88%	95%	46%	49%
LNG	"Low Carbon Energy" (LCE)	-	-	-	51%
Biodiesel Blends[94]		-	5%	a12%	
"Renewable" Fuels		12%	-	42%	
Electric		-	-		

TABLE D1.

Projections and historical use of various fuels by BC Ferries based on CFP 2019, as published on the website and the FOIPP 2023 request data received

There are discrepancies between the data obtained through the FOIPP 2023 and what has been stated by BC Ferries in its CFP 2019. For example, LNG use in the FOIPP data for 2030 is approximately 15 million diesel litre equivalent (DLE), which is a decrease from 2020 at 25 million DLE. However, according to the CFP 2019 posted on the BC Ferries website, there should be an increase in LNG use for major routes from 26% to 46%. Currently LNG consumption for fiscal year 2023 is approximately 28 million DLE (FOIPP Request 24-022). Unless BC Ferries plans to reduce overall fuel use, for all fuel types, in 2030 or reduce the number of ferries currently in use, the numbers do not seem to tell the same story. BC Ferries has not provided any clarification on the numbers in the FOIPP 2023 data or the reason why there are discrepancies between the FOIPP 2023 data and the CFP as published on their website.

The CFP 2019 states that only one conversion to LNG per year is feasible, with a maximum of four identified vessels (three Coastal Class and the Northern Expedition) as potential candidates for conversion. This projected conversion of more ships to LNG, as per CFP, does not match the reduced LNG fuel consumption in 2030 in the FOIPP 2023 data, in the Global Methane Pledge, or in the 2023 International Maritime Organization Strategy on Reduction of GHG Emissions.

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90 See Enridge Westcoast Energy Inc. for the pipeline index of customers: DUNS Numbers.

91 Rextag Energy Datalink shows that of 11,273 total wells that are active and producing in B.C., 10,186 wells are natural gas producing only, and 7,780 of these are horizontal (i.e., fracked).

92 Alternative Fuels Data Center: Biodiesel Blends: Biodiesel can be blended and used in many different concentrations - the most common are B5 (up to 5% biodiesel) and B20 (6% to 20% biodiesel). There is also a scientific study on B20 and petroleum diesel: Numerical Comparison of B20 Biodiesel and Petroleum Diesel in terms of Performance, Combustion, and Emission at Constant Speed - IOPscience

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94 BC Ferries includes diesel blends in its “low carbon energy,” but it does not clarify whether the volume of the whole mixed fuel is counted or strictly the volume of the biodiesel added in. For example, if we take an imaginary tank of 100 litres, and imagine that it is filled with 20 litres of biodiesel and 80 litres of fossil diesel, we are not sure if BC Ferries would count that as 100 litres of a mix of LCE or if it would count that as 20 litres of bio LCE and 80 litres of fossil diesel. The lack of clarity has a significant impact on the calculations in the CFP, as well as the actual reductions achieved by BC Ferries, and potentially locks in fossil fuel use. Without clarification, we assume that the whole mixed volume is included, which means that “legacy fossil fuel” use in 2030 will be much more than stated in the CFP, as 80% of the B20 fuel will be fossil diesel.

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