About LNG

What is LNG?

LNG is natural gas that has been converted to a liquid form for storage or transportation. LNG is 1/600th the volume of natural gas in its gaseous state. Natural gas is converted to LNG by cooling to approximately -162 degrees Celsius. Once it is in liquid form it is transported on specially designed LNG carrier ships, and then re-gasified following transportation.

LNG Plants Are Energy Intensive

LNG production and transportation is one of the most energy intensive industrial processes known. The cooling process requires enormous amounts of power. For example, the proposed LNG Gas Canada facility (Shell) in Kitimat will require approximately 1,200 megawatts of power. In comparison the rebuilt Rio Tinto/Alcan aluminum smelter will require approximately 900 MW of power, and the proposed Site C hydro project on the Peace River would produce 900 megawatts.

Power Choices

The power required for a LNG plant can come in different ways, usually described as “outside the fence” or “inside the fence.”

“Inside the fence,” sometimes referred to as “direct drive,” uses approximately 7 - 15% of the gas coming into the plant from a pipeline to mechanically cool and condense the natural gas into LNG.

“Outside the fence” would use power sourced from outside the plant, either from existing electric capacity, or capacity yet to be developed, which could include renewable sources such as wind power.

Generally “Inside the fence” causes significantly more pollution and greenhouse gas emissions than “outside the fence.” If “outside the fence” power is sourced for LNG production, large upgrades to BC’s transmission and generating capacity will be needed. This could cost tens of billions of dollars, but could also generate significant income to First Nations, or crown corporations.

Generally “Inside the fence” causes significantly more pollution and greenhouse gas emissions than “outside the fence.”

Air quality and greenhouse gases

Much of the gas that would be used in proposed BC LNG plants will come from shale gas, which often has high concentrations of CO2 that are currently vented to the atmosphere. When all the CO2 emissions associated with the proposed LNG facilities are considered, there is almost no chance that BC could meet any of its stated greenhouse gas emission targets. The projects would also significantly impact Canada’s ability to meet its stated greenhouse gas emission targets.

Depending on which method is used to power LNG facilities, CO2 and other emissions from LNG plants can be significant. In 2012, the BC Government exempted LNG export facilities and electricity generation used to power them from the Clean Energy Act, which would have required them to be powered by clean and renewable energy.

Currently, there is little capacity for citizens, communities, government or industry to consider the cumulative ecological and social impacts of the proposed LNG projects, especially in conjunction with other proposed major developments, like the Rio Tinto / Alcan smelter expansion and the proposed oil refinery in Kitimat.

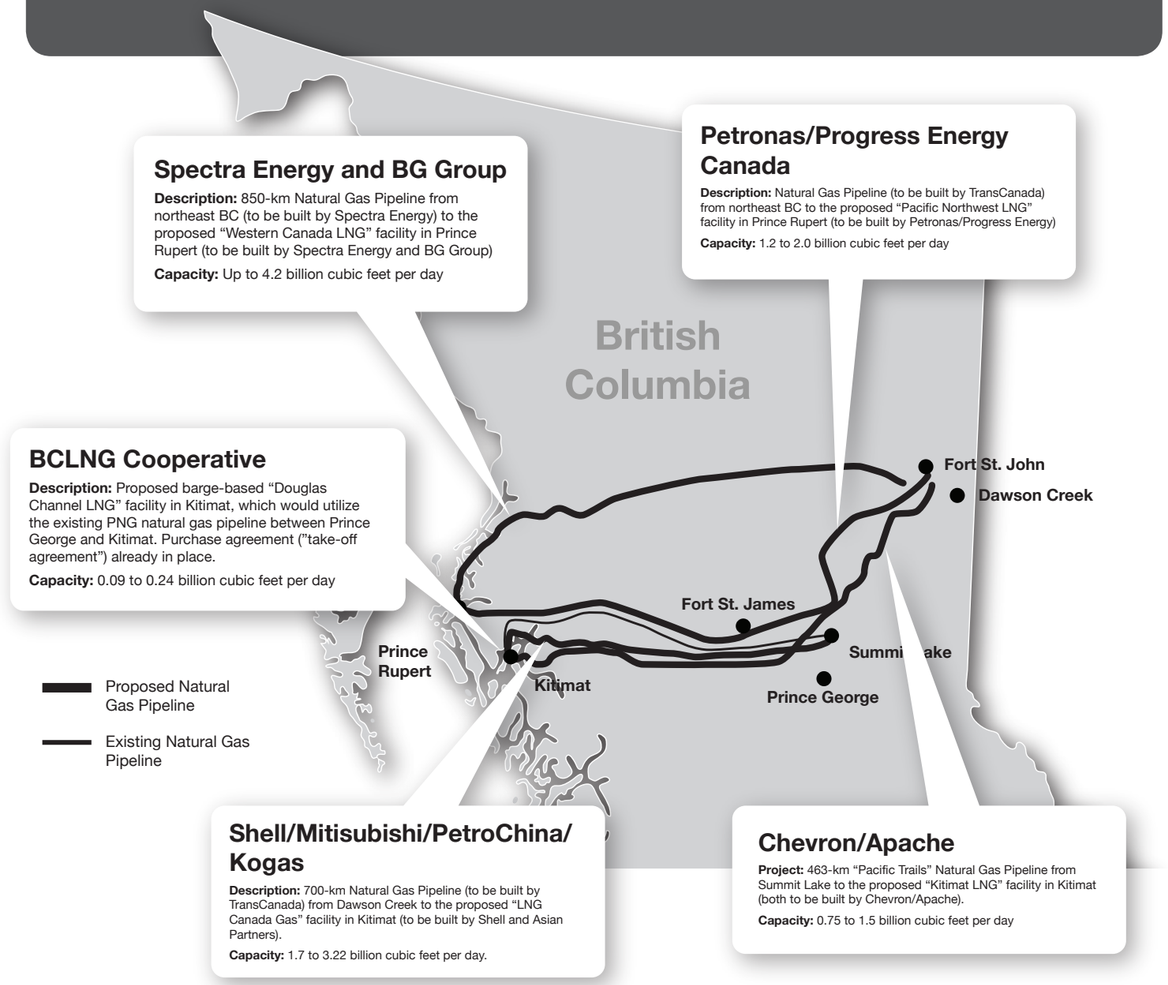
Fracking and Water

Extracting gas from shale in Northern BC requires hydraulic fracturing, or “fracking.” This is a process that involves injecting water and chemicals under high pressure into shale formations. Fracking uses enormous volumes of water, and impacts the quality of that water, and has other potential impacts.

Security of BC’s Gas Supply

The volume of gas associated with the proposed LNG projects is significant. BC currently produces 3.0 billion cubic feet per day – of which 14% is consumed in BC, 41% is exported to the US, and 43% is delivered to other provinces. In comparison, Shell’s “LNG Canada Gas” has obtained an export license for 3.2 billion cubic feet per day. Several of the proposed BC LNG projects rank in size as the largest proposed LNG facilities in the world. If the Shell, Apache and BG/Spectra projects were built, as proposed by industry and government, it would increase global LNG production by 21%. Under full scale LNG development as suggested by government, all known and projected reserves of natural gas in BC would be gone in under 100 years. Canada ranks 20th insofar as proven reserves of natural gas, with just under 1% of global proven natural gas reserves.

Proposed LNG Projects in Northern B.C.



Spectra Energy and BG Group

Description: 850-km Natural Gas Pipeline from northeast BC (to be built by Spectra Energy) to the proposed “Western Canada LNG” facility in Prince Rupert (to be built by Spectra Energy and BG Group)

Capacity: Up to 4.2 billion cubic feet per day

Petronas/Progress Energy Canada

Description: Natural Gas Pipeline (to be built by TransCanada) from northeast BC to the proposed “Pacific Northwest LNG” facility in Prince Rupert (to be built by Petronas/Progress Energy)

Capacity: 1.2 to 2.0 billion cubic feet per day

BCLNG Cooperative

Description: Proposed barge-based “Douglas Channel LNG” facility in Kitimat, which would utilize the existing PNG natural gas pipeline between Prince George and Kitimat. Purchase agreement (”take-off agreement”) already in place.

Capacity: 0.09 to 0.24 billion cubic feet per day

Shell/Mitisubishi/PetroChina/ Kogas

Description: 700-km Natural Gas Pipeline (to be built by TransCanada) from Dawson Creek to the proposed “LNG Canada Gas” facility in Kitimat (to be built by Shell and Asian Partners).

Capacity: 1.7 to 3.22 billion cubic feet per day.

Chevron/Apache

Project: 463-km “Pacific Trails” Natural Gas Pipeline from Summit Lake to the proposed “Kitimat LNG” facility in Kitimat (both to be built by Chevron/Apache).

Capacity: 0.75 to 1.5 billion cubic feet per day

Other potential proponents

AltaGas Ltd/Idemitsu Kosan
Project: potential 0.36 bcf/day LNG facility

Imperial Oil/Exxon Mobil
Project: LNG facility at Digby Island

Nexen/Impex
Project: unknown

Kitsault Energy
Project: unknown

Comparing Proposed LNG Projects in Northwest BC

LNG Name	LNG Status	Partners	Location	Capacity	Power Demand	Pipeline Name	Pipeline Status	Pipeline Proponent	Pipeline Details
Douglas Channel LNG	EA: not required Export license granted Take off agreements signed. In-service 2015	BC LNG Export Co-operative - a partnership between Haisla Nation and LNG Partners (Houston TX)	West Side Douglas Channel. Barge facility	Initially 0.7 MTA 0.09 bcf/d Up to 1.8 MTA 0.18 bcf/d (1 ship per month)	45 MW Power currently available.	Pacific Northern Gas	Existing	AltaGas	0.115 bcf/d
Kitimat LNG	EA: Complete Export license obtained. No “Take Off” agreements In-service 2016	Chevron & Apache 50/50 equity of LNG facility, pipeline, & upstream production	Bish Cove, Kitimat	Phase 1: 5 MTA 0.75 bcf/d License: 10 MTA	525 MW Possible with current transmission infrastructure	Pacific Trails Pipeline via new corridor Gas Source: Horn River and Liard Basin	EA: Complete.	Chevron & Apache	
Western Canada LNG	Proposed In-service 2020	BG Group and Spectra Energy	Ridley Island, Prince Rupert	32 MTA 4.2 bcf/d	Unknown	Natural Gas Transmission System - NE BC to Prince Rupert Area	EA: Pre-Application	Spectra	36”- 48” Diameter 870 km Cypress to Ridley Island via Nass Valley
LNG Canada Gas	Proposed Advantage: partners are LNG buyers In-service 2018	Royal Dutch Shell PLC with PetroChina, Mitsubishi Corp. and Korea Gas Corp	Kitimat	Initial: 13 MTA 1.7 bcf/d Up to 37 MTA 5 bcf/d	1200 MW (13 MTA) Requires a 500 kV line from PG to Terrace	Coastal GasLink Pipeline Ltd.	EA: Pre-Application	TransCanada	48” Diameter 650 km
Pacific Northwest LNG	Proposed In-service 2018	Petronas and Progress Energy Resources	Lelu Island, Port Ed	18 MTA 2.4 bcf/d	Unknown	Prince Rupert Gas Transmission Project	Proposed To submit EA Project Description in 2013	TransCanada	??
??	Proposed	AltaGas Ltd. (50%) and Idemitsu Kosan Co. (50%)	Not determined.	2.7 MTA 0.36 bcf/d	??	??	??	??	??
??	Speculative	Imperial (Exxon Mobil)	Digby Island, Prince Rupert	??	??	??	??	??	??
??	Speculative	CNOOC	Unnkown	??	??	??	??	??	??
??	Speculative	Woodside Petroleum (Australia)	Unknown	??	??	??	??	??	??

Subject to change. Based on information available in March 2013.

Understanding the technical terms

Natural gas and LNG use different units of measurement.

- Reserves of gas are measured by volume in trillion cubic feet (tcf)
- When gas is produced and/or transported by pipeline it is measured by volume per day – usually billion cubic feet per day (bcf/d; also written as MMcfd).
- When is converted to LNG, it is measured by weight, either million tons (MT) or million tons per annum (MTA).
- LNG ships are specified by cargo volume – typically cubic meters (m3)
- Once LNG has been reconverted to gas; it is sold in energy units – either joules or British Thermal Units (BTU’s).

The proposed phase I of the Chevron/Apache 5 MTA LNG facility would require a pipeline flow rate of 0.75 bcf/d. It would fill a small LNG tanker in 3.7 days (99 per year), and over 20 years will require recoverable reserves of 5.5 tcf. The LNG plant would require 525 megawatts of electrical power.

Chevron/Apache Example

As an example, here are how the different units of measurement are used in regard to the Apache/Chevron project:

LNG units of measurement			Pipelines, tankers and reserves		
Annual Capacity (Weight)	Daily Output (Volume)	Electrical Requirements (Power)	Pipeline Flow (Volume)	Tankers (Number)	Recoverable reserves needed for 20 years of operation (Volume)
5 million tons per annum (MTA)	47,000 cubic metres (m^3)	525 Megawatts (MW)	0.75 billion cubic feet per day (bcf/d)	Small: 99 tankers per year	5.5 trillion cubic feet (tcf)

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