

West Coast Olefins Project

DOWNSTREAM CANADA CONFERENCE

Maximizing Value
from BC's Natural Gas Liquids



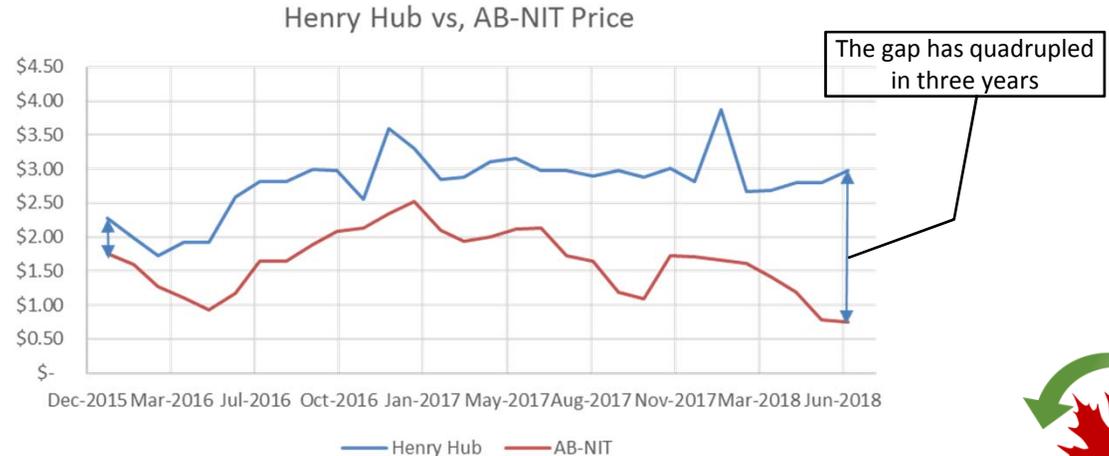
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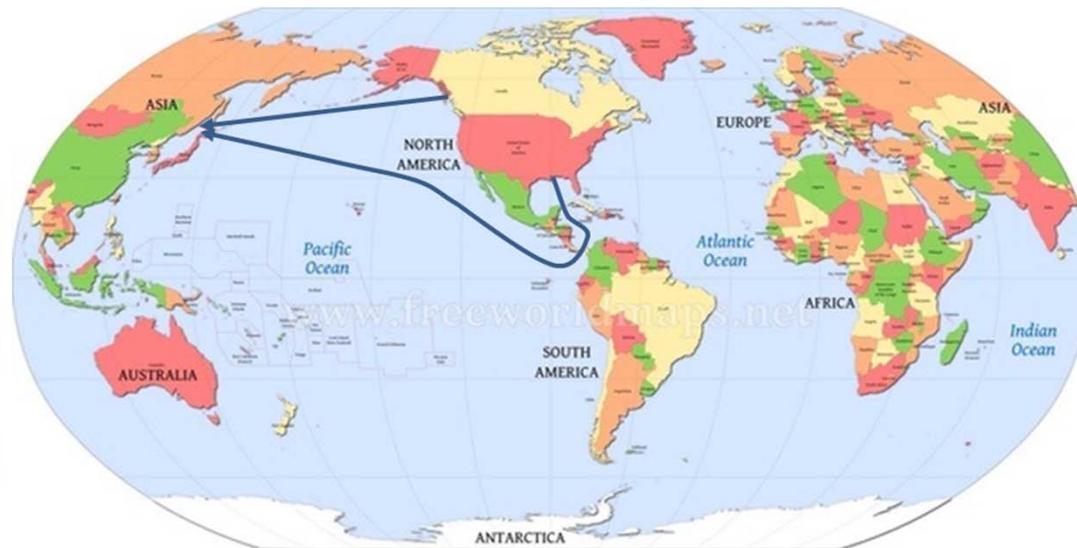
Canadian Gas Market in Distress

- Abundant natural gas seeking new markets
 - Rapid growth of shale gas in the US has eliminated markets where the majority of Western Canadian gas was historically sold and US suppliers are even encroaching on Eastern Canada markets
 - Local public & First Nations support has been a challenge for projects to date
 - This has led to oversupply that has significantly reduced prices in Western Canada



The Canadian Opportunity

- **Competitive Production Cost Structure**
 - *Abundant, low-cost natural gas*
 - *Low-cost access to rapidly growing Asian markets*



Why Prince George?

- Don't need a new pipeline
- Availability of critical infrastructure (rail, river, road, airport, fab shops...)
- Availability of industrial zoned fee-simple land
- Population base to support project through full life cycle



Competitive Advantages

- **Benchmark against new olefins projects (US Gulf Coast or Alberta)**
 - *Low cost ethane feedstock delivered to the BC interior via existing pipelines with ready access to export off the west coast, but not constructing in environmentally sensitive coastal region*
 - *>\$250/tonne shipping and feedstock advantage over USGC plants exporting to Asian markets*
 - *\$50 to \$75 / tonne advantage over Alberta plants exporting to Asian markets*
 - *Integrated plant design yields capital and operating cost advantages and significant reductions in environmental impact*

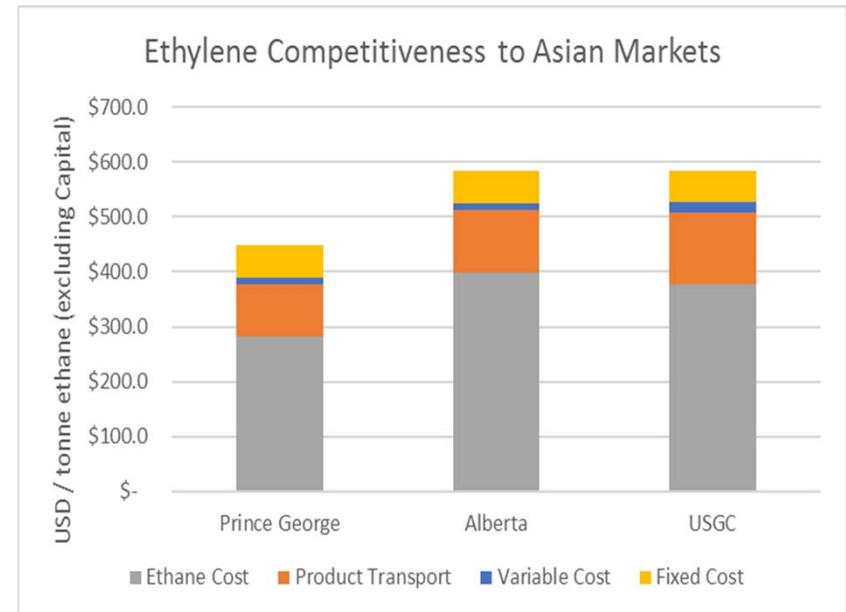
Feedstock & Transport Advantage

USGC:

- Higher ethane cost (Henry Hub price basis vs AECO)
- Higher shipping costs

Alberta:

- Higher ethane cost (NGL pipeline tolls)
- Higher rail costs



WEST COAST OLEFINS LTD.

Project Breakdown

WCOL Facilities:

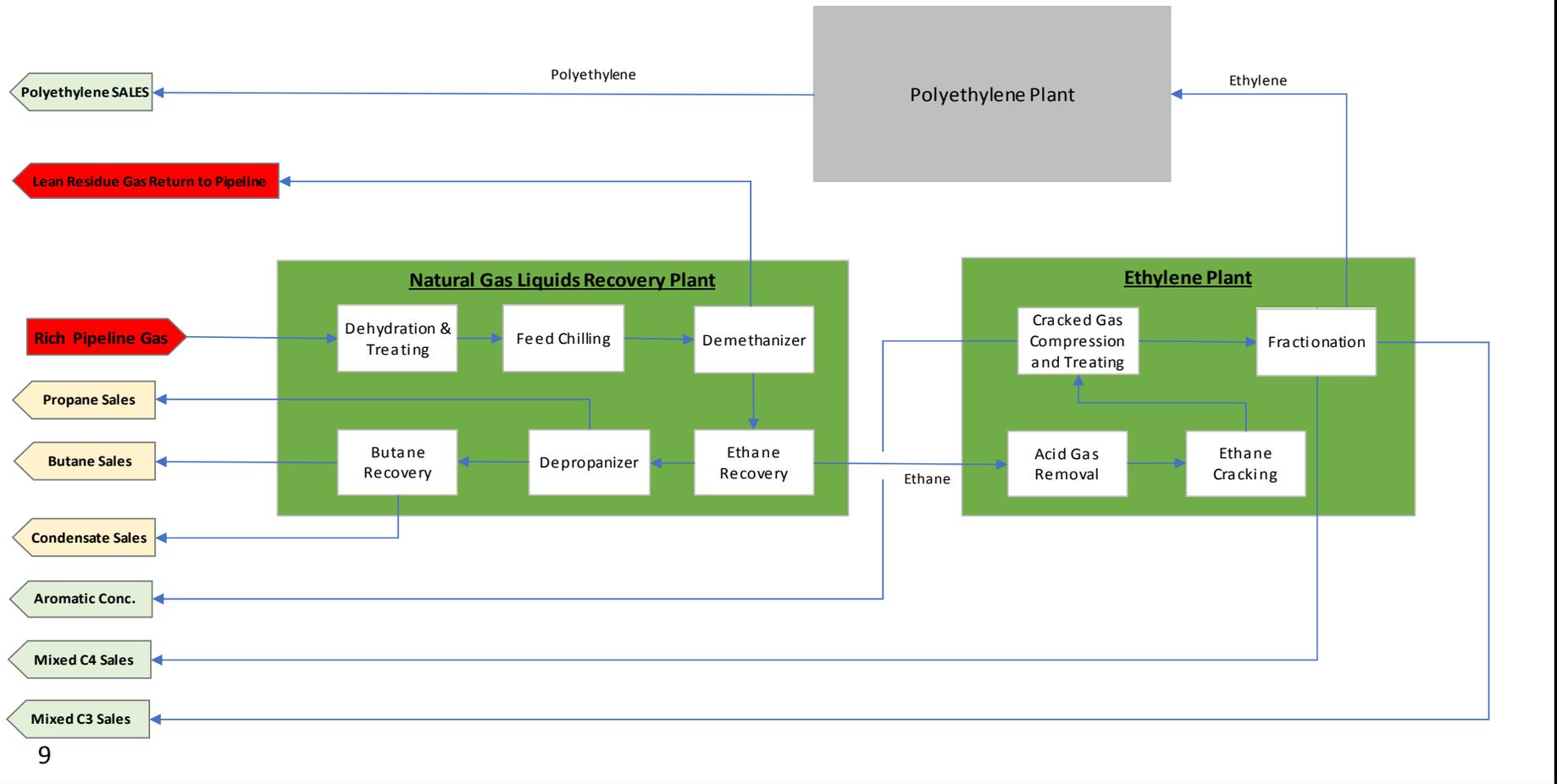
- Natural liquids recovery plant, ethylene plant and associated offsites and infrastructure will be owned and operated by WCOL
- Facilities operated on a cost-of-service basis for natural gas and ethylene derivative producers
- Gas producers retain ownership of their lean gas and recovered liquids and responsibility for its disposition into the market
- Long-term supply and offtake agreements in place with credit-worthy counterparties

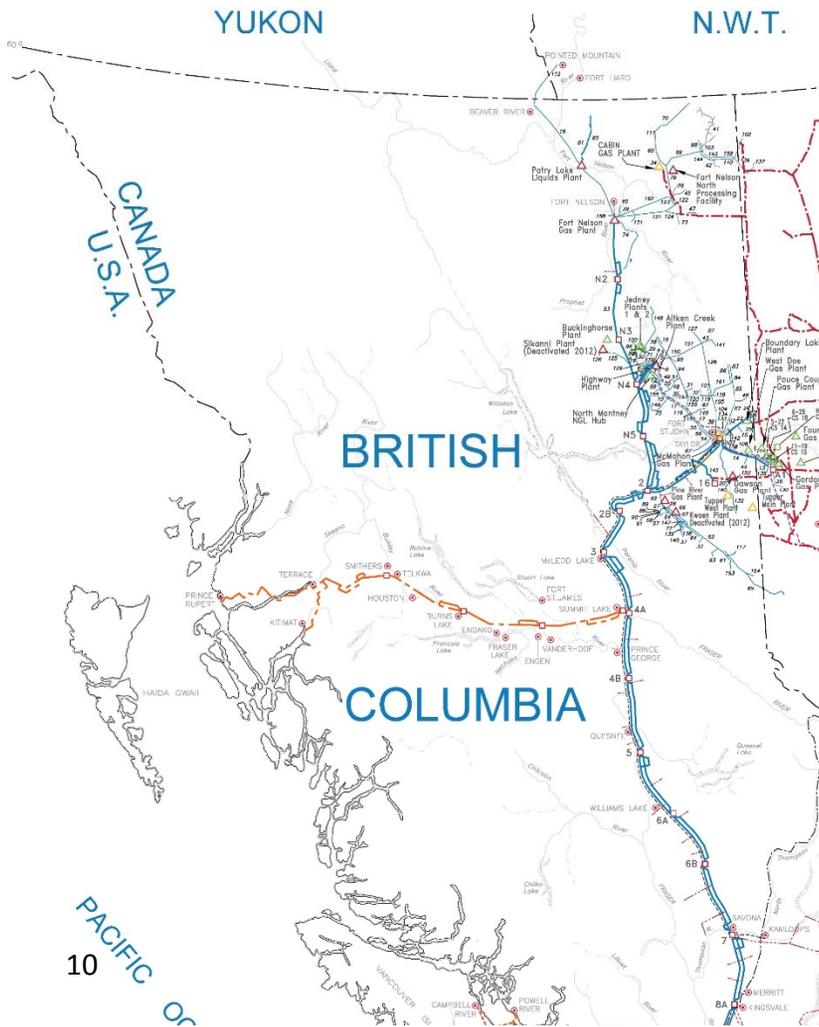
Third Party Derivative Facilities:

- Responsible to design, construct, operate and maintain the ethylene derivative facilities
- Responsible for sales and marketing of their product



Proposed Phase 1 Development





Enbridge BC Pipeline System Map

- Capacity of 2.1 BCFD
- Ideal site location near Prince George (between Station 4A & 4B)
- Ethane Feed
 - 1 million TPA ethylene plant (1.35 million possible from Enbridge pipeline)
 - 1 million TPA polyethylene plant
- Propane and butane recovered have short rail haul to Prince Rupert
- Lean residue gas preferred for customers in southern BC and NW USA



Economic Benefits

- **“Value-Add” Component of the Project**
 - *Approximately \$1.0 million per day over value accretion from NGL recovery*
 - *Similar magnitude derived from the ethane value chain*
- **Capital expenditures**
 - *\$5.6 billion upfront capital required to design and construct the project*
 - *>\$50 million per in sustaining capital spend*

Economic Benefits

- **Employment Opportunities**

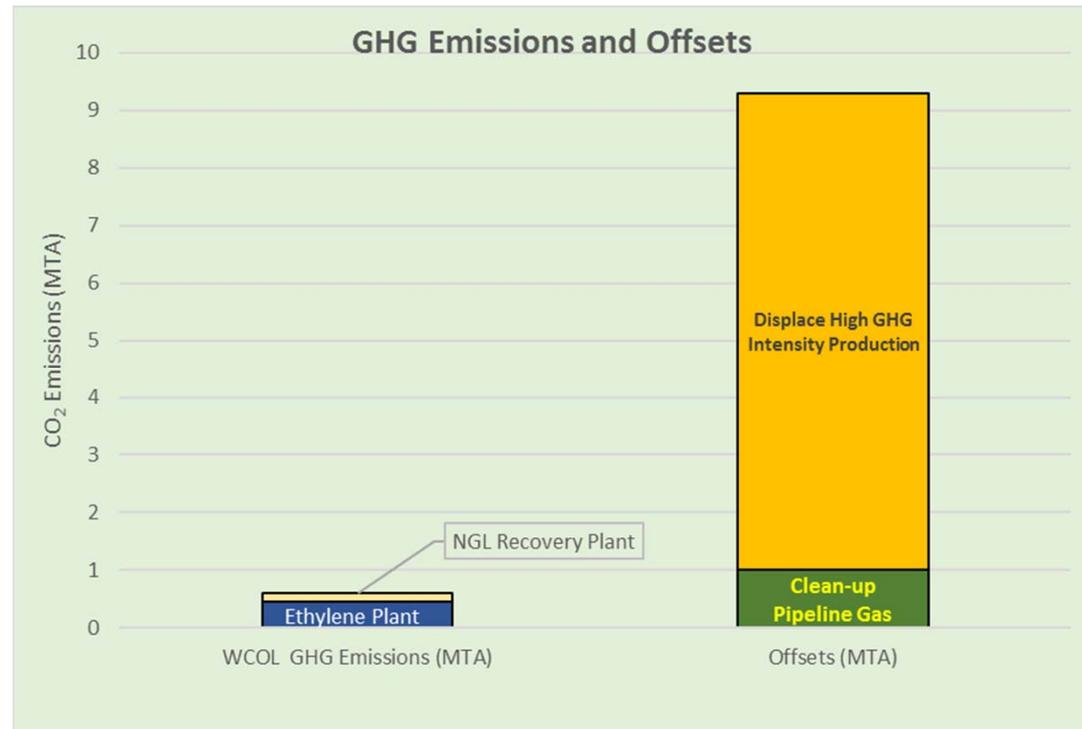
- *Thousands of construction related jobs over a three year period*
- *Up to 1000 permanent high-skill jobs to support commercial operations*

- **Indirect Benefits to the Community**

- *Support services (transport, food, lodging, maintenance & professional services...)*
- *Educational opportunities at local institutions (CNC and UNBC)*
- *Associated business opportunities*



Negative Net GHG Emissions



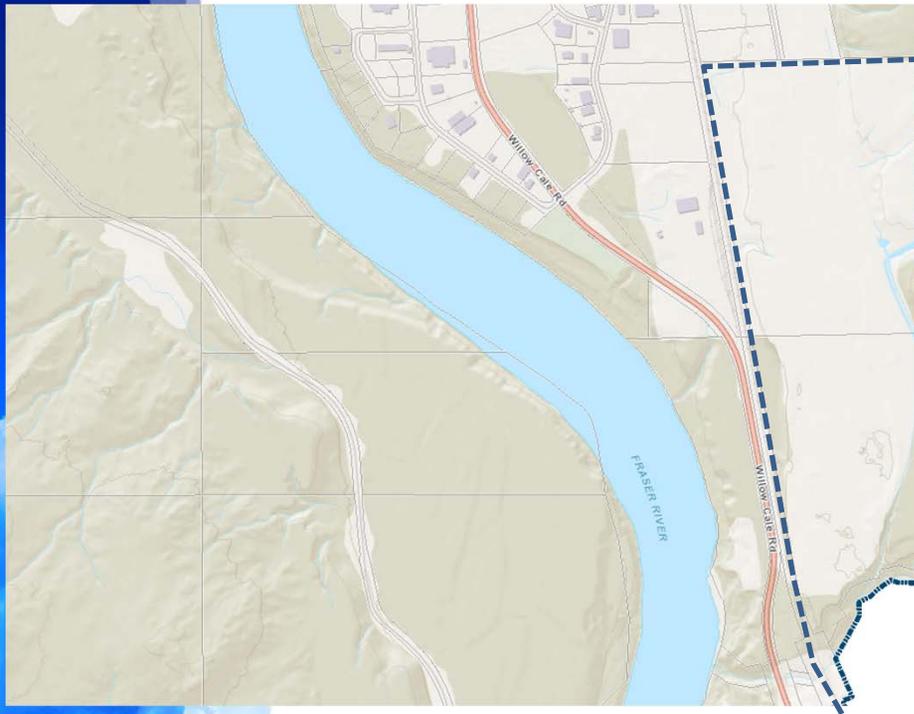
Growth Doesn't Have to Come at the Expense of the Environment



Design with the Environment in Mind

- Electric vs Gas Turbine Drive
 - *Largest emission in the NGL Recovery Plant*
 - *Reduce GHG from 490 kta to 160 kta*
- Deploy latest energy efficient designs
- Greenhouse for Tree Seedlings
 - *Opportunity waste heat to greenhouse for year-round use*
 - *Grow tree seedlings for local reforestation and emissions credits under the BC Forest Carbon Emissions Offset policy*

Site Secured in BCR Industrial Park



- 300 acres – former gravel pit and log storage yard
- Zoned industrial (to be rezoned for petrochemical use)
- Adjacent to Fraser River and CN rail line (Vancouver & Prince Rupert port access)
- Length along west boundary to store unit trains of product
- Site within the PG city limits
- Westcoast Energy Pipeline is 10 km west of the site
- Main BC Hydro transmission line within a few hundred meters

Project Milestone Schedule

Milestone	Target Date
Value Components Submitted to EAO	Q1 2020
Final Investment Decision	Year End 2020
Local Fabrication Shop Upgrades	First Half 2021
Module Fabrication	Spring 2021 → Spring 2023
Site Construction	Spring 2021 → Summer 2023
Commercial Operations Date	Year End 2023



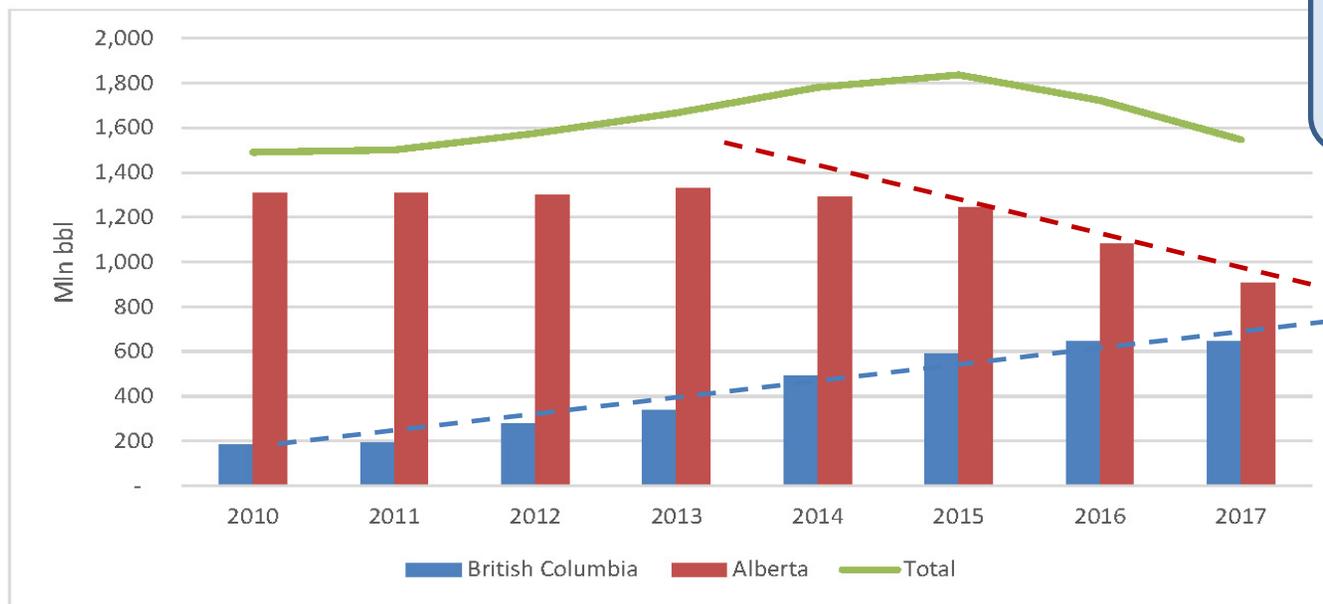
Scalable Opportunity in BC

- **Future opportunities to develop projects as new LNG projects come onstream**
- **Inclusion will drive cooperation**
 - *Alberta and BC should collaborate rather than fight over market access*
 - *Expanding economic benefits to British Columbian's will be an essential element*

BC vs. Alberta NGL Reserves

Dramatic Changes Over the Last Seven Years

Figure 3.1: Ethane, Propane and Butane Reserves



BC's NGL reserves on track to catch Alberta

Source: CAPP Statistical Handbook 2017

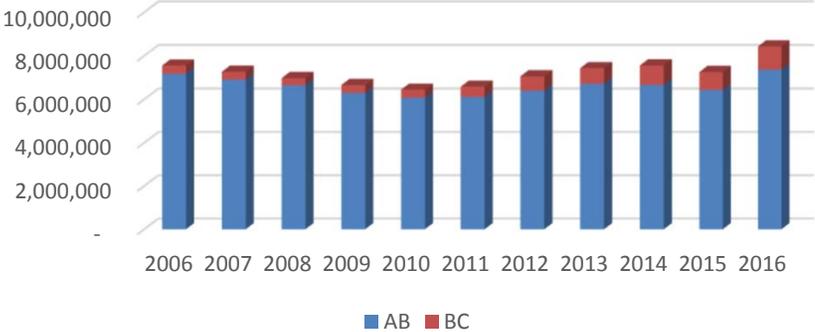


Primary Production

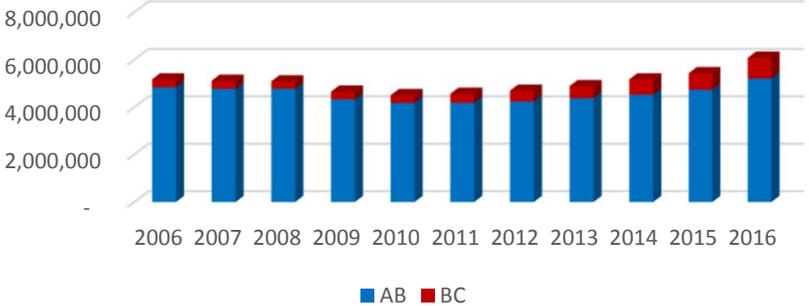
- First Step in Realizing Economic Value
 - *Reserves are the known volumes of resource that are commercially recoverable*
 - *They don't contribute to the economy until produced and sold into the market*
 - *Although BC's reserves have risen dramatically over the past ten years, the province is lagging in production*
 - *That will change as LNG industry grows on the west coast*

Reserves are Leading to Production

Propane Production (cubic metres)



Butane Production (cubic metres)



Developing Downstream Opportunities

- Value realized through downstream processing
 - *LNG will proceed in large discrete steps*
 - *This will create value add opportunities*
 - *Learn from Alberta's experience*
 - *Take advantage of tidewater access to large and rapidly growing Asian markets*

Downstream Non-Existent in BC

	Alberta	British Columbia
Ethylene Plants	4	0
Polyethylene Plants	6	0
Ethylene Glycol	4	0
Propylene	2	0
Polypropylene	2	0
Styrene Monomer	1	0
Ammonia	8	0
Urea	6	0
Methanol	4	0
Other	6	0
Total	43	0