The LNG Supply Team

Summary presentation of scientific and socio-political perspectives submitted in the 2018 Dragon's Den Competition

Not peer-reviewed and not intended for public distribution or citation

The ReDeveLoP Challenge
Calgary, Alberta
Apr.30 – May 4, 2018

Fueling Remote Communities with Liquefied Natural Gas

Aly Abdelaziz
Civil Engineering

Hanh Bui Thi
Physics Department

Jake Fuss
Public Policy

Sarah Saad
Geoscience Department

The ReDeveLoP Challenge
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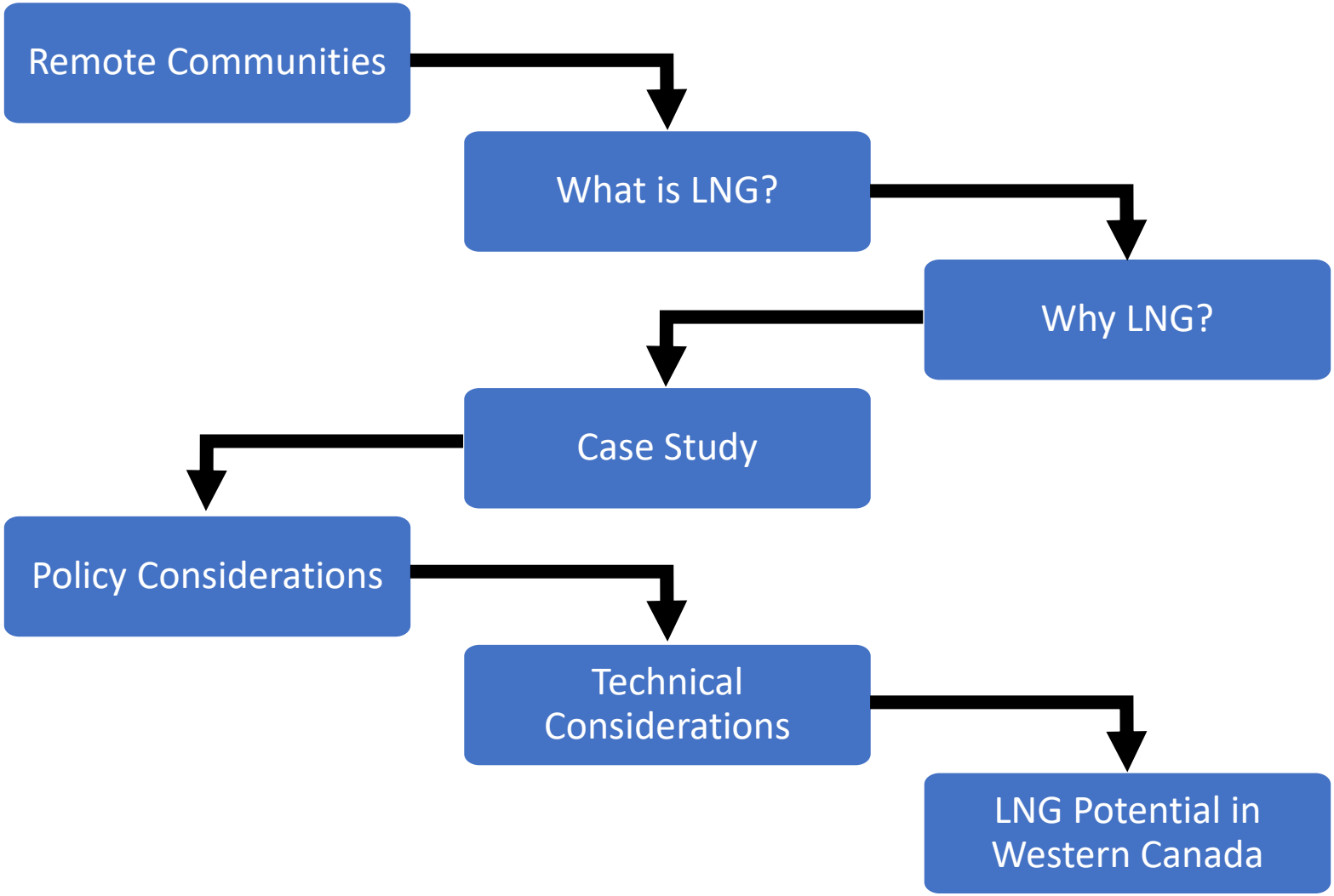
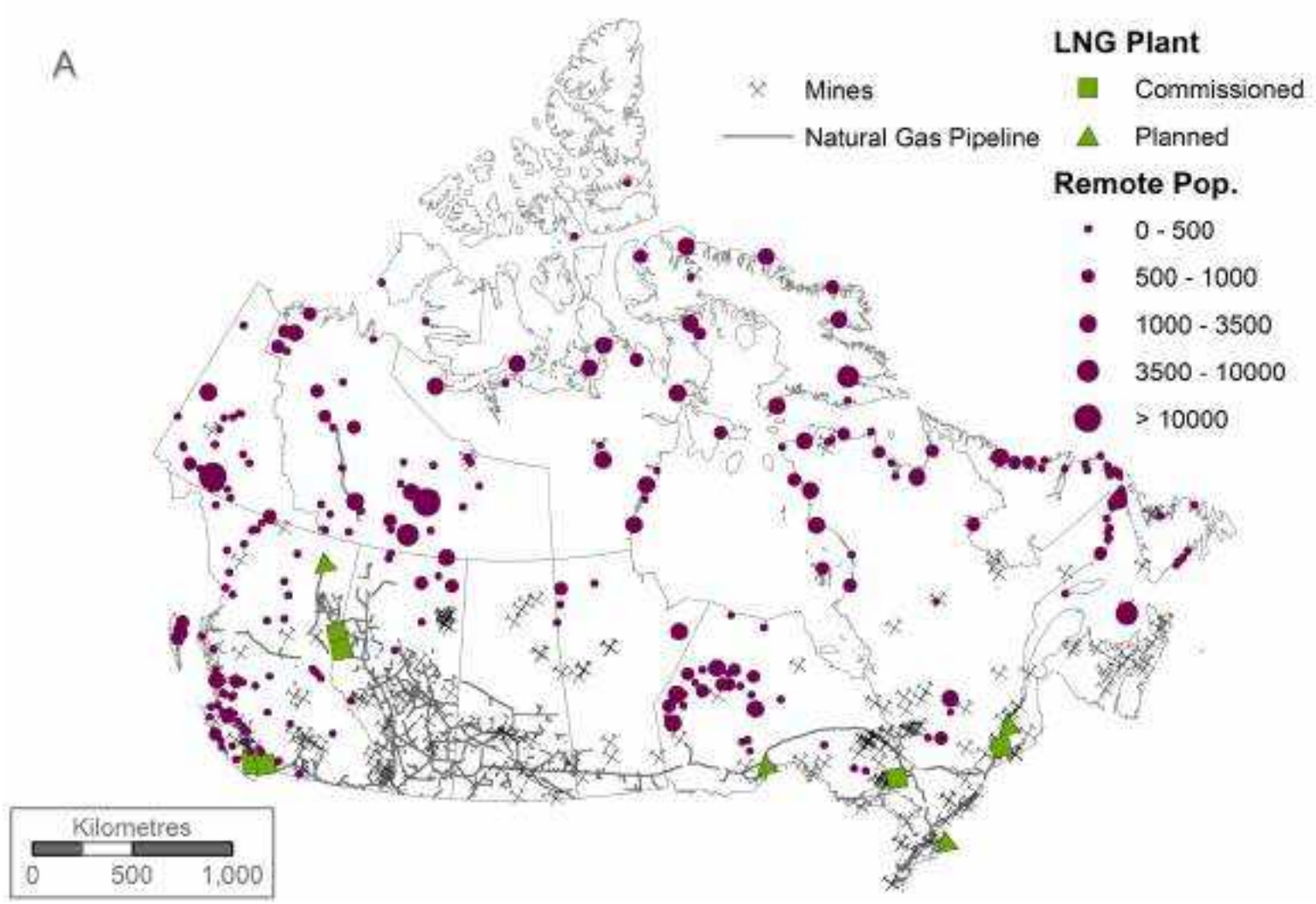
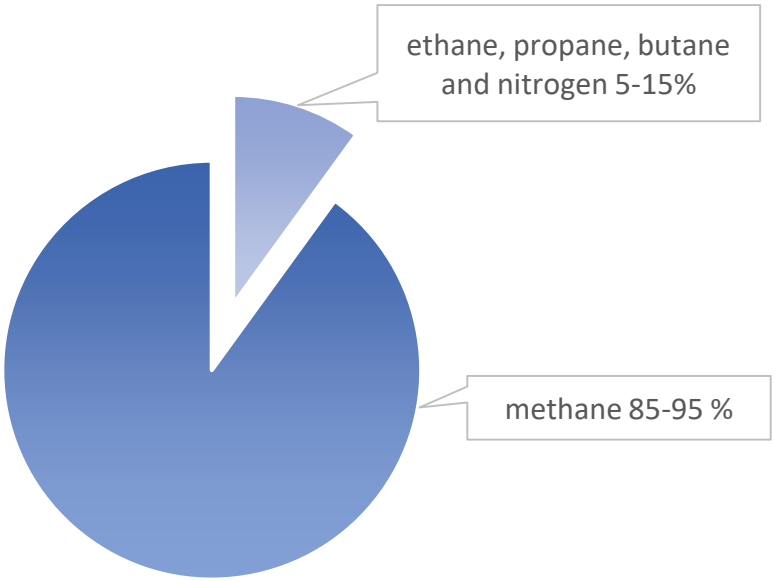

Remote Communities
What is LNG?
Why LNG?
Case Study
Policy Considerations
Technical Considerations
LNG Potential in Western Canada

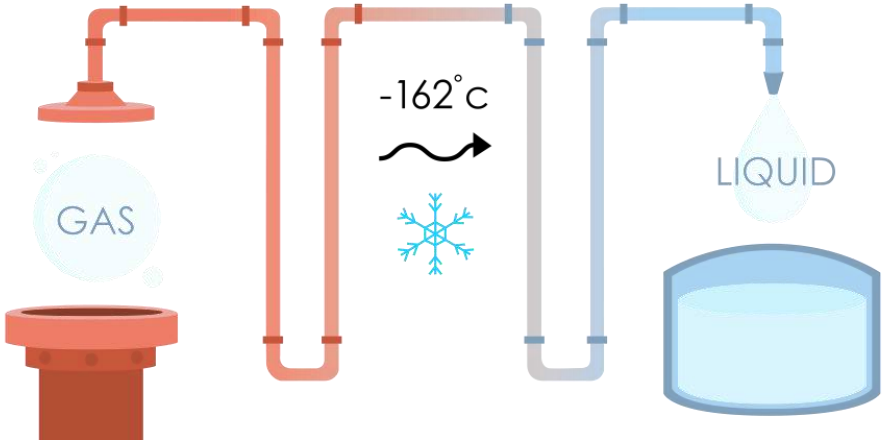
REMOTE/OFF-GRID COMMUNITIES



ArcGIS Data sourced from: Statistics Canada; National Resources Canada



Source: US Department of Energy, 2005

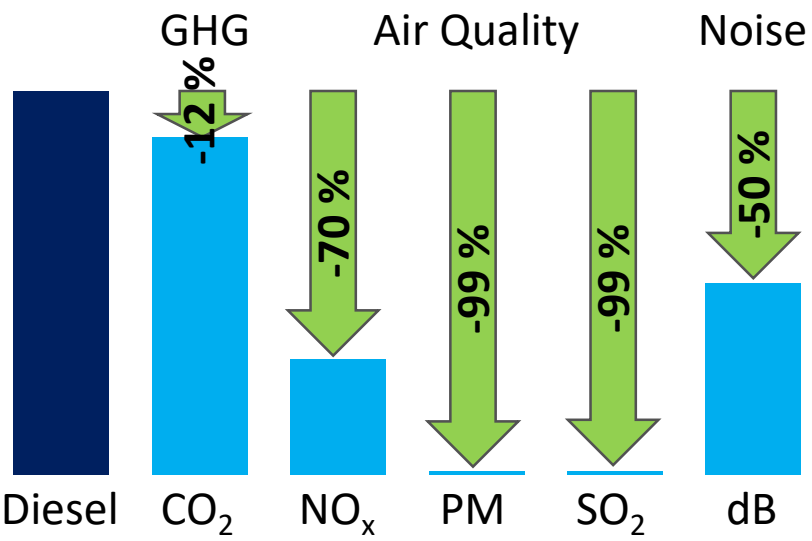


Source: Steelheadlng.com

When natural gas is liquefied

Its size shrinks to about 600 times its volume

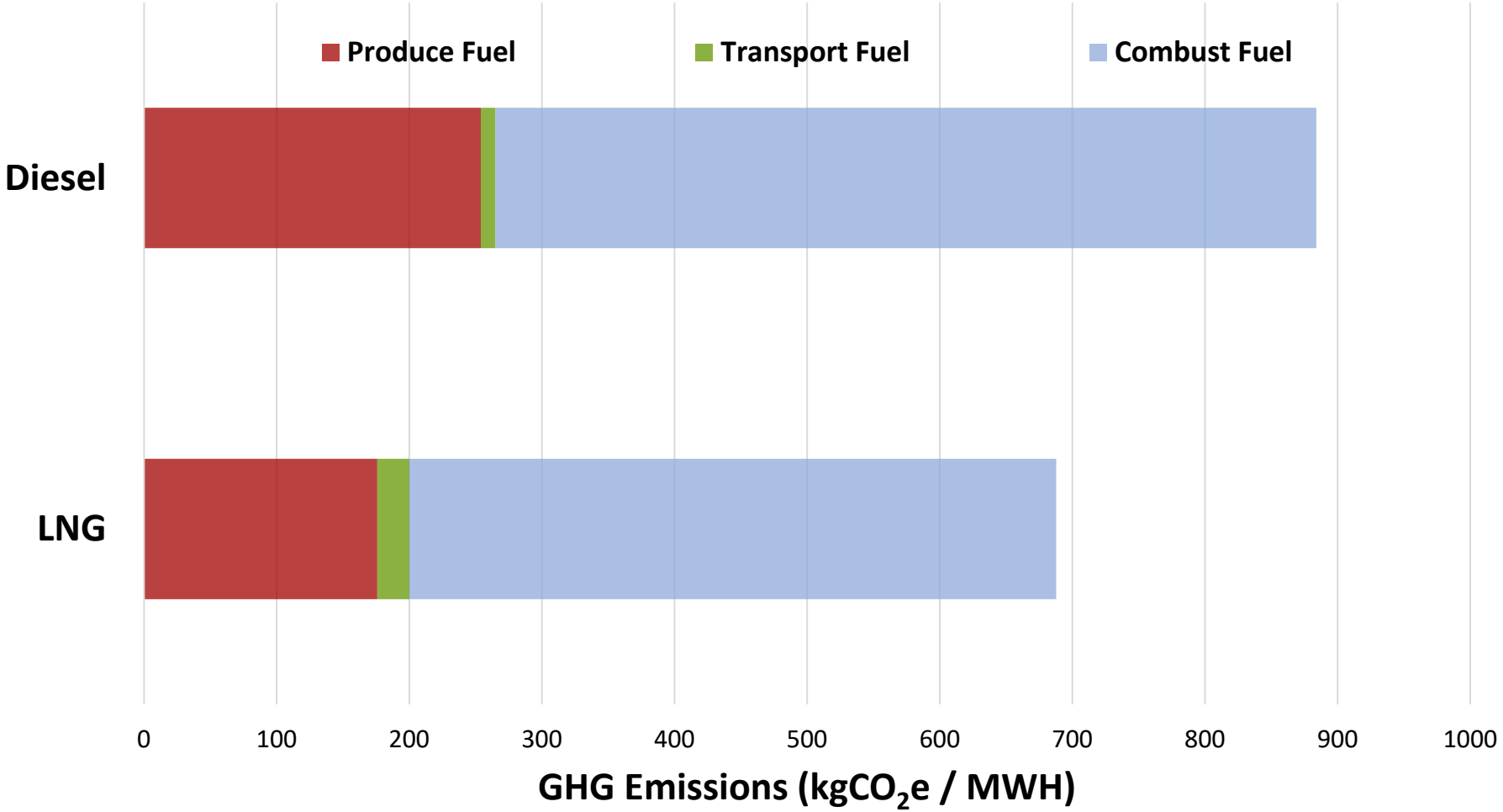
SAFETY & ENVIRONMENT



Source: Fluxys.com

Source: US Department of Energy, 2005

GHG EMISSIONS



Source: Pembina Institute – LNG Life Cycle Assessment (2013)

FORT CHIPEWYAN

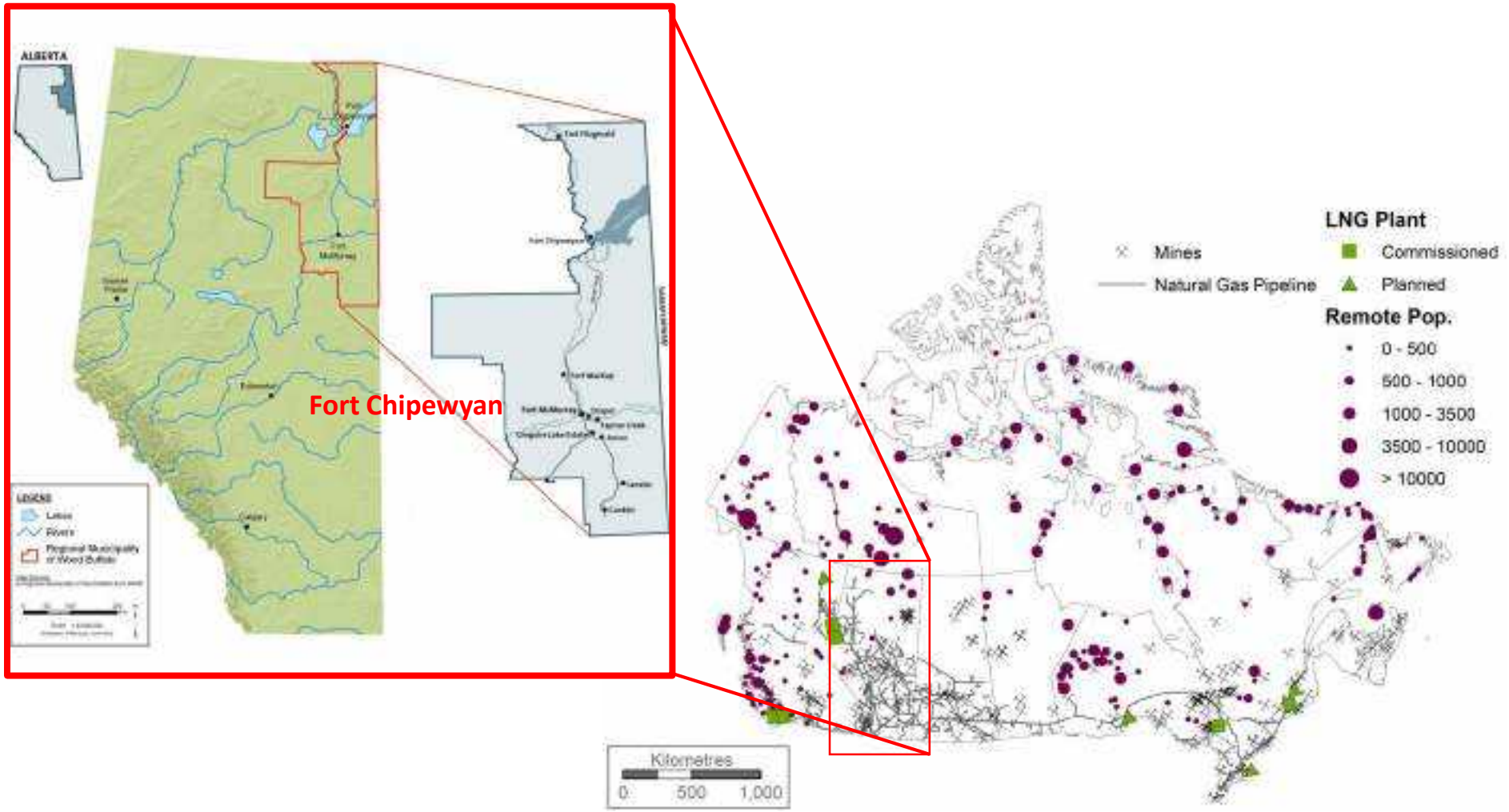
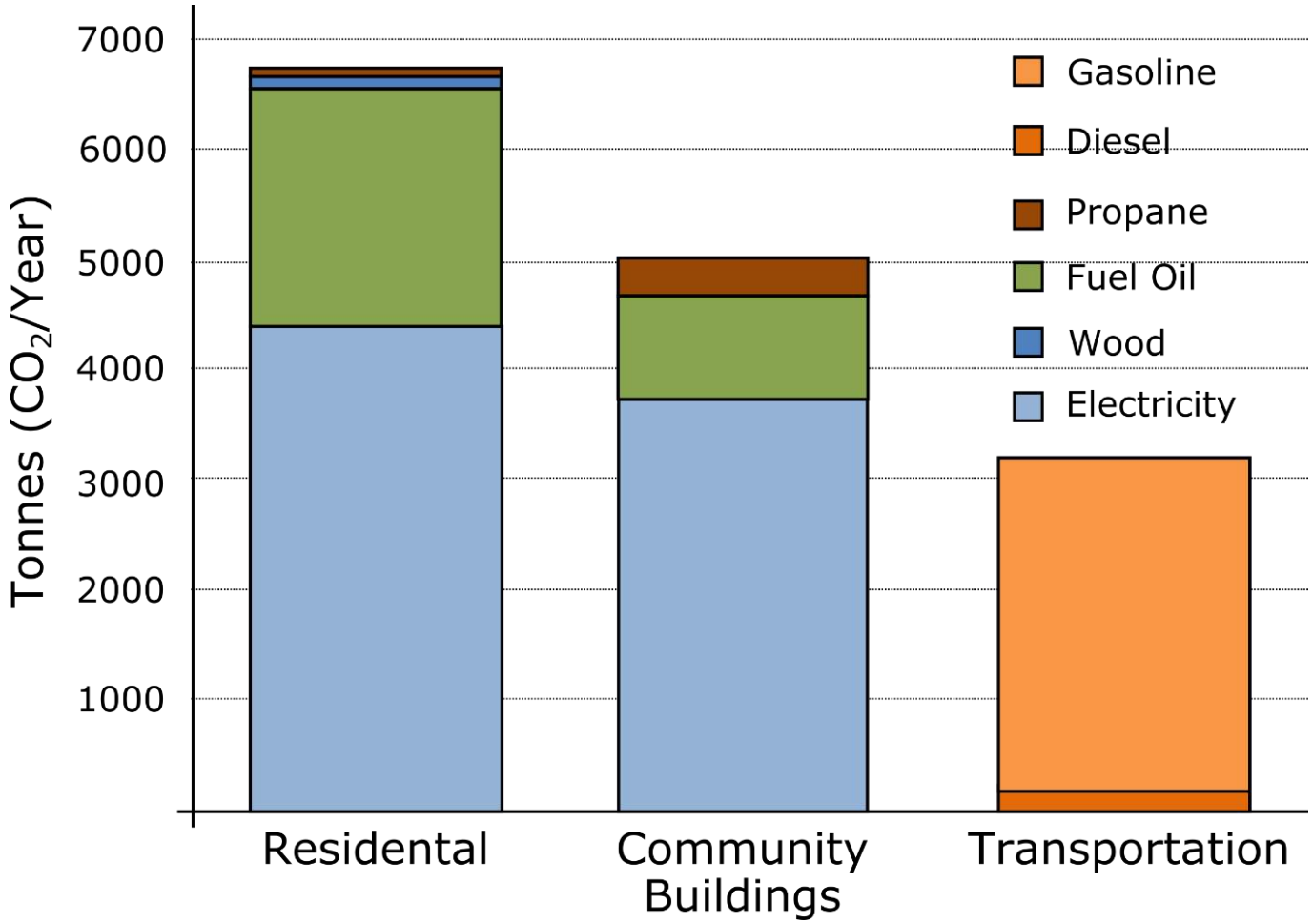


Image Source: http://www.ramp-alberta.org/resources/tourism.aspx ; https://www.rmwb.ca/living/Communities.htm
ArcGIS Data sourced from: Statistics Canada; National Resources Canada.

GHG EMISSIONS



ALBERTA UTILITIES COMMISSION

AUC
Alberta Utilities Commission

Electric Industry

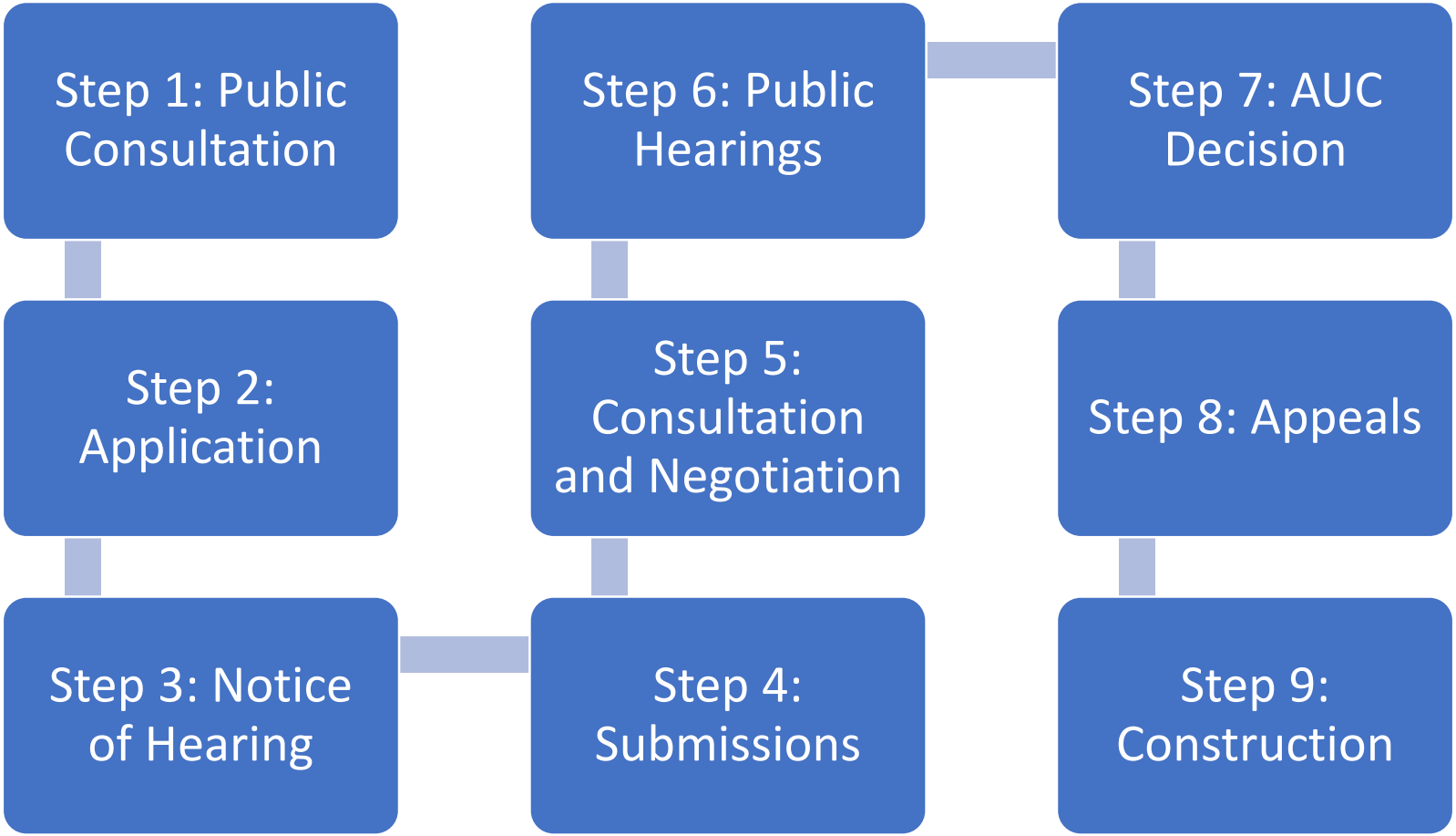
Natural Gas Industry

Water

Renewable Power Generation

Micro-generation

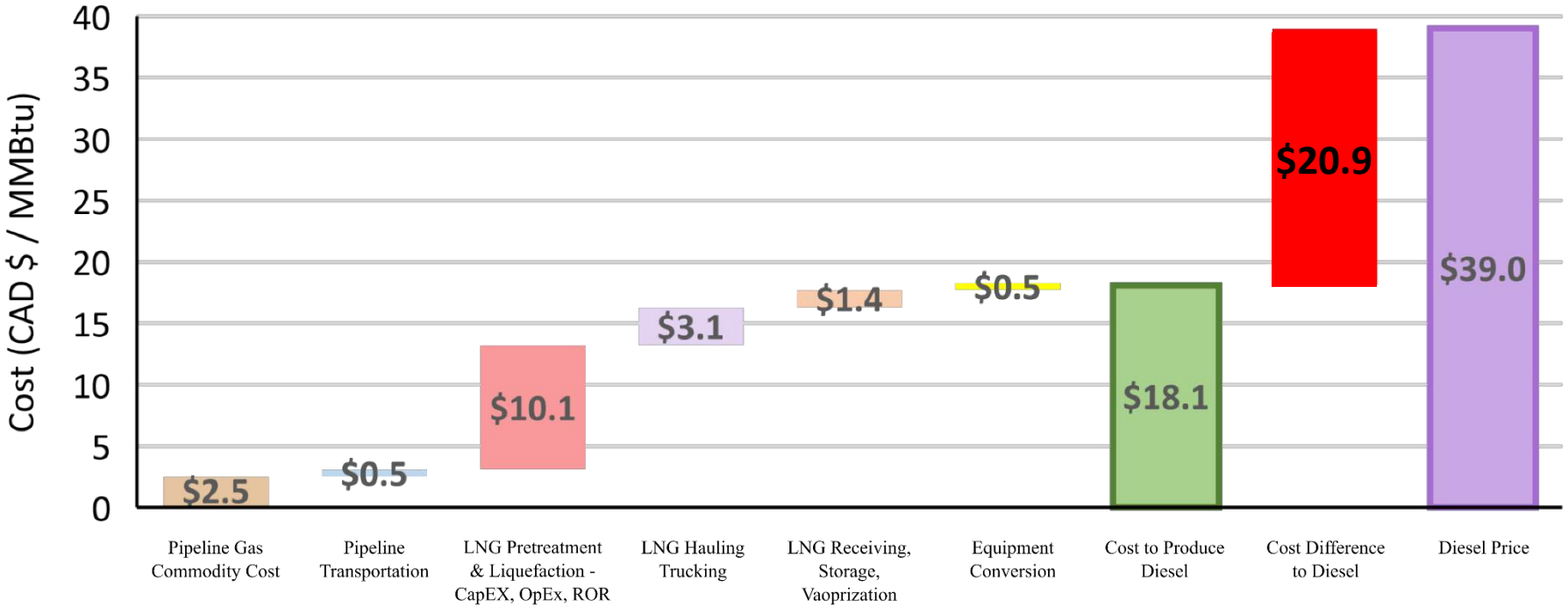
APPROVAL PROCESS



POLITICAL CONSIDERATION

REGIONAL MUNICIPALITY
OF WOOD BUFFALO

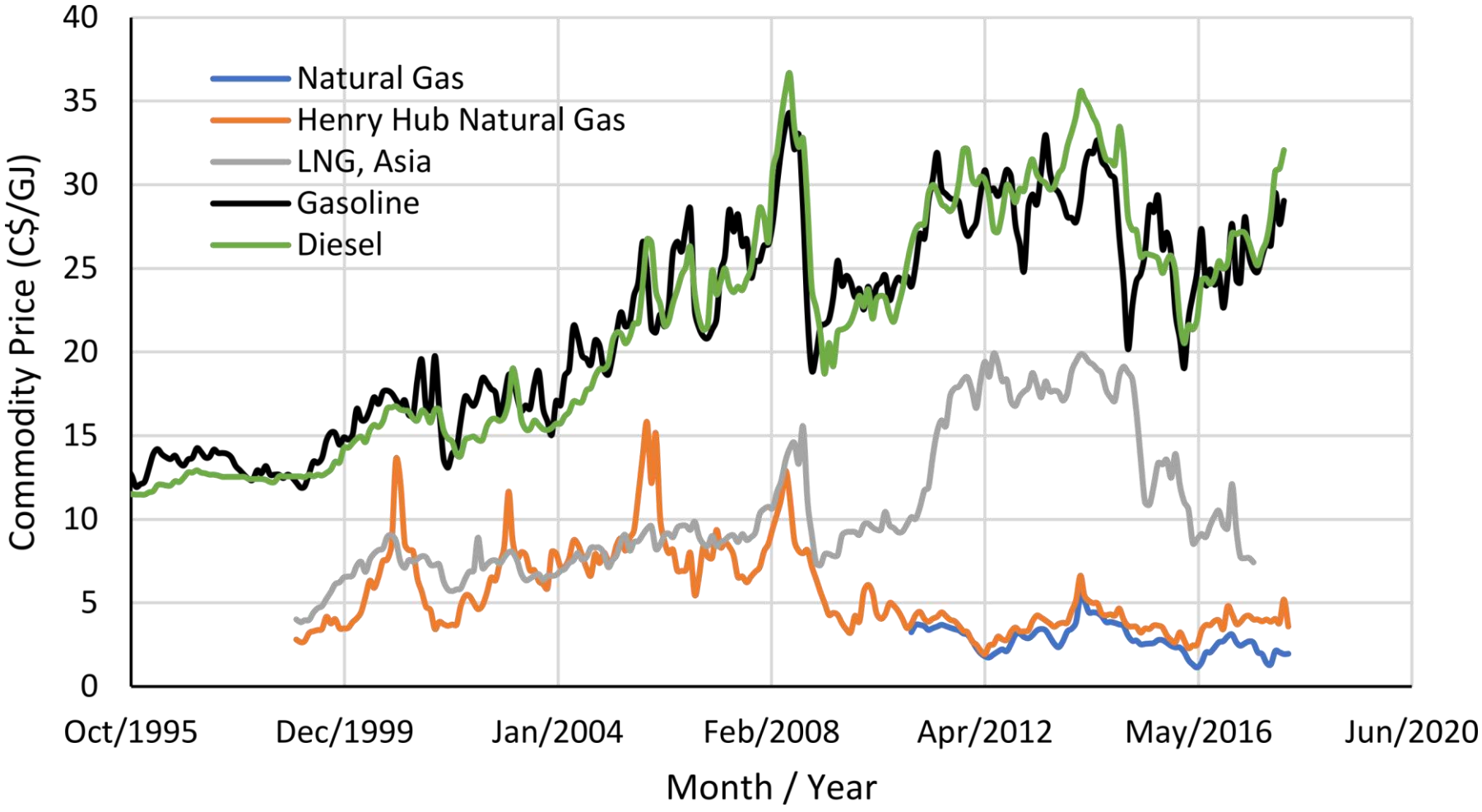
ECONOMIC CONSIDERATION



ECONOMIC LIMITATIONS

- Four economical limitations of LNG feasibility:
  1. High storage costs
  2. Lack of infrastructure
  3. Logistical factors
  4. Declining prices

ECONOMIC LIMITATIONS



POLICY OPTION

- Government funding
- Long-term commitments
- Improved communication

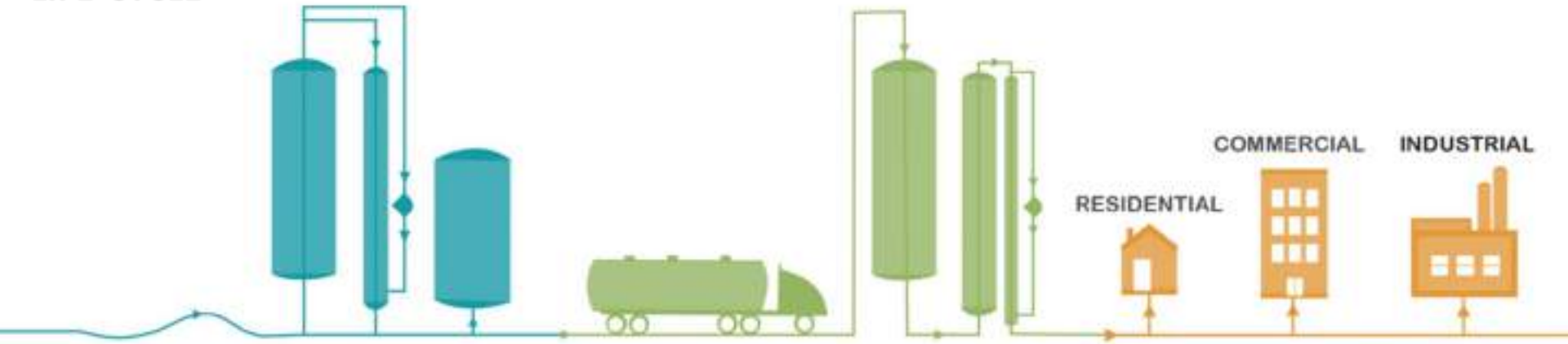
Pros	Cons
Reduced emissions	Government expenditures
Improved safety	Political feasibility
Increase investor confidence	Time to complete projects
Improve the economics	

LNG PROCESSING

PRE-TREATMENT

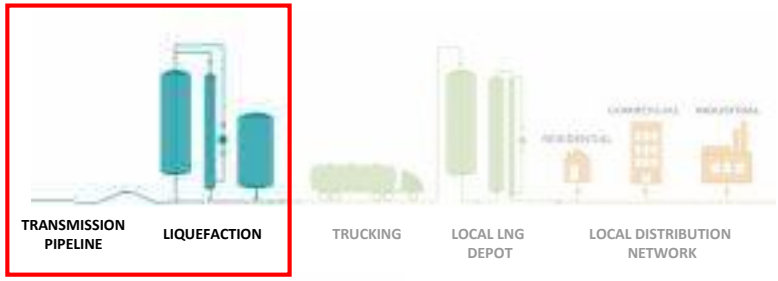
Mercury/acid gas removal → Dehydration → Removal of natural gas liquids → Natural gas transmission pipeline

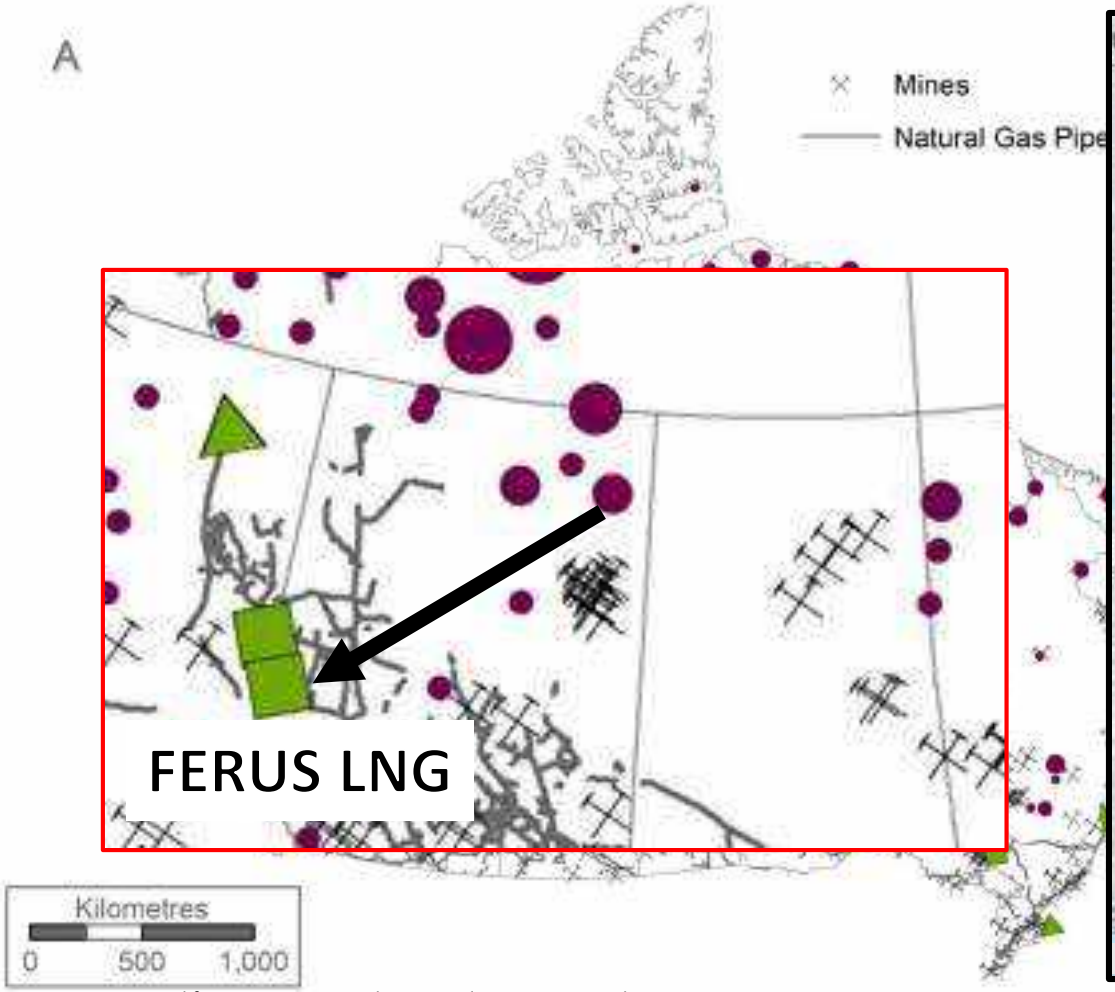
LIFE-CYCLE



1. TRANSMISSION PIPELINE
2. LIQUEFACTION
3. TRUCKING
4. LOCAL LNG DEPOT
5. LOCAL DISTRIBUTION NETWORK

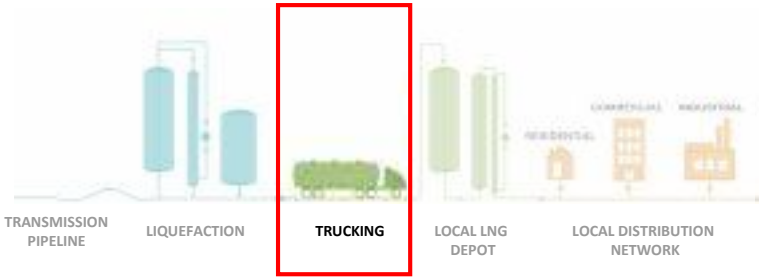
1/2 GAS SOURCE / LIQUEFACTION

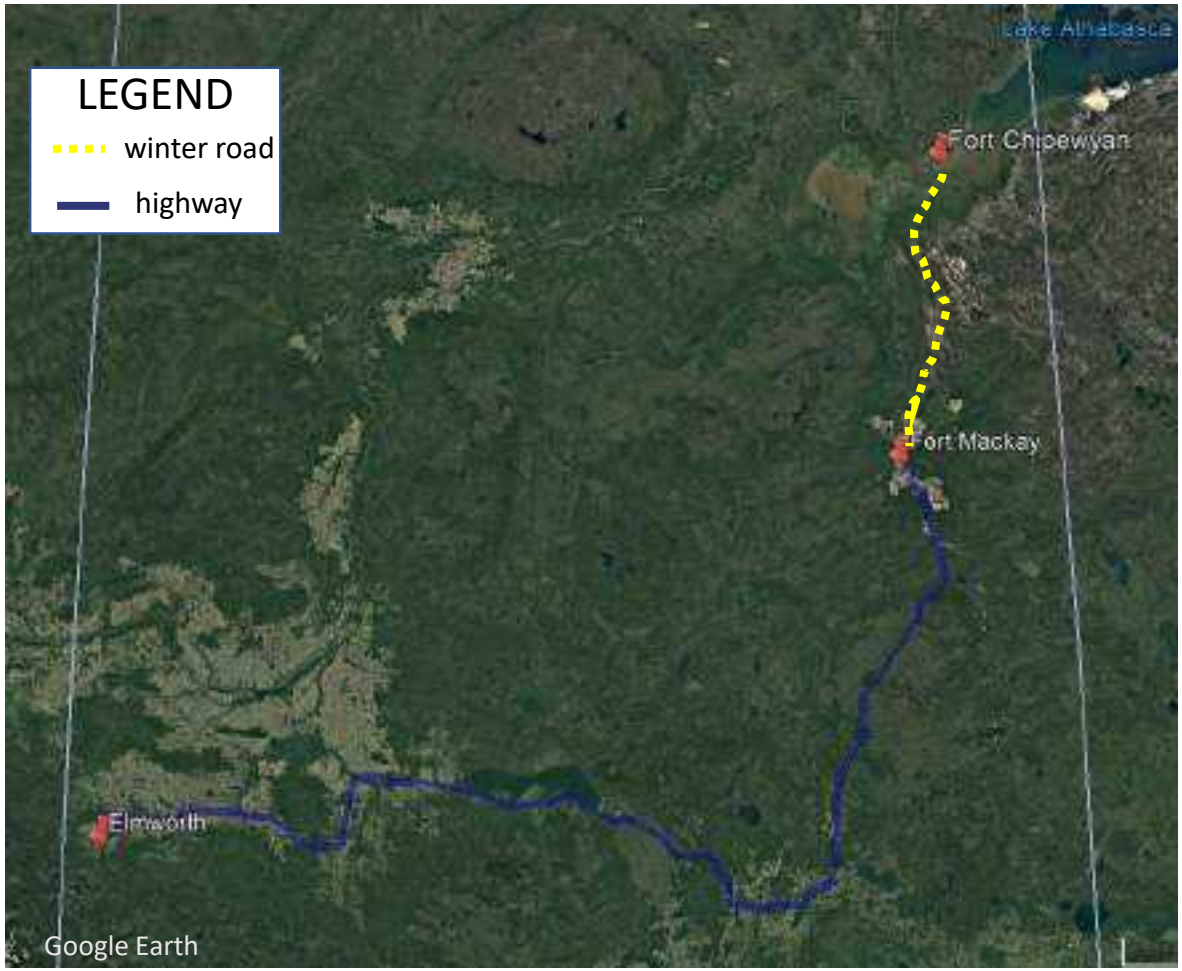




ArcGIS Data sourced from: Statistics Canada; National Resources Canada

3 TRANSPORTATION

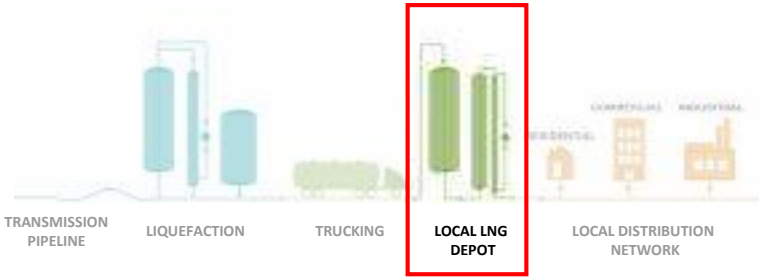




- **290 km winter road accessible December – March**
  - Max weight capacity: 45,000 kg
- **Fort Chipewyan annual diesel consumption**: 4.7 million L
- **Assume**:
  - 1,080 hours to transport max weight capacity
  - 20,034 kg load capacity per truck

166 x

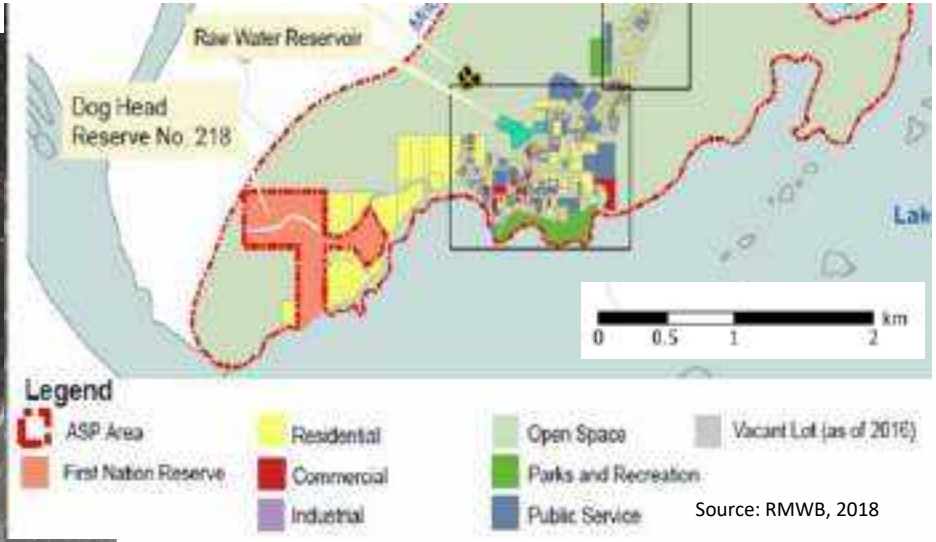
4 STORAGE / REGASIFICATION



- **Fort Chipewyan**
  - Burn Rate: 5,768 USg/day
  - No. of storage days: 300
- **Assume**:
  - Cost of storage: $25/USg

Total Storage Cost
$46,600,000

5 DISTRIBUTION



Source: RMWB, 2018

Source: www.pagasswitch.com

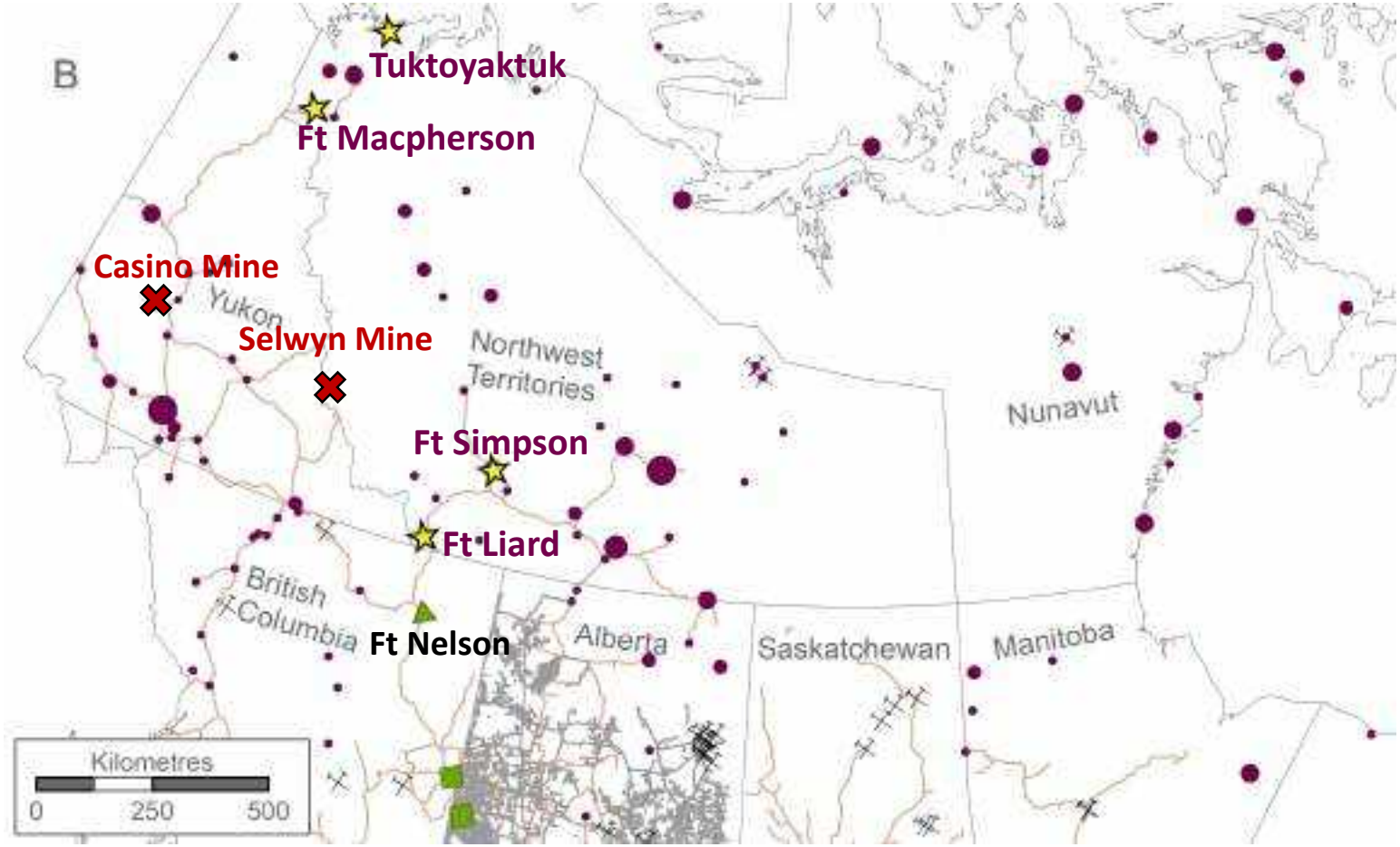
TECHNICAL OPTION

- 100% replacement of Diesel by LNG is not feasible in Fort Chipewyan.
  - Alternate solutions: supply of LNG in winter months with Diesel and Solar in summer months.

TECHNICAL OPTION

- Five key factors for LNG feasibility:
  1. All-season road access
  2. Proximity to LNG facility
  3. Proximity to high demand industrial client
  4. Existence of distribution network in community
  5. Existence of aging machinery

POTENTIAL OF WESTERN CANADA



ArcGIS Data sourced from: Statistics Canada; National Resources Canada

ACKNOWLEDGEMENTS

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sonoma
RESOURCES LTD.

Our deepest condolences go the family and friends of Paul Miller.

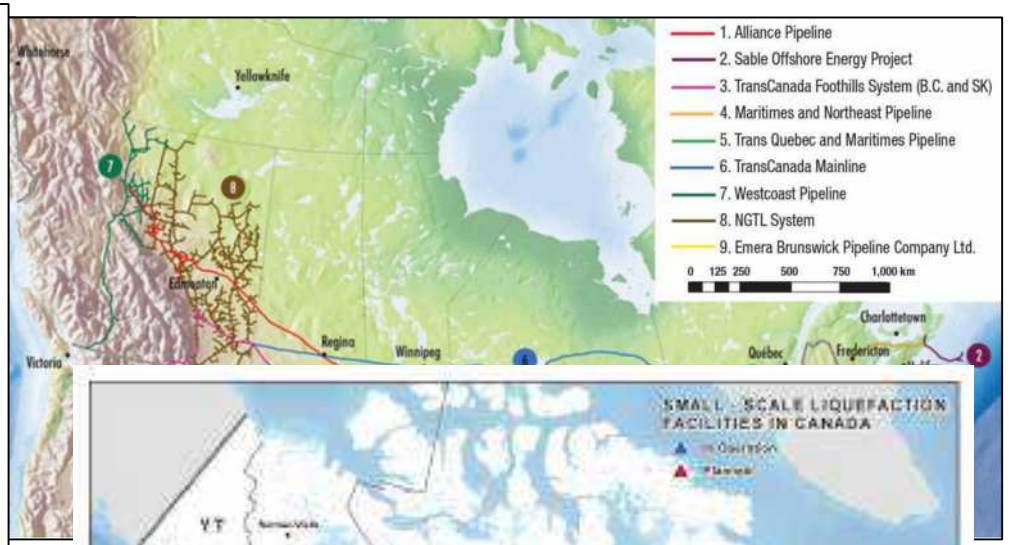
His contributions towards this project are substantial.

May he rest in peace.

Questions?

aly.abdelaziz@mail.utoronto.ca
hbui@ualberta.ca
jafuss@ucalgary.ca
sarah.saad2@ucalgary.ca


BASINS
TIGHT GAS PLAYS
TIGHT OIL/LIQUID PLAYS
POTENTIAL RESERVES


1. Alliance Pipeline
2. Sable Offshore Energy Project
3. TransCanada Foothills System (B.C. and SK)
4. Maritimes and Northeast Pipeline
5. Trans Quebec and Maritimes Pipeline
6. TransCanada Mainline
7. Westcoast Pipeline
8. NGTL System
9. Emera Brunswick Pipeline Company Ltd.
0 125 250 500 750 1,000 km
Whitehorse
Yellowknife
Edmonton
Regina
Winnipeg
Victoria
Québec
Fredericton
Charlottetown

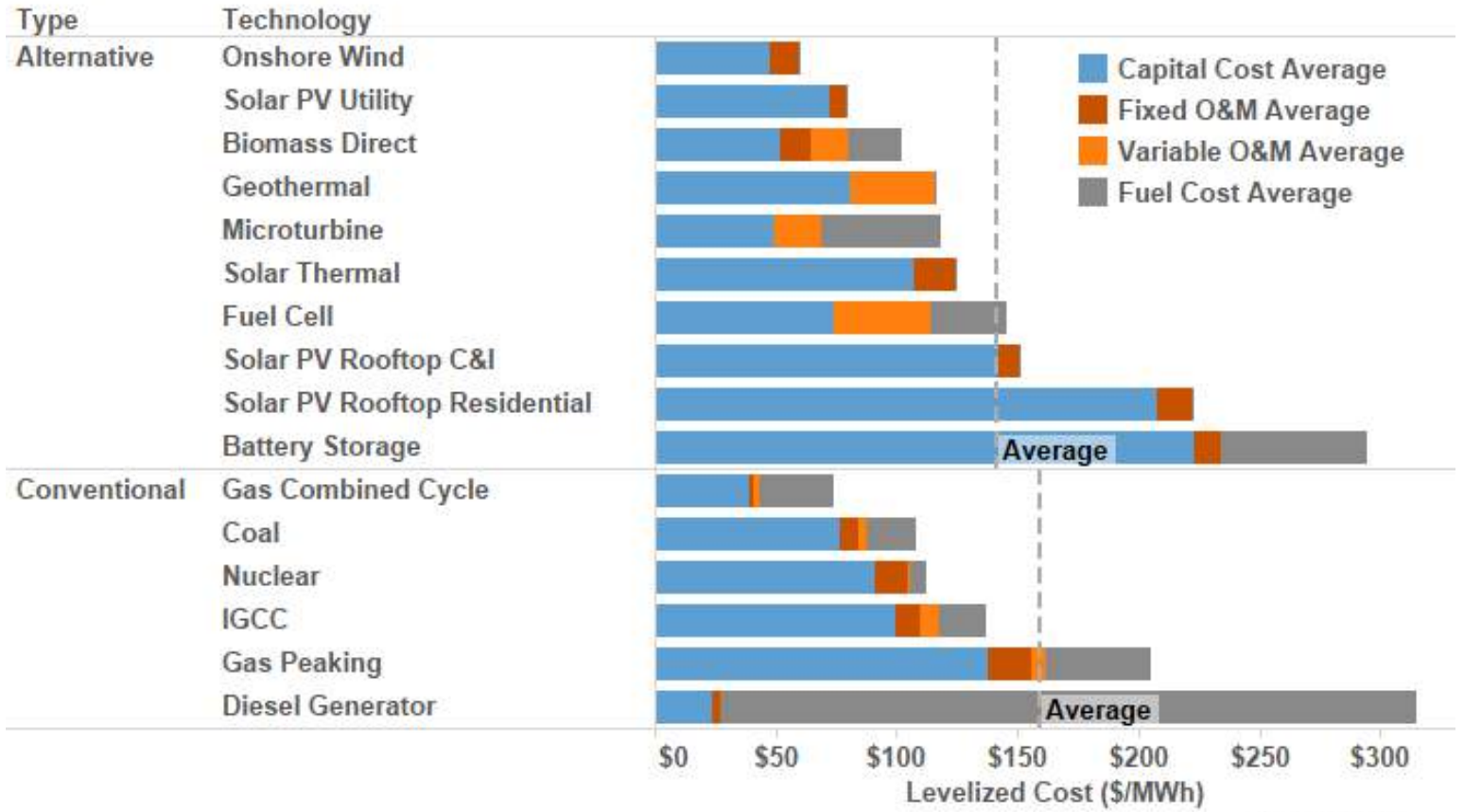

SMALL - SCALE LIQUEFACTION FACILITIES IN CANADA
YT
NT
NU
BC
AB
SK
MB
ON
QC
NL
PE
NB
NS

COMMUNITY EXAMPLES

Inuvik

Yukon

Components of levelized cost of energy



Source: Lazard's Levelized Cost of Energy Analysis--Version 8.0, September 2014
http://www.lazard.com/PDF/Levelized%20Cost%20of%20Energy%20-%20Version%208.0.pdf