

## **CALCULATION OF CO<sub>2</sub> EMISSIONS CREATED BY PIPELINE TRANSPORT OF NATURAL GAS**

Colin Craig of Second Street.org asked for a reliable measurement of the carbon dioxide (equivalent) emissions created by transporting natural gas from source to Quebec markets. The motivation is to calculate how many emissions might be prevented by sourcing natural gas within Quebec, and avoiding long distance transportation, expressed as taking xxx cars off the road for a year.

Digging in, this is a complex calculation involving a large number of assumptions. Many of these are fairly straightforward and obvious, but others are less clear. A 2011 Quebec government report, quoting an unpublished SNC-Lavalin report, estimated 125,000T emissions could be avoided by replacing Alberta gas with locally-sourced gas.

Key parameters:

- Quebec consumed 216 BCF (6.12 billion m<sup>3</sup>) gas per year in 2019 (Canadian Energy Regulator)
  - Most of this gas is sourced from Western Canada. However:
    - Quebec imports about 5% of the total from the States
    - Gas flowing from Ontario contains a mix of Western Canada gas and gas that Ontario itself imports
    - Some gas flows through for export from Quebec
  - We'll assume Western Canada sourcing for gas – meaning pipeline transport of up to 3500 km
    - American gas would likely travel smaller distances, but it depends on the precise routing
- Emissions associated with transportation include:
  - Power generation to run compressors and other equipment
    - Emissions will depend on what fuel source is used to generate power – gas-powered vs electrical-powered compressor. And if electrically-powered – how is that electricity generated?
    - Power consumed can vary according to how quickly product is moved
  - Fugitive methane emissions associated with pipeline and facilities leakage
    - Leakage varies with age and capacity of pipeline and the operating pressures
    - Methane leakage would be expressed in CO<sub>2</sub>-equivalent terms, and there are various multiples used to convert methane to CO<sub>2</sub>-equivalent

- Emissions associated with gas production – lacking reliable data for gas supply source, we assume that the gas supplied to Quebec will have the same emissions footprint regardless of origin (W Canada / Quebec / U.S.A.)
- The average American car produces 4.6 T of CO<sub>2</sub>-equivalent per year (EPA)
  - Assuming 11,500 miles driven per year @ 22 mpg

We were not satisfied with any values we found quoted in our brief literature search as a direct measure of emissions / volume of gas / distance travelled. There appear to be a variety of calculations, and the head of CEPA (Canadian Energy Pipeline Association) states that research is ongoing regarding measurement of methane emissions, so that reliable figures do not yet exist.

TransCanada Energy in their current Report on Sustainability and Climate Change document an Emissions Intensity at 779 tonnes CO<sub>2</sub>-equivalent per BCF of gas moved through their Canadian pipelines (2018).

Multiplying this by 216 BCF yields 168,264 T CO<sub>2</sub>-equivalent emitted for the 216 BCF moved to Quebec in 2019.

- This value is comparable to the 2011 Quebec / SNC figure.
- Avoiding 168,264 T emissions is equivalent to removing 35,000 cars from the road for a year

## **SUMMARY STATEMENT**

Quebec consumes large quantities of natural gas – 216 billion cubic feet (BCF) (6.12 billion m<sup>3</sup>) in 2019. Considerable energy is expended in transporting gas from producing areas in western Canada and the U.S. to Quebec.

CO<sub>2</sub> emissions associated with transportation energy depend on many variables and assumptions. Choosing reasonable assumptions, we calculate that producing Quebec's gas supply in the province instead of importing it from western Canada or the United States could save up to almost 170,000 tonnes of CO<sub>2</sub>-equivalent emissions per year, which is comparable to removing about 35,000 cars from the road each year.

[Petrel Robertson Consulting Ltd.](#)



Brad Hayes, Ph.D., P.Geo.  
President