



The Mining Association
of Canada | L'association minière
du Canada

Living Responsibly with Carbon: Mining Industry Perspective

May 16, 2018

Industrial Gas Users Association Spring Seminar
Montebello, Quebec



♦ Wind And Solar:

- ♦ Steelmaking coal – approximately 100 tonnes of steelmaking coal is necessary to produce the steel to build the average wind turbine.
- ♦ Copper – While the amount of copper in a wind turbine will vary from model to model, it is estimated that the average 1.8 MW wind turbine contains approximately 3175 kg of copper.
- ♦ A single wind turbine generally contains 500 kg of nickel.
- ♦ Silver makes up 90% of a glass paste applied along the top and bottom of crystalline silicon photovoltaic cells.



♦ Electric Cars:

- ♦ The average electric car contains 75 kg of copper wiring – three times as much as a conventional vehicle.
- ♦ Lithium, aluminum, nickel, cadmium, cobalt and zinc are key ingredients of new and emerging battery technologies. For example, cars powered by nickel hydride batteries produce 50% less pollution and GHGs than comparable gasoline-powered vehicles.



♦ High-Efficiency Natural Gas:

- ♦ Natural gas boilers come in cast-iron, steel, copper, aluminum and other materials fit-for-purpose to maximize efficiency relative to intended use.
- ♦ Upgrading a natural gas furnace or boiler from 56% to 90% efficiency in an average cold-climate house will save 1.4 tonnes of carbon dioxide emissions each year.



Natural Synergy:

Extracted raw materials are transformed into technology that, having gone full circle, assist mining operations in reducing environmental footprints and enhancing efficiency and reliability.

- ◆ Stornoway's off-grid diamond mine deployed natural gas from the outset of production, which has demonstrated the increasing viability of natural gas as a substitute for high- emitting diesel fuel.
- ◆ ArcelorMittal has launched pilot project to displace Bunker C heavy fuel oil with natural gas in Sept-Îles.
- ◆ A number of Teck's coal mines have increased their use of natural gas in the place of coal over the last decade, reducing more than 250,000 tonnes of CO₂e annually.
- ◆ The Glencore Raglan Mine's three-megawatt wind turbine is integrated with an energy storage network using an energy management system, the first of its kind in the world.
- ◆ Rio Tinto's wind farm at the remote Diavik Diamond Mine in the Northwest Territories, the first large-scale wind farm in the territory, has reduced the operation's diesel consumption by 10% annually.
- ◆ Goldcorp developing North America's first all-electric underground mine at Borden. Others following suit.



At the Borden Gold project in Ontario, Goldcorp will replace all of its underground diesel fleet of trucks with Battery Electric Vehicles, which will make it the first all-electric underground mine in Canada.

MINING.CA

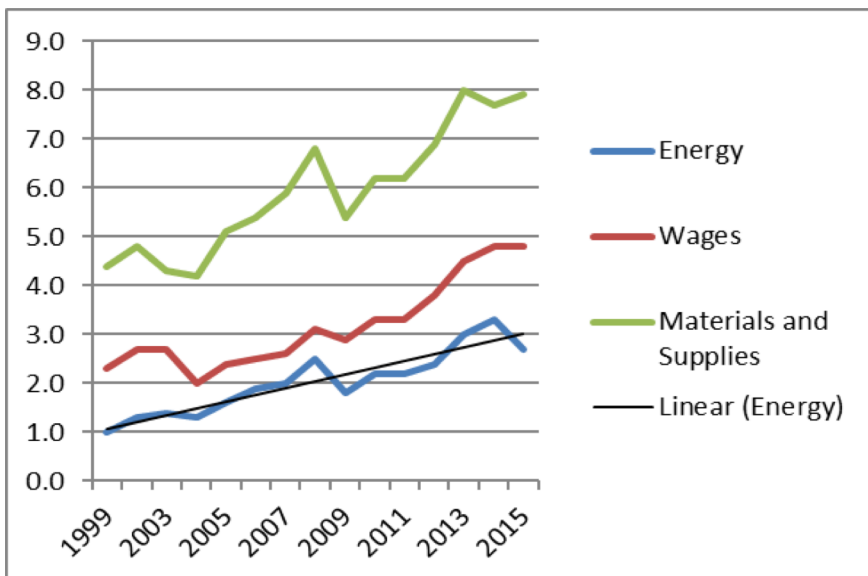




Rio Tinto, wind farm at the Diavik
Diamond Mine, NWT

- ◆ In 2016, MAC issued seven *Principles for Climate Change Policy Design*, which included support for a broad-based price on carbon.
 - ◆ Any policy or plan must protect Emissions-Intensive and Trade-Exposed (EITE) sectors and be sensitive to remote and northern regions.
- ◆ MAC has consistently advised of the need to avoid cumulative effects in existing or developing regulatory initiatives that are likely to result in double (or more) regulation/costing of the same emissions in one or more respects.
 - ◆ Government should clearly demonstrate complementarity before adopting non-pricing climate change policies/regulations.
 - ◆ This demonstration should include a robust and publicly-disclosed economic impact assessment.

Key Mining Costs in Canada (\$b)



On aggregate, energy is the third highest cost to Canadian miners, rising 170% (2.75 times) between 1999-2015.

Some remote mines operate at \$0.30/kWh, (when price-per-unit-of-delivered-fuel is factored in)

Gas and electricity transmission/distribution economics significant to service remote regions

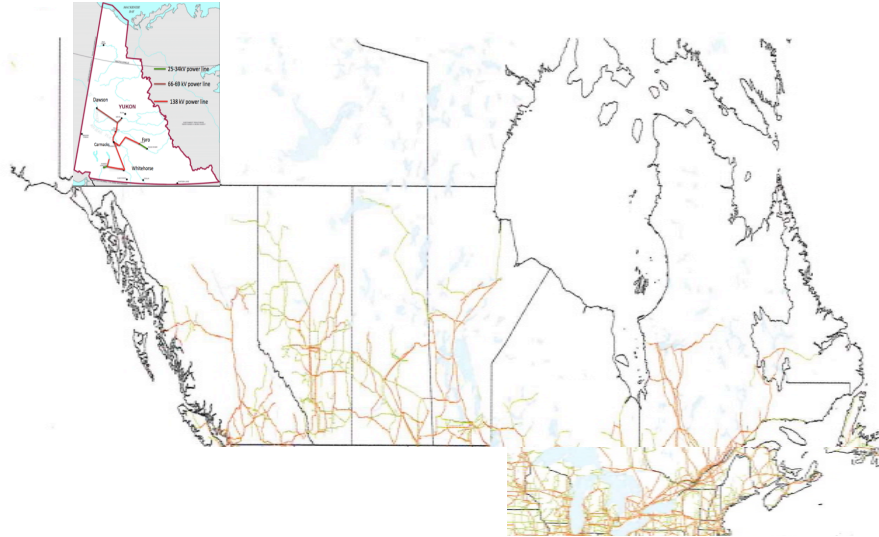
Mining Industry Energy and GHG Data

	1990	2015
Canadian economy		
Canadian energy use (PJ)	9,608	11,924
Energy used by broader industry (PJ)	2,400	3,656
Canadian GHG emissions (mt)	613	741
Direct GHG emissions by all industries (mt)	104.1	149.6
Metal and non-metal mining		
Total energy use (PJ)	143	150
Share of Canadian energy use (%)	1.48	1.126
Total GHG emissions (Mt CO₂e)	8.57	8.6
Share of Canadian GHG emissions (%)	1.4	1.16

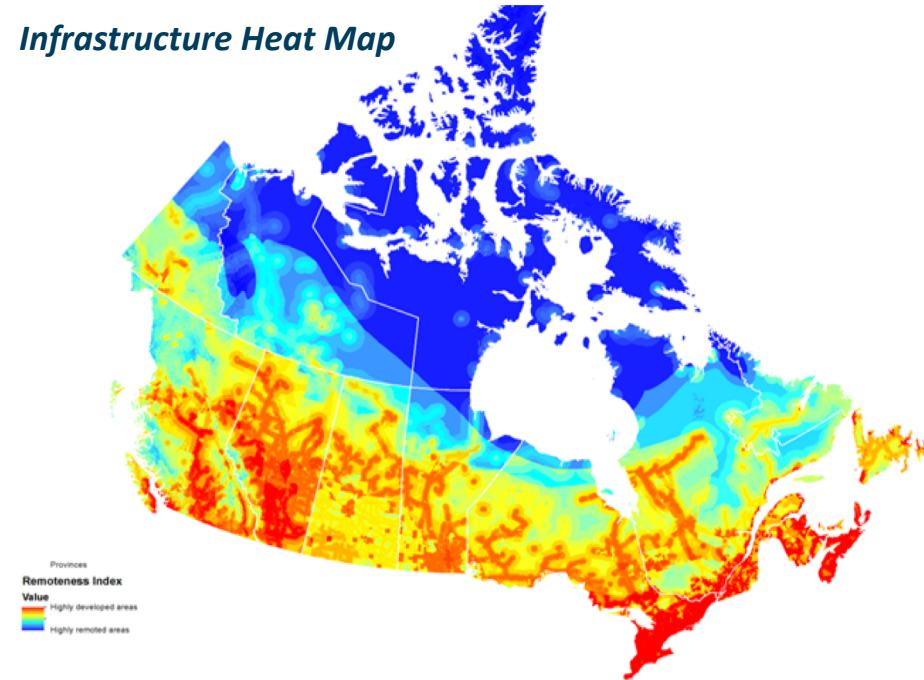
Metal and non-metal mining according to CIEEDAC definitions accounts for 1.2% of Canada's total emissions, less than 1990 levels.

Total GHGe emissions remains virtually unchanged since 1990 at 8.6 Mt.

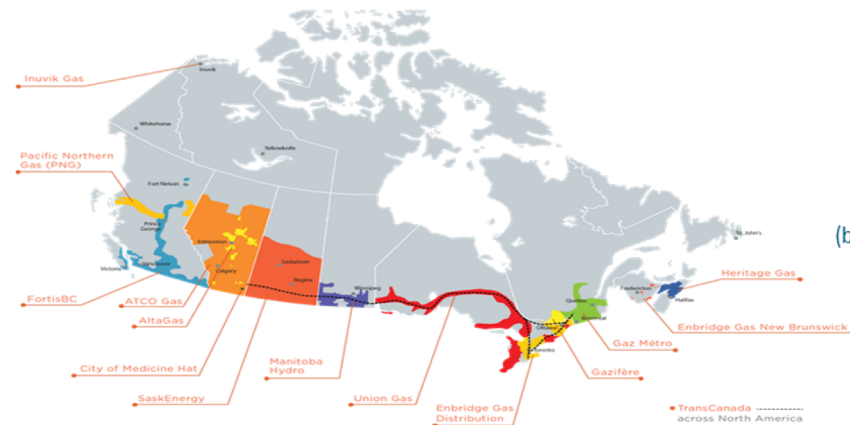
Canadian Electricity Network



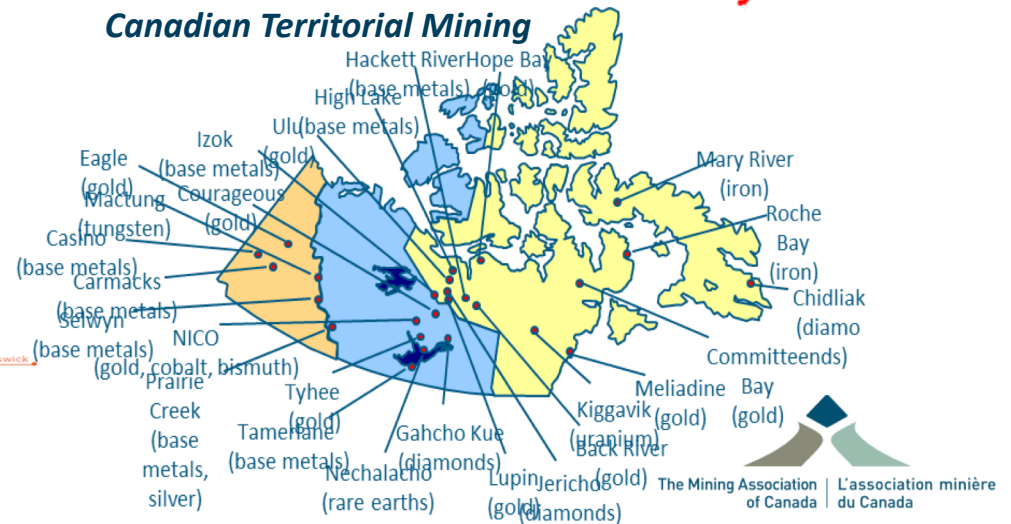
Infrastructure Heat Map



Canadian Gas Delivery Network



Canadian Territorial Mining



◆ Observations:

- ◆ Remoteness = infrastructure deficit, higher the costs and greater the exposure to carbon pricing
- ◆ Greater distance from markets means greater exposure to supply chain carbon-cost pass-through
- ◆ Remote regions have no options to displace diesel to prevent absorbing the carbon price as a business cost.
- ◆ With no grid, renewable power is the main potential
 - ◆ like miners who have to go where the minerals are located; an economically viable renewable asset is needed to support fuel switching.
 - ◆ Not all mines have this option with current technologies
- ◆ Even where alternative options exist, there are sharp limitations:
 - ◆ Diavik Diamond Mine wind farm in NWT displaces ~10% of total diesel consumption on an annual basis.
 - ◆ Glencore Raglan's wind turbine was only viable with provincial and federal government support
- ◆ Carbon pricing costs should be productive in facilitating behavioral change, not unproductive in reducing competitiveness.



Critical Considerations: *Climate Change Policy and Regulations must:*

- ◆ **Facilitate Innovation** – *Transforming the productivity, performance and competitiveness of the mining sector to make Canada a leader in the production of cleaner minerals and metals that are essential in the transition to a low-carbon economy*
- ◆ **Be sensitive to remote and northern regions** – *a one-size-fits-all policy approach with disproportionately burden these regions, reducing already limited opportunities for social and economic development, reducing likelihood of making progress on other government priorities like Indigenous Economic Reconciliation*
- ◆ **Address Supply Chain Carbon Costs** – *EITE companies should be able to receive credit equal to the amount of the indirect carbon costs that are passed on from transportation service providers each year when reconciling their carbon accounts.*
- ◆ **Infrastructure** – *the infrastructure deficit amplifies exposure, while simultaneously perpetuating disproportionate reliance and dependency of the North on Ottawa for core programming. Reducing the infrastructure deficit is critical to reducing diesel reliance.*



For more information please contact:

Brendan Marshall
Vice President
Economic and Northern Affairs
Mining Association of Canada
613-233-9391

Follow us on Twitter:
[@theminingstory](https://twitter.com/theminingstory)



Before it's yours, it's mined.
Canadian mining provides the materials that make the devices the world uses to communicate.
mining.ca

CANADIAN MINING
What will we find next?