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IMPACT OF CARBON TAX ON CANADIAN NATURAL GAS

JUNE 2021

INTRODUCTION

With the recent completion of the US climate Summit in June 2021, Canada has increased its 2030 emission target for the third time in the past 6 months.

This analysis will review overall targets for Canadian emission reductions by sector and then focuses on the impacts to the natural gas sector in reaching these targets.

Current Canadian Methane emissions are also explored with expectations for the Western Canada Oil and Gas shown.

CANADIAN CARBON TAX

Ahead of the April 2021 US lead, Leaders Summit on Climate, Canada increased the target reduction from its 2005 baseline to 40-45% emissions reduction target by 2030, from 36% previously agreed to at the Paris summit.

Carbon Pricing/Tax

- Canada does not have a single carbon pricing framework – provinces are required to meet emissions targets, failure triggers implementation of a federal backstop.
  - Quebec utilizes a cap-and-trade structure.
  - Alberta, Saskatchewan, and New Brunswick have a Hybrid using the Federal fuel charge with a large emitter program.
  - British Columbia and NWT have a provincial carbon tax.
  - Ontario, Manitoba, Yukon and Nunavut utilize the Federal Output Based Pricing System
- Federal policy on Fuel is structured with a fee (carbon tax collected) and dividend (80% returned to households/20% to general revenues to be used on GHG projects)
- Output-based pricing system for facilities that emit >50,000 t of CO_2 (large industrials) with allowance reduction over time.

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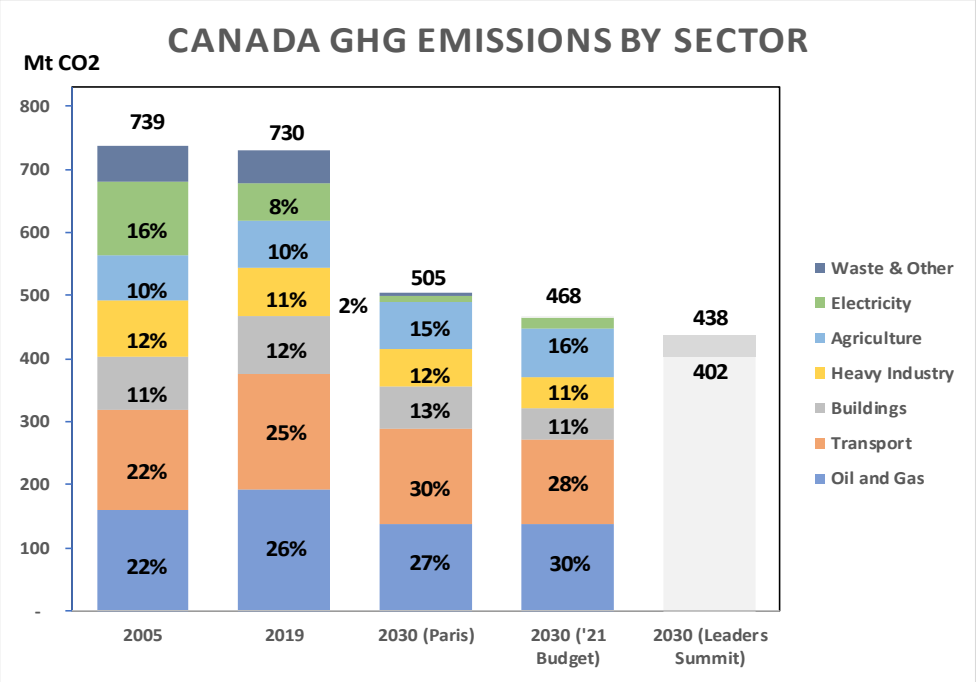
MEETING CANADA'S 2030 GHG TARGETS



- In December 2020, the Canadian Government announced plans to exceed previous 2030 Paris agreement targets.
- Under the Paris Agreement, Canada committed to reduce its GHG emissions to 30 per cent below its 2005 level of 739 Mt by 2030. This translates into a target of 505 Mt in 2030.
- The April 2021 Federal budget included further measures to reduce emission to a target of 468 Mt in 2030.
- Announced in April, although post budget, before the June 2021 Leaders Summit on Climate a further reduction to 402-438 Mt of emissions.
- The Parliamentary Budget Officer (PBO, independent/nonpartisan) released a report (*Beyond Paris: Reducing Canada's GHG Emissions By 2030*) in June 2021 concluding that it would "take extraordinary measures to achieve [the '21 Budget] objective"

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BEYOND PARIS: REDUCING CANADA'S GHG EMISSIONS BY 2030 – INCORRYS REVIEW OF PBO FINDINGS

- Reference Case of $50/t CO_2 2022-2030 results in overall 2030 emissions of 674 Mt.
- Federal Backstop case reaching $170/t in 2030 results in overall emissions of 578 Mt, 73 Mt short of Paris and 110 Mt short of '21 Budget.
- PBO analysis shows a carbon price of $261/t ($13.85/MMBtu) would be required to meet '21 Budget target of 468 Mt in 2030.
- Assumes 80% of fuel charges are returned to households and 20% for government spending. 100% of Output Based Pricing System (OBPS) are used for government spending.
- Estimated 1.4% lower GDP in 2030 resulting from meeting 468 Mt 2030 target.
  - Oil and Gas (-0.8%) and Transportation (-0.3%) are the most impacted sectors.

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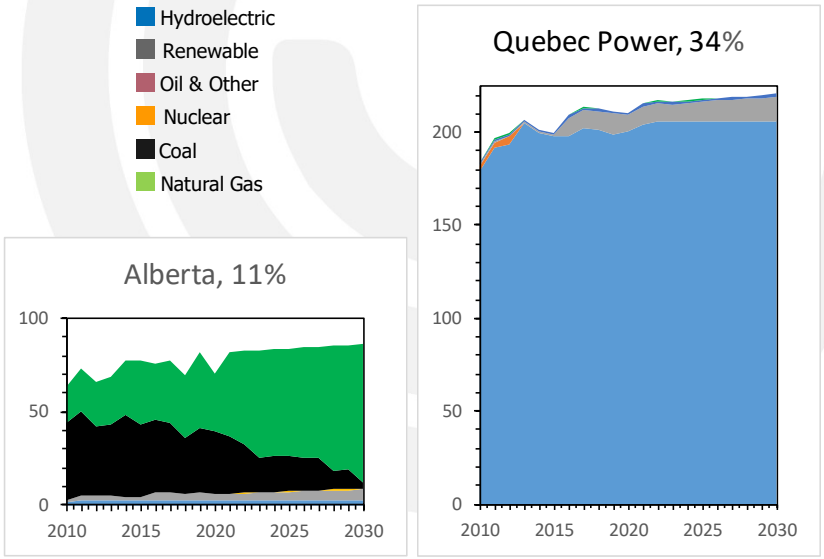
EFFECTIVENESS OF CARBON PRICE

- Incentives created in pricing Carbon are effective when a substitute path to reduce carbon is available.
  - For example, coal generation has dropped almost in half to 50 TWh in 2019 from 95 TWh in 2005. This drop has been offset by Natural gas (50% less emissions than coal) which has grown by 44 TWh during this same time period.
- Carbon abatement may be difficult even at high price as technology may be untested or require expensive capital investment into infrastructure.
- Sectors without substitute carbon abatement paths (barriers to carbon abatement) will be disproportionately impacted by increasing carbon pricing. Regional variations in resource endowments in Canada further complicates increasing price signals.



- The obvious example presents in the buildings sector:
  - Almost all of buildings sector in Alberta utilize natural gas or propane for heating. Increased carbon price signals for buildings will also be seen in substitute market of electric heating. Currently 45% of Electricity in Alberta is produced using natural gas and is expected to increase to 85% by the end of the decade as coal fired plants close. Natural gas sets the marginal price of electricity and will therefore see spark spread impacted by Carbon tax, plant inefficacies, and electric transmission losses.
  - Quebec with its very large hydro endowment allows this zero-emission source to produce almost all its electric power. Buildings and households using a natural gas furnace can switch to electric home heating without economic penalty.

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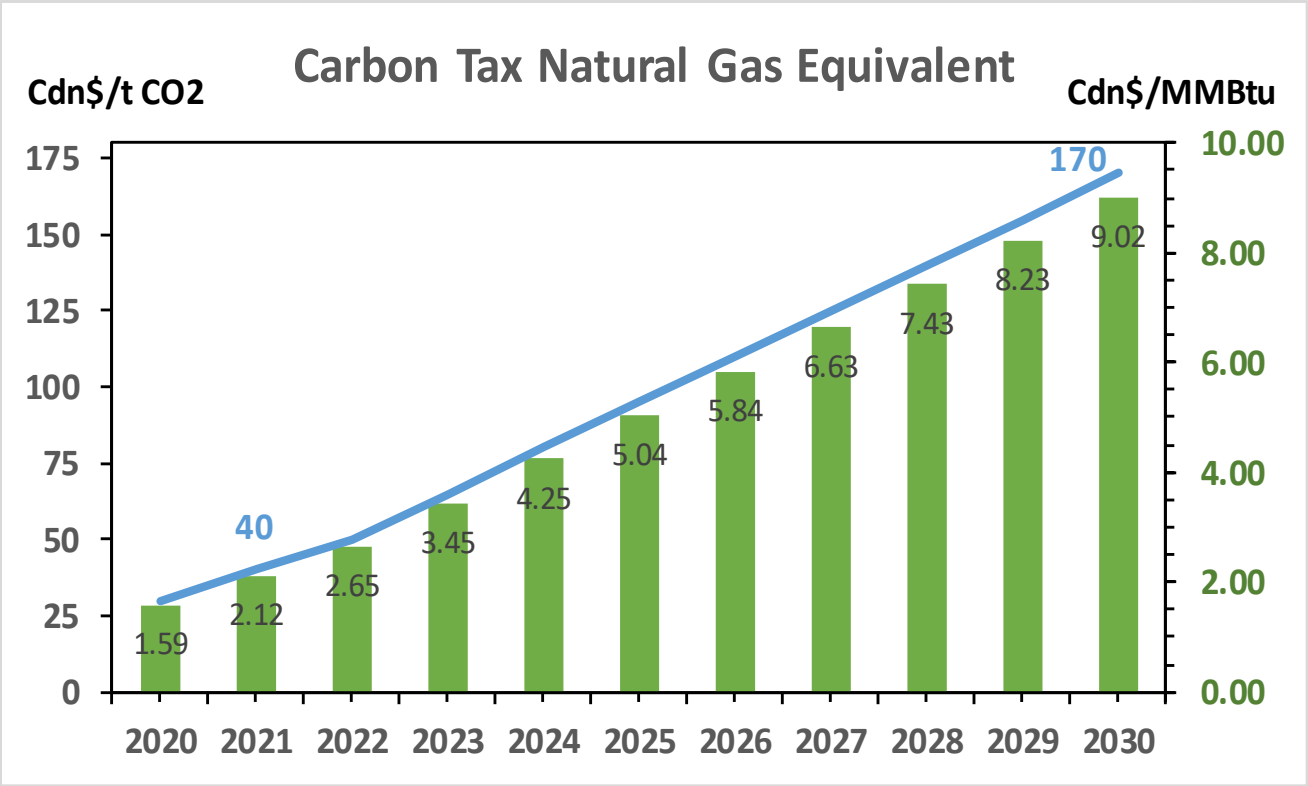
FEDERAL BACKSTOP CARBON TAX RATE IMPACT ON NATURAL GAS



The Canadian Federal government has mandated a carbon price under the Greenhouse Gas Pollution Pricing Act. The federal program acts as a back stop price which applies to provinces whose carbon policy or emissions regulations do not meet federal benchmarks.

- Natural gas produces 53 Kg (117 lbs) of CO_2 emissions per MMBtu or 0.053 tonnes per MMBtu
- \$40/t CO_2 equates to a cost of \$2.12/MMBtu of natural gas use
- \$170/t CO_2 equates to a cost of \$9.02/MMBtu of natural gas use
- AECO-NIT has averaged Cdn\$2.90/MMBtu over the first 5 months of 2021

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LARGE EMITTERS - CANADIAN CARBON TAX

OBPS FRACTION OF HISTORICAL EMISSION CUTOFF

OBPS Sector	2022	2030	Change
Electricity using gaseous fuels	95%	46%	-49%
Electricity using liquid fuels	95%	63%	-32%
Electricity using solid fuels	74%	46%	-28%
Mining, Oil and gas, and Pipelines	80%	66%	-14%
Food and tobacco	80%	66%	-14%
Lumber, Pulp and paper mills	80%	66%	-14%
Non-ferrous metals	80%	66%	-14%
Miscellaneous Equipment Manufacturing	80%	66%	-14%
Cement, Gypsum and lime, Iron and steel	95%	81%	-14%
Fertiliser, Petchem, Petroleum products	90%	77%	-13%

Output-based pricing system for facilities that emit >50,000 t of CO_2 (large industrials).

Regulations determine permissible GHG levels from historical industrial processes at facilities. With oil and gas standard decreasing at ~2% per year to achieve increased emission efficiency.

Large industrials will pay a price on carbon emissions that exceed the set level and earn credits (one tonne CO_2 e/credit) if below emission cutoff.

- For example, a normal operating pipeline compressor would pay for 20% of overall emissions in 2022 and 34% in 2030

Credits can be used to achieve compliance within a company or be marketed to other firms.

OUTPUT-BASED PRICING SYSTEM FOR INDUSTRIALS

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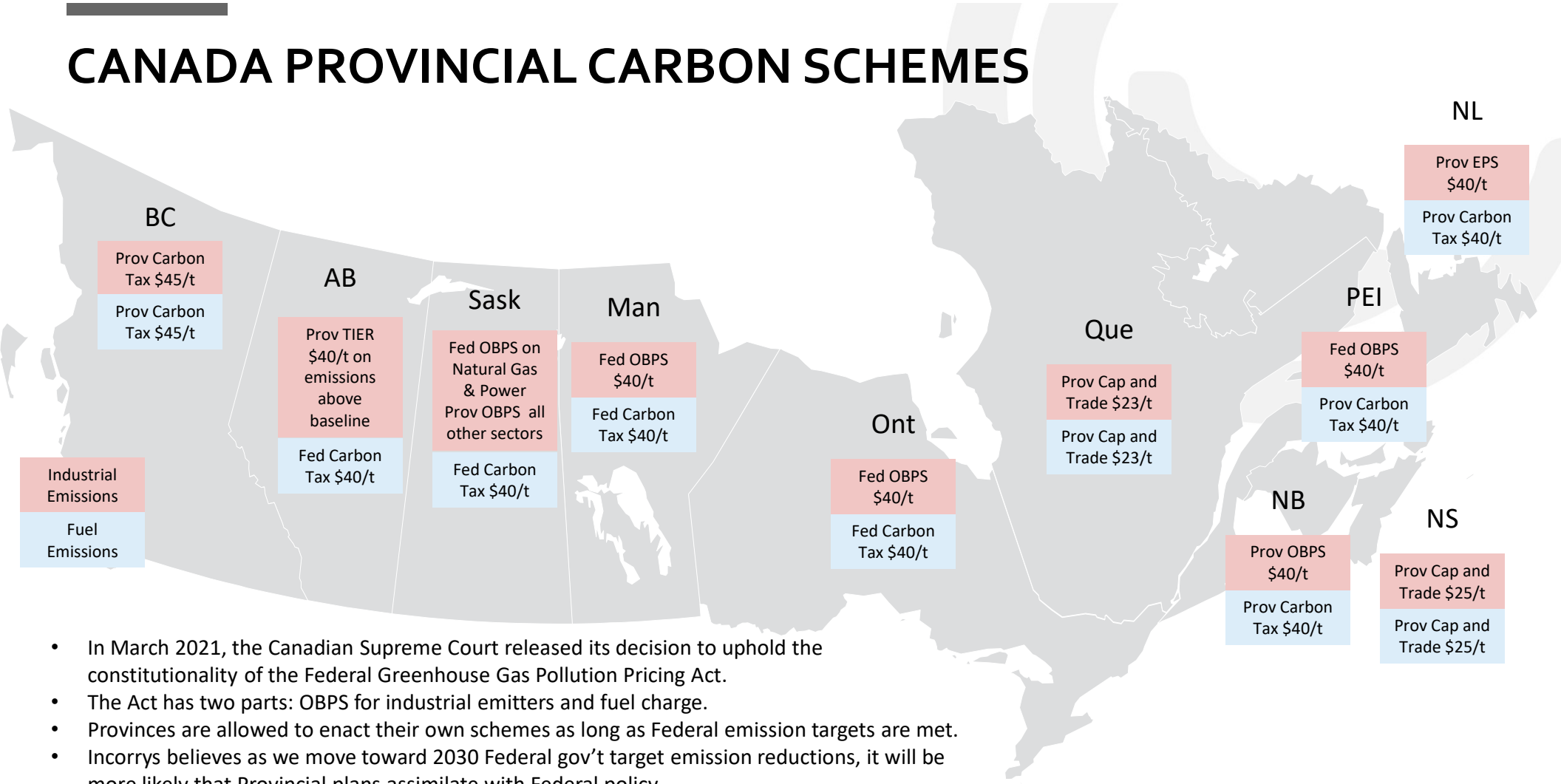
CANADA PROVINCIAL CARBON SCHEMES



- In March 2021, the Canadian Supreme Court released its decision to uphold the constitutionality of the Federal Greenhouse Gas Pollution Pricing Act.
- The Act has two parts: OBPS for industrial emitters and fuel charge.
- Provinces are allowed to enact their own schemes as long as Federal emission targets are met.
- Incorrys believes as we move toward 2030 Federal gov't target emission reductions, it will be more likely that Provincial plans assimilate with Federal policy.

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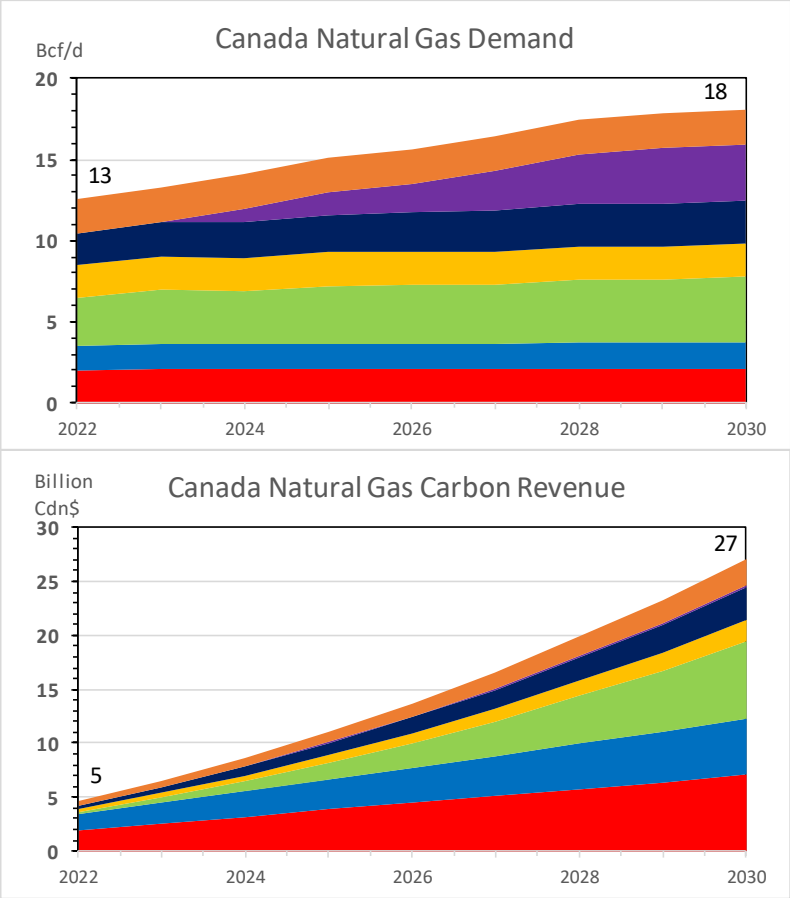
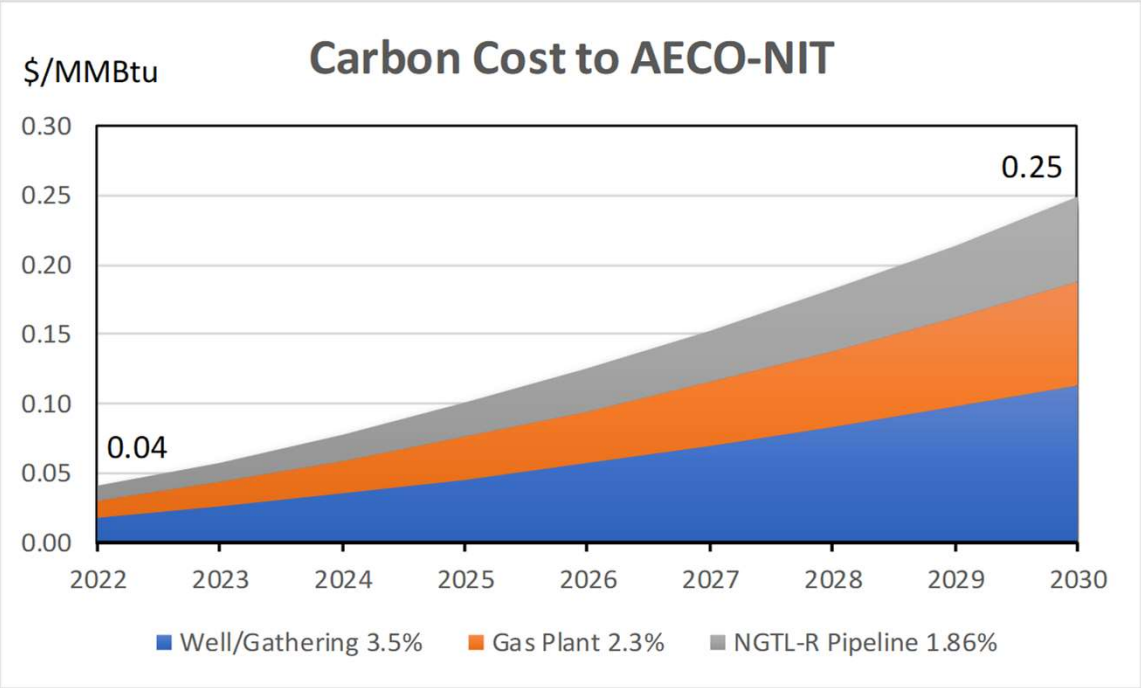
CANADA'S CARBON PRICE IMPACT ON NATURAL GAS



- Driven by LNG exports, Canadian natural gas demand is expected to increase 4.6%/year to 18 Bcf/d in 2030.
- Based on Federal backstop carbon pricing and OBPS Fraction for large emitters, revenues collected from Canadian natural gas sector is expected to increase 24.6%/year to Cdn$27 Billion in 2030.
  - Incorrys estimates 60% will be returned to households (fuel emissions from Residential, Commercial, and Electrical sectors).
  - Therefore, in 2030 OBPS will create Cdn$10.8 Billion in funding to potentially help reduce emissions from large industrials or Oil Sands sectors.
- Gas-fired power sector is expected to show the greatest increase with revenues increasing 64%/year on demand growth of 4.5%/year.
- In 2030, the oil sands will pay carbon costs of Cdn$3 Billion due to natural gas used or Cdn$2.15/Bbl.
- Although LNG exports are the highest growth demand sector, only a fraction of emissions are created within Canada during the liquefaction process.

CARBON TAX RATE AND OBPS IMPACT ON AECO-NIT NATURAL GAS



Natural Gas Producers utilize natural gas from wellhead to burner tip.

- Well activities and gathering will consume about 3.5%.
- Gas Plant operations will consume about 2.3%.
- Pipelines, such as NGTL, will utilize natural gas to operate compression, current fuel rate on NGTL is 1.86%
- Based on OBPS Fraction of 80% for 2022, carbon price impact on producer cost will be $0.04/MMBtu.
- As OBPS fractions are tightened at 2%/year, the carbon cost impact to producers grows to $0.25/MMBtu in 2030.

North American pipeline grid is integrated and competitive. Therefore, Canadian producers will be limited in their ability to pass carbon costs onto downstream consumers accessing gas produced without a carbon price. AECO-NIT basis could see widening.

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CANADIAN CARBON BORDER ADJUSTMENTS

Carbon Border Adjustments (CBA) are applied to imported goods from jurisdictions without a price on carbon or with a low price on carbon. CBA policies are put in place to address 'carbon leakage':

- to protect carbon-intensive domestic industries from foreign competitors not subject to a carbon price. This is done by applying an import carbon tariff while also providing a carbon rebate for exported goods.
- reduce industry incentives to transfer production overseas to avoid higher carbon input costs. Result is to preserve domestic economic activity and labor especially in Emissions-Intensive and Trade-Exposed Industries.
- Canada's OBPS results in large emitters only paying for emissions over a prescribed threshold, if combined with a CBA could provide increased advantage within the Canadian Market.

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CANADIAN CARBON BORDER ADJUSTMENTS- IMPLICATIONS

CBA administration requires a centralized federal approach; that would be administered by The Canada Border Services Agency (CBSA). The long-term implication is that CBA, is a devolution of provincial powers over carbon-based resources, resulting in provinces relinquishing legislative and administrative control over the any Carbon reduction schemes; as all are tied to a more substantive Federal trade and regulatory framework.

It should also be expected that the Canadian Revenue Agency (CRA) will use the tax code framework to manage and maintain adherence to carbon reduction legislation.

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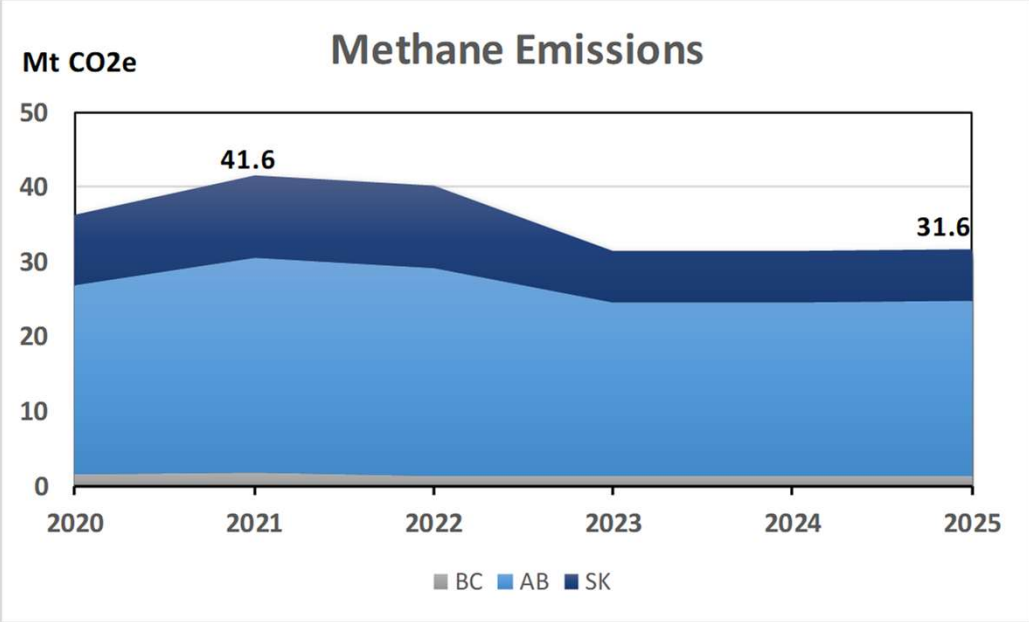
METHANE EMISSIONS FROM OIL AND GAS SECTOR FORECAST



- In 2019 methane emissions from oil and gas sector in Canada was about 40 Mt of CO_2 eq. or ~1.6 Mt of methane*.
- Methane emission from oil and gas sector was ~6% of total Canadian emissions (730 Mt of CO_2 eq.).
- In 2020 methane emissions reduced due to decline of economic activities and in particular oil production.
- Methane emissions are expected to decline after 2022 as a result of federal and provincial regulations and reach ~32 Mt of CO_2 eq in 2025.

Source: Government of Canada and Incorrys Assessment

* Canada assumes that one tonne of methane is equivalent to 25 tonnes of CO_2

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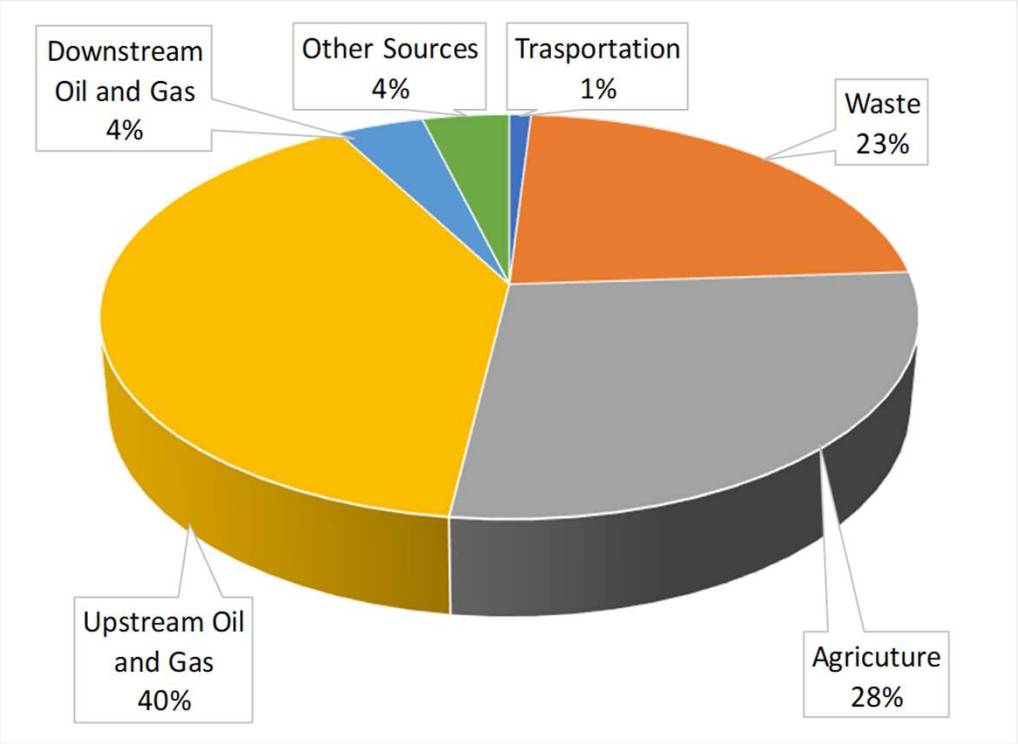
METHANE EMISSIONS IN CANADA



Methane Regulations in Canada:

- **Limit fugitive leaks**: inspection, detection and repair programs
- **Reduce venting from facilities**: limit 1,250 m3 per day, natural gas conservation.
- **Reduce venting from pneumatic devices**: limit 0.17 m3 per hour
- **Reduce venting from compressors**
- **No venting from well completions**

Source: Government of Canada, 2014 data

Implementation: January 1, 2020 – January 1, 2023

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ENGINEERED SOLUTIONS FOR CARBON REDUCTION

Geoengineering immediately leads to the question of what consequences there could be.

- Would such an intervention work?
- Should a country decide if it should go ahead or a wider international amalgamation?
- What unintended consequences or side-effects?

- Solar Radiation Management
- Weathering Volcanic rock (olivine) www.projectvesta.org
- Coastal forests of Kelp www.projectseagrass.org
- Carbonate formation via seawater alkalization https://pubs.acs.org/doi/full/10.1021/acssuschemeng.0c08561#

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THANK YOU !

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