

**MINISTRY OF ENVIRONMENT
INFORMATION NOTE**

June 6, 2012
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PREPARED FOR: Honourable Terry Lake, Minister of Environment

ISSUE: Advance drafts of the Progress to Greenhouse Gas (GHG) Targets Report and Provincial Inventory Report

BACKGROUND:

A complete draft of the Progress to GHG Targets Report has been distributed to relevant ministries for comments. In addition, a select group of peer reviewers have undertaken a confidentiality agreement to review the data contained in the report. A draft is attached for your information along with the Provincial Inventory Report. Following comments from other ministries and any views you may have on this draft, final versions will be sent recommending your approval by June 19th so that printing of the Progress to Targets document can be completed for a public release currently scheduled for June 26, 2012.

The *Greenhouse Gas Reduction Targets Act* (GGRTA) requires a public report every even-numbered calendar year, as soon as reasonably practicable for each year, respecting:

- (a) a determination of BC's GHG emissions level for the relevant calendar year;
- (b) the progress that has been made toward achieving the targets;
- (c) the actions that have been taken to achieve that progress, and;
- (d) the plans to continue that progress.

The BC GHG Inventory Report 1990-2010 (Provincial Inventory Report) represents the determination of BC GHG emission levels as required by GGRTA. These emission estimates form the foundation for the Progress to Targets Report.

DISCUSSION:

Key points in the Progress to Targets Report

- Reported 2010 emissions are 4.5% below emissions in 2007 – the benchmark year established in *GGRTA*.
- BC could meet its 2012 interim target of 6% below 2007 levels.
- Positive signs include a decline in BC's consumption of major fossil fuel types since 2007, and in each case by a larger amount than Canada's. At the same time, BC's GDP was slightly better than the Canadian average.
- Work on carbon storage through forest management offset projects (not included in the 4.5%) provides an additional climate action benefit that could be included in BC's progress towards targets (approximately an additional 0.6% toward 2012).

- In order to reach the 2012 target and those beyond, BC will have to see continued emissions reductions as the economy recovers from the recession.
- More will need to be done to address emissions growth anticipated from increased natural gas production, new industrial projects and growing off-road diesel emissions.

Key points in the Provincial Inventory Report

- Reported emissions in 2010 are 62.0 Mt CO₂e, 4.5% lower than the 64.9Mt reported for 2007 and 0.8% higher than the 2009 estimate of 61.5 Mt CO₂e.
- BC uses the internationally verified Environment Canada National Inventory Report as the basis for the BC GHG Inventory Report.
- This year, there will be difference between the federal and provincial emissions inventory reports for BC. There is a known error in the federal report's Fossil Fuel Production and Refining line item (caused by a Statistics Canada data processing error) that results in an underestimation of BC's emissions for 2010. Environment Canada and Statistics Canada are aware of the error and intend to revise BC's (and other provinces') fossil fuel estimates in the next annual National Inventory Report in 2013. BC's Provincial Inventory Report will correct this mistake and note the known error in the federal report.
- Taking the acknowledged errors into consideration and adding net deforestation, the BC Ministry of Environment has re-calculated the emissions for BC to be 62.0 Mt of CO₂e in 2010, 61.5 Mt in 2009 and 64.9 Mt in 2007.

Attachments:

1. Draft Progress to GHG Targets Report
2. Draft Provincial Inventory Report

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**MINISTRY OF ENVIRONMENT
INFORMATION NOTE**

October 10, 2012
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PREPARED FOR: Honourable Terry Lake, Minister of Environment

ISSUE: Report by Canadian Centre for Policy Alternatives (CCPA), *BC's Legislated Greenhouse Gas Targets vs. Natural Gas Development: The Good, the Bad and the Ugly*, October 10, 2012.

BACKGROUND:

The CCPA has released the above report, which assesses British Columbia's (BC's) performance against its greenhouse gas (GHG) targets in light of BC's Natural Gas Strategy and exports. The report's key messages are as follows:

- 1) BC has made progress in the direction of its interim 2012 target. Emissions reductions have come from the rest of the economy while the oil and gas industry's emissions have been growing. Policy has likely had a role in emissions reductions, but the global economic downturn has also played a role. The report questions whether GHG reductions would be maintained under a new period of economic growth.
- 2) BC's Jobs Plan and Natural Gas Strategy envision natural gas development and export to Asia via liquefaction terminals on the coast as a key economic driver for BC's future. The doubling of natural gas production in BC expected to result from this strategy would lead to emissions increases large enough to make achievement of 2020 targets unattainable, because the remainder of the economy would have to make prohibitively deep cuts to their emissions.
- 3) BC, through its export of fossil fuels for combustion elsewhere, is allowing millions of tonnes of carbon that is currently underground to be released to the atmosphere. BC's natural gas industry is being developed now with an export focus, which will lead to GHG emissions abroad (which are not included in targets) that are four times BC's legislated internal GHG target for 2020. More empirical research is needed to determine whether, after accounting for leakage of methane and processing in unconventional gas development, there is actually a GHG benefit as a 'transition fuel' in the substitution of natural gas for coal abroad.

The report recommends:

- A "next-generation Climate Action Plan" that would get BC to its GHG targets;
- Research into the true emissions impact of unconventional gas production in BC;
- Regulation for fugitive emissions;
- Carbon capture and storage requirements for liquefaction plants the same as those for thermal electricity in BC;

- Expansion of the carbon tax to all lifecycle emissions from natural gas development;
- A new royalty regime focusing on benefits for British Columbians;
- Approval of only those exports guaranteed to displace dirtier energy sources; and
- No public subsidies to the natural gas industry.

The CCPA is an independent think tank focusing on social and economic justice issues. The report was generated by its BC office in Vancouver.

DISCUSSION:

The report *Making Progress on BC's Climate Action Plan* concluded that BC was within reach of its interim 2012 target and that some sectors were starting to 'bend the curve' downward. It acknowledged that more would need to be done to accelerate the change needed to reach the 2016 and subsequent targets. New industrial projects, especially natural gas sector development, were highlighted as one of the challenges in continuing toward the 2020 targets.

Projections of levels of natural gas production and resulting emissions are characterized by very high uncertainty, depending on commodity prices, access to markets, pace of development, and other factors. Within this uncertainty, the CCPA's range of expected emissions impacts is broadly consistent with those expected by government. However, in its estimation of natural gas exports' impact on global emissions, it uses an additive approach, rather than describing emissions net of those displaced from other fuel sources.

International GHG accounting rules attribute emissions occurring within a jurisdiction to that jurisdiction's inventory. As such, emissions from combustion abroad of fuels exported from BC are included in the inventories of the jurisdictions in which combustion takes place.

BC is working to reduce the environmental impact of natural gas production, processing and liquefaction through efforts such as becoming the first liquefaction plants in the world powered by clean energy. Other cost-effective options to reduce GHG emissions from the oil and gas sector include: use of low carbon energy sources; energy efficiency measures (e.g. waste heat recovery, compressor driver efficiency); venting emission reduction technologies (e.g. plunger lift systems, dry seal compressors); and better operations and maintenance to reduce fugitive emissions.

SUMMARY:

The CCPA report affirms the conclusions of BC's *Making Progress* report that BC has made progress toward its targets but still faces challenges, particularly from natural gas development, in the achievement of its 2020 target. Though exported fuels are not counted in domestic GHG inventories, there are opportunities to reduce the GHG impact of exports and to displace dirty fuels used abroad. BC is working with the natural gas industry to reduce its emissions and produce a clean liquefied natural gas product for export markets.

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**MINISTRY OF ENVIRONMENT
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PREPARED FOR: The Honourable Mary Polak, Minister of Environment

ISSUE: Greenhouse gas (GHG) emissions from shale gas.

BACKGROUND:

On top of emissions from natural gas combustion and flaring, methane and carbon dioxide can also escape or be vented during natural gas extraction (including hydraulic fracturing, the stimulation of gas fields through high pressure injection of water, proppant and chemicals), processing and transmission. Methane emissions are a particular concern since they have a global warming impact 21 times higher than carbon dioxide. A small increase in the percentage of natural gas that escapes can have a significant impact on overall emissions.

In the 2013 Budget Estimates debate, MLAs Chandra Herbert and Holman questioned why estimates of the percentage of natural gas extracted that is lost as fugitive methane emissions differed significantly among BC, other North American jurisdictions, and scientific literature (0.3% and 3% and 7 to 8%, respectively). For the last several years a vigorous public and scientific debate has been ongoing about the level of shale gas GHG emissions.

The debate was escalated by a study by Professor Robert Howarth of Cornell University published in the journal *Climatic Change* in 2011 (attachment 2). In his work, Howarth calculated that between 3.6% and 7.9% of methane from shale gas production in the U.S. escapes to the atmosphere in venting and leaks over the lifetime of a well largely during the hydraulic fracturing and well completion processes.

Feedback on the Howarth study has been mixed. The Howarth work has been criticized as being based on very limited data set and not factoring in the impact of existing technology for reducing emissions. The leading consultancy IHS CERA indicated that extremely hazardous emissions would have been created at the well site if methane emissions were as high as Howarth assumes. Limited field work conducted in the U.S. by the National Oceanic and Atmospheric Administration (NOAA) found 4 to 9% of methane extracted became fugitive emissions, which is in line with Howarth's estimates and far higher than U.S. Environmental Protection Agency (EPA) estimates.

To address the uncertainty around fugitive and venting emissions during shale gas development, NOAA, the Environmental Defense Fund and industry partners are conducting a comprehensive assessment of U.S. natural gas emissions.

DISCUSSION:

A recent article referencing ‘implausibly low’ BC shale gas emissions was published in DeSmog Canada, a blog that looks at the environment, social issues, and the economy. Using this article as evidence, the BC Sustainable Energy Association and others are questioning if the natural gas to be used for LNG production is clean and if industry is operating with appropriate social license.

The DeSmog article uses U.S. emissions levels to estimate those from BC shale gas. However, natural gas extraction regulations and on-the-ground practices are significantly different in BC and the United States. Howarth’s study uses worst-case scenario assumptions which are not applicable to British Columbia. For example, the vast majority of wells drilled in BC do not vent methane to the atmosphere as ‘green completions’. In BC, methane is separated from water present and placed in a pipeline instead of being released to the atmosphere. Additionally, in BC leaks are more tightly regulated since some BC natural gas contains hydrogen sulfide, a toxic gas, which if leaked, would be a health emergency.

The best current BC estimates of natural gas methane emissions are determined using the *Greenhouse Gas Reduction (Cap and Trade) Act* Reporting Regulation. BC’s Reporting Regulation uses prescribed Western Climate Initiative quantification methods (the same used for cap and trade in California and very similar to those used in regulatory reporting by the U.S. EPA). For methane fugitive emissions, the regulation largely uses emissions factors which assume a set percentage of methane will escape during extraction. Under the BC Reporting Regulation, companies have emissions reports verified by a third party; therefore, intentional underreporting is unlikely.

BC published detailed 2011 oil and gas emissions data for each specific source on its website. Methane emissions within the natural gas value chain are estimated to be 1.97 Mt carbon dioxide equivalent (CO₂e), or 0.3% of total natural gas production. Methane emissions make up ~20% of total oil and gas sector emissions (10.5 Mt CO₂e). (see attachment 1)

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NEXT STEPS:

BC has been transparent in releasing oil and gas GHG emissions data and believes its estimates of emissions to be accurate. We are currently working with industry to improve emissions estimates around several specific sources and would like to further reduce uncertainties.

Attachments: 1. BC Reporting Regulation Oil and Gas Emissions Data
2. Howarth Study

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Attachment 1: BC Oil and Gas Emissions

Q: What percentage of methane produced in BC is vented deliberately and/or accidentally to the atmosphere?

Year	Natural Gas Production (m3)	Methane Mass Density (kg/m3)	Methane Amount (t CH4)	CO2e Amount (Mt CO2e) if all released into Atm.	Actual Venting (Mt CO2e)	% Vented Out of Total Production	GWP 100yr
2010	34,991,762,000	0.678	23,724,415	498.21	1.97	0.4%	21
2011	41,441,414,000	0.678	28,097,279	590.04	1.97	0.3%	21

Q: What are the emissions from the different segments of the natural gas value chain?

Row Labels	Venting	Fugitive	Flaring	Stationary Combustion	Sum of Total Wastewater	Total
Oil and Gas Extraction	3,282,489	962,670	528,510	5,373,869	17	10,147,555
Natural Gas Distribution	6,462	16,537	2,617	6,318	0	31,934
Pipeline Transportation	42,816	71,897	2	214,036	0	32,8752
Grand Total	3, 331,767	1,051,104	531,129	5,594,223	17	10,508,241

Q: What are the emissions from the specific natural value chain sources?

Emission Source	Category	Total	Percent
Stationary Combustion: Natural Gas	Stationary Combustion	5,060,500	49.0
Stationary Combustion: Other Fuels	Stationary Combustion	276,100	2.7
Electricity Generation	Electricity Generation	150,600	1.5
Well Testing Flares	Flaring	139,500	1.4
Associated Gas Flares	Flaring	35,200	0.3
Flare Stacks	Flaring	362,700	3.5
Continuous High Bleed Device Vents	Venting	311,100	3.0
Pneumatic Pump Vents	Venting	173,700	1.7
Continuous Low Bleed and Intermittent Device Vents	Venting	68,900	0.7
Acid Gas Removal	Venting	2,408,000	23.3
Dehydrator Vents	Venting	97,100	0.9
Well Venting for Liquids Unloading	Venting	6,200	0.1
Well Venting, with or Without Hydraulic Fracturing	Venting	4,100	0.0
Blowdown Vent Stacks	Venting	58,900	0.6
Well Testing Venting	Venting	1,100	0.0
Associated Gas Venting	Venting	730	0.0
Centrifugal Compressor Vents	Venting	102,000	1.0
Reciprocating Compressor Vents	Venting	52,400	0.5
EOR Injection Pump Blowdowns	Venting	-	-
Other Venting Sources	Venting	40,900	0.4
Storage Tanks	Fugitive	16,900	0.2
Gathering Pipeline Equipment Leaks	Fugitive	156,500	1.5
Equipment Leaks from Valves, Connectors, etc.	Fugitive	784,300	7.6
Above-Ground Meters/Regulators at Gate Stations	Fugitive	5,900	0.1
Below-Ground Meters/Regulators/Valves	Fugitive	8,500	0.1
Other Fugitive Sources	Fugitive	9,400	0.1
Wastewater processing	Wastewater	17	0.0
Total		10,331,500	100

Pages 1 through 12 redacted for the following reasons:

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