

# CERI Commodity Report - Natural Gas

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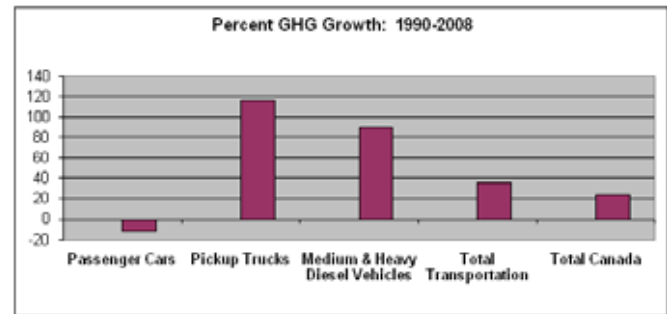
## Deploying Natural Gas Trucks and Buses to Reduce Canada's Carbon Emissions

By Alicia Milner

Canada has a growing problem with carbon emissions from medium- and heavy-duty vehicles. At the national level, total greenhouse gas (GHG) emissions are declining. In 2008, Canada's gas annual GHG emissions decreased by 2.1 percent, contributing to a five year average decrease of 0.8 percent.<sup>1</sup> However, within the transportation sector, emissions continue to rise. Total carbon emissions from transportation sources increased by 8 percent between 2003 and 2008, and by 36 percent between 1990 and 2008.<sup>2</sup>

Emissions from medium- and heavy-duty diesel vehicles are a significant factor in the overall growth in emissions

from transportation sources, contributing 18.7 megatonnes, or 35 percent of the total growth in transportation GHG emissions since 1990.<sup>3</sup> This contribution is noteworthy, given that only 4 percent of vehicles used in Canada are medium- and heavy- duty vehicles.<sup>4</sup> Since 1990, the rate of growth in carbon emissions from these vehicles has been second only to the rate of growth in emissions from light-duty pick up trucks, and sport utility vehicles.



Source: Environment Canada

Canada aims to reduce carbon emissions by 17 percent, relative to 2005 levels, by 2020. This 17 percent goal equals 127 megatonnes of carbon dioxide equivalent (CO<sub>2</sub>e), of which an estimated 34 megatonnes would theoretically need to come from transportation sources.<sup>5</sup> Based on the current vehicle population mix, this would suggest a 6.6 megatonne decrease is needed from the medium- and heavy-duty portion of the vehicle population. Achieving this reduction will be a significant challenge, given that energy use for medium- and heavy-duty vehicles is one of the fastest growing areas of energy demand, according to Natural Resources Canada.

### Natural Gas as a Niche Solution for Transportation

In June 2009, an article from the Canadian Natural Gas Vehicle Alliance, highlighting natural gas as a potential niche solution for medium- and heavy-duty vehicles in Canada, was featured in the Canadian Energy Research Institute's Commodity Report – Natural Gas.<sup>6</sup> In this article, the leadership position of Canadian companies, in supplying natural gas engines to North American truck and bus manufacturers, was noted. Key technology benefits that were cited included lower cost fuel, lower carbon fuel,

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criteria contaminant reductions relative to pre-2010 diesel engines, and the ability of natural gas vehicles to operate on renewable natural gas produced from waste sources with near zero emissions. An increasingly robust natural gas supply outlook was referenced. The relatively high upfront capital cost, for both natural gas vehicles and natural gas refuelling infrastructure, was highlighted as a key barrier to adoption, and public policy considerations were briefly reviewed.

### What Has Changed?

Since June 2009, a number of significant developments have taken place that underscore the potential for natural gas as a transportation fuel for medium- and heavy-duty vehicles in Canada. First among these changes is an increasing understanding of the robustness of the Canadian natural gas resource.

**Robust Gas Supply Outlook** - In May 2010, the Canadian Society for Unconventional Gas (CSUG) released a report on the size of Canada's natural gas resource, incorporating information about both conventional and unconventional natural gas. The key finding of the report was that Canada's natural gas in place resource is almost 4,000 trillion cubic feet (Tcf), with the marketable portion of the resource estimated at between 700 and 1,300 Tcf.<sup>7</sup> Based on current annual production rates of 5 to 6 Tcf, and assuming that the resource can be recovered economically, the report demonstrated that Canada has natural gas resources of more than 100 years.

Concerns associated with declining production from conventional natural gas sources had, in the past, limited the Canadian government's interest in considering a greater role for natural gas as a lower emission transportation fuel. The findings of the CSUG report suggest that natural gas can be relied upon as an abundant fuel that can serve as a foundation for Canada's sustainable energy future, and play a more significant role in reducing carbon emissions from transportation sources.

**Intent to Regulate Carbon Emissions** - In April 2010, the Government of Canada released draft vehicle regulations, which align with proposed regulations in the United States. For the first time, carbon emissions from passenger vehicles, including automobiles, pickup trucks, and sport utility vehicles, will be regulated. It is expected that the new rules will apply to model year 2011 vehicles in Canada. Annual requirements to improve emissions performance will result in model year 2016 vehicles that emit roughly 25 percent less carbon than new vehicles sold in 2008 in Canada.

Medium- and heavy-duty vehicles are not subject to these new regulations. The regulatory focus for these types of vehicles will continue to be tailpipe emissions of criteria contaminants, at least until the 2014 to 2015 timeframe, although the Government of Canada also recently announced its intent to regulate GHG emissions from the medium- and heavy-duty vehicle sector. The approach that is to be taken will be one that is harmonized with the United States.

These future carbon-based regulations could provide a framework, within which the lower carbon intensity of natural gas as a transportation fuel could provide a viable compliance pathway for medium- and heavy-duty vehicles, operating in return-to-base mode, or in regional corridors. Emissions modelling of liquefied natural gas (LNG) highway tractors using Natural Resources Canada's *GHGenius* model suggests a 26 percent well-to-wheels reduction in carbon, compared to a diesel powered tractor, and 65 percent of the carbon reduction is attributable to vehicle operation. It is too early to know how the proposed regulations will be structured, but an emphasis on carbon could support greater adoption of natural gas as a transportation fuel.

**Growing Fleet Interest** - The first deliveries of medium- and heavy-duty natural gas trucks from original equipment manufacturers have also taken place over the past year in Canada. Enbridge Gas Distribution took delivery of two Freightliner M2 112s with factory-equipped compressed natural gas (CNG) fuel systems, and Cummins Westport ISL G engines. Enbridge also had three International Model 4400s converted at a local International truck dealer, using Emission Solutions engines, and dedicated CNG fuel systems.



*CNG-powered Freightliner M2 112 medium-duty dump truck is one of five natural gas trucks purchased by Enbridge Gas Distribution in Ontario for its fleet.*

The City of Toronto has taken delivery of a rear-loading CNG refuse collection truck and, at a recent green fleet event, staff presented a plan to transition the City's 300 refuse truck fleet to renewable natural gas operation, beginning in 2014. The City plans to expand an existing digester, and to build a second large digester to process increased volumes of curbside organic waste, collected through the existing green bin program. City Council recently approved a recommendation to enter into a sole source contract with Enbridge Gas Distribution for upgrading the biogas to pipeline standard, and injecting it into the local gas distribution system. This "green gas" will then be used by the City for its refuse truck fleet, and to heat municipal buildings.

Also in Ontario, privately-held Miller Group has purchased a natural gas refuse collection truck, with funding assistance from the Province of Ontario. Miller is a leader in both the refuse collection, and road construction and maintenance industries, and has operations in Central and Western Canada.

The other area in which fleet interest is growing is in regards to natural gas highway tractors. Groupe Robert, a leading Québec-based for-hire trucking company, has announced that it intends to purchase at least 50 LNG highway tractors, to be used on linehaul routes between Montréal, Québec City, and Toronto, Ontario. Negotiations are underway for two refuelling stations to support the trucks. Groupe Robert is considered to be one of Québec's leading trucking companies. The company has demonstrated expertise in adopting and integrating innovative technology solutions for over-the-road trucking. Group Robert operates an estimated 1,100 tractors in Central and Eastern Canada, and is ranked within the top 30 full truckload carriers in North America.

**Increased Availability of Natural Gas Trucks and Buses** - The trend toward increased availability of natural gas trucks and buses from North American original equipment manufacturers continues. Within the past year, California-based Gillig Corporation added natural gas to its factory-direct transit bus product offering. Kenworth expanded its line of natural gas trucks, adding a natural gas cement mixer, as well as expanding its highway tractor and vocational truck offerings. Peterbilt also now offers additional models of highway and vocational trucks with natural gas fuel systems. And, in the past month, Navistar has announced that it will soon start taking orders for a natural gas version of its medium-duty DuraStar truck, which will be built on the line at its production facility in Texas.

**Initiation of Natural Gas for Transportation Deployment Roadmap** – The final, and perhaps most significant, change in the landscape for natural gas as a transportation fuel in Canada is the launch of a deployment roadmap process, co-led by industry and the federal government, under the leadership of Natural Resources Canada Deputy Minister Cassie Doyle. An initial roundtable session was held in March 2010 to begin the process. A broad group of stakeholders were invited with participation from across the natural gas value chain, end user groups, provinces, truck and bus manufacturers, academia, and the environmental community.

Six working groups are now in place, involving a range of stakeholders, and with ongoing support provided by Natural Resources Canada. An initial reporting back to the roundtable took place in June 2010, at which time stakeholders confirmed that the priority for near term (0 to 5 years) market development is medium- and heavy-duty natural gas vehicles in return-to-base, and corridor operation.

Unlike previous roadmap processes that Natural Resources Canada has been involved in, such as the Electric Vehicle Technology Roadmap in 2009, or the Carbon Capture and Storage Technology Roadmap in 2006, the natural gas for transportation roadmap is focused on deployment, rather than technology development. It is well understood that there are commercial technologies available for natural gas vehicles and refuelling infrastructure. It is also clear that for natural gas to move from the periphery to the mainstream, as a transportation fuel in Canada, a number of issues need to be verified, and addressed, related to natural gas supply, pricing, and environmental considerations, vehicle and infrastructure readiness and future RD&D requirements, end user needs in both the private and public sectors, codes and standards issues, and key drivers and strategies for market transformation. Current deployment roadmap work may create the model for future roadmaps with other industry sectors in Canada.

#### **Looking Forward to 2011**

Given the many indicators of forward momentum for natural gas as a transportation fuel for medium- and heavy-duty vehicles in Canada, the next twelve months offer an opportunity to build on this momentum, and create the right conditions to encourage fleet adoption of natural gas vehicles. An end user-centric approach that recognizes, and responds to, different fleet needs will be fundamental to success. Similarly, a clear view of roles and responsibilities for industry and government players is vital to ensure that end user needs are met and that the solution

that is taken to the market is integrated and involves a seamless process for fleet adoption.

Natural gas can be successfully deployed for medium- and heavy-duty vehicle fleets that return-to-base, or operate in regional corridors. Natural gas offers an option to reduce emissions from transportation sources, and it is in Canada's environmental and economic interest to move in this direction.

#### **Endnotes**

<sup>1</sup> Canada's 2008 Greenhouse Gas Inventory: A Summary of Trends: 1990-2008, Environment Canada. May 26, 2010. <http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=0590640B-1#section1>. Accessed on July 5, 2010.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Canadian Vehicle Survey: Annual 2008, Statistics Canada Transport Division, July 2009.

<sup>5</sup> National Inventory Report: Greenhouse Gas Sources and Sinks in Canada 1990-2005, Environment Canada Greenhouse Gas Division, April 2009.

<sup>6</sup> CERI Commodity Report – Natural Gas, Canadian Energy Research Institute, June 2009.

<sup>7</sup> Heffernan, Kevin. "CSUG report redefines size of Canada's natural gas resource". Canadian Society for Unconventional Gas. May 12, 2010. <http://www.csug.ca/images/news/2010/CSUG%20Report%20Release.pdf>. Accessed on June 7, 2010.

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