



# Canadian municipalities embrace hybrid technology

By: AMM Staff with files courtesy the City of Kelowna

In May 2005, Canada's first hybrid bus arrived in Kelowna, BC. BC Transit purchased six hybrid electric buses to replace aging buses in the Kelowna and Greater Victoria regions. In a City of Kelowna news release, former Mayor Walter Gray stated, "The hybrid-buses are an excellent example of using technologies to help address climate change. When using the buses in urban areas, fuel consumption and greenhouse gas emissions are significantly reduced when compared to conventional diesel buses."

Research on hybrid applications encourages the transit industry to move toward this technology. A key advantage is the technology does not impact existing infrastructure or daily business operations, providing a simple step toward improved performance.

The supplier was New Flyer of Winnipeg. New Flyer has recently delivered 235 hybrid electric buses to Seattle, both 40-foot vehicles and 65-foot articulated vehicles. Another fleet order is in production for Philadelphia, PA. The six BC Transit buses delivered to Kelowna and Victoria were the first production-line hybrid buses in Canada.

## HOW THE HYBRID ELECTRIC SYSTEM WORKS

A 'hybrid drive' means there is a combination of more than one type of motive power on the bus. Hybrid electric buses utilize two power sources: a smaller than normal internal combustion engine and an energy storage unit (the battery). The batteries are located on the roof of the bus and weigh approximately 400kg (900lbs).

The engine-generator combination works in parallel with the battery, providing electrical power to keep the battery charged. As a

result, the engine operates only in its most efficient ranges. For example when accelerating from a stop, the electric transmission accelerates the vehicle to a speed of about 12 kmph.

Once the vehicle is underway, the parallel hybrid system blends both the diesel engine and electric motor power to maintain speed. At highway speeds, the vehicle is powered



solely by the diesel engine. During this time, the engine also charges the energy storage system (battery). Significant fuel economy is achieved when the vehicle runs at its optimal speed, offering top engine performance and low exhaust emissions. The vehicle also uses regenerative braking to charge the batteries.

The hybrid electric bus has three major advantages: reduced fuel consumption, reduced emissions, and lower operating and life cycle costs.

## 1. Reduced fuel consumption

Short demonstration tests indicate up to a 58% reduction in fuel consumption depending on the vehicle usage profile. The fuel savings could be as high as 100,000 litres per year for the first order of six buses.

## 2. Reduced emissions

'Greenhouse' gas emissions, believed to contribute to global warming, are reduced up to 60%. Applying this figure to this initial 6-bus fleet, the estimated reduction in greenhouse gas emissions would be 403 tonnes per year and up to 90% fewer particulates.

## 3. Lower costs

The hybrid electric system results in lower operating costs due to reduced stress and maintenance on mechanical components such as brake linings. The hybrid transmission has fewer component parts and therefore requires less maintenance. The hybrid bus option has about a 40% premium on capital. The operating costs savings means the 'break even' point in total expenditures is estimated at 10-12 years dependent upon future petroleum price trends. Buses are typically kept in service for 20 years.

## HOW CLEAN IS THE TECHNOLOGY?

In stop-and-go applications, each year greenhouse gasses are reduced by over four times the weight of a regular bus – that's 60 metric tonnes.

- Particulate Matter (PM) is reduced by up to 90% over the cleanest diesel buses now in BC Transit's fleet
- Carbon Monoxide (CO) reduced by up to 90%
- Hydrocarbons (HC) reduced by up to 90%
- Carbon Dioxide (CO<sub>2</sub>) reduced by up to 40-60%
- Nitrogen Oxide (NO<sub>x</sub>) reduced by up to 50%

## WHAT IS THE COST?

A 40-ft. low floor bus costs \$530,000. The premium cost for the hybrid technology is an additional \$300,000. Based on current fuel costs, the bus should recuperate the additional cost in 10-12 years. The average life span of a transit bus is 20 years.

## ACROSS CANADA

While BC Transit is a leader in adopting hybrid technology in its fleet of buses, other municipalities are moving toward hybrid systems as well.

In 2003, **Toronto's** City Council approved a Green Fleet Transition Plan pioneering a significant increase in the use of hybrid-electric vehicles and biodiesel fuel in a major municipal fleet. The Toronto forecast is a reduction in CO<sub>2</sub> by 23% or between 10,000 and 15,000 tonnes over three years.

In 2004, the **City of Hamilton** directed staff to prepare a Central Fleet Strategic Plan with the objective of providing an affordable way to use new vehicle and fuel technology. New technologies, such as hybrid electric vehicles and biodiesel are incorporated into the Green Fleet Implementation Plan.

In 2005, the **City of Edmonton** announced a \$3.2M investment to evaluate new technologies that could lead to energy savings and reduced pollution, including purchasing more fuel-efficient vehicles (buses and trucks), and eventually using hybrid or fuel cell vehicles.

Recently, Alberta's Climate Change Central launched *Hail a Hybrid*, a pilot program that encourages **Calgary and Edmonton** cab drivers to switch to fuel-saving, environmentally friendly hybrid vehicles. Under the pilot program, up to four cab drivers in each of Calgary and Edmonton will receive a \$5,000 incentive for purchasing a hybrid taxi.

In Manitoba, the **City of Brandon** replaced two of its older pickup trucks with two Honda Civic hybrids. More hybrids may be added to the fleet as the city looks to replace other vehicles, especially if the cost of gasoline remains high. ♻

## Sources:

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Kelowna Regional Transit System: [http://www.bctransit.com/regions/kel/news/hybrid\\_electric.cfm#backgrounder](http://www.bctransit.com/regions/kel/news/hybrid_electric.cfm#backgrounder)

Federation of Canadian Municipalities: <http://www.fcm.ca/english/media/stories/april122005.html>

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While the environmental benefits of hybrid technology isn't disputed, some municipalities question estimated cost savings. Ottawa's Fleet Emissions Reduction Strategy called for the purchase of 226 diesel-electric hybrid buses in a move to a zero emission transit fleet. However, Council put the planned \$536M purchase on hold while the City studies natural gas options. The City of Ottawa Hybrid Bus Feasibility Study Report concludes: "Hybrid systems will not provide sufficient fuel savings on low-stop frequency and high-speed routes...or rural routes to offset initial cost."

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