

# RAIL TRANSIT IN CANADA



*A sample of Canada's rail transit systems: Ottawa's diesel O-Train (main), electric LRT in Calgary (top) and commuter rail in Greater Montreal (bottom)*

Canadians are increasingly aware of public transit's key role in overcoming vital challenges such as climate change, smog and congestion. The expansion of rail and bus rapid transit systems will be essential for the transit industry to meet its performance and ridership targets, because they can carry growing passenger volumes quickly and reliably over long distances.

In major cities across Canada, rail-based systems have been the backbone of transit service for more than a century. About half of all Canadian transit riders make part of their journey by rail, and new or expanded rail transit services are being built or planned in no fewer than eight cities.

Many rail transit technologies are available to suit the diverse operating and built environments found in Canadian cities. Traditional electric streetcars (surviving only in Toronto) have been joined by electric and diesel-powered light rail lines, rubber-tired and steel-wheeled subways, fully automated

driverless rail transit systems, and diesel-powered locomotives pulling bi-level commuter rail cars. Canadian suppliers compete vigorously to win international rail transit contracts, and are constantly improving their products and services.

This issue paper will help Canadian transit stakeholders understand the different types of rail transit, their advantages, and their essential role in the success of Canadian public transit systems.

## Benefits of rail transit

Rail transit offers many benefits. Some are common to rapid transit services in general, while others are unique to rail.

- **Capacity.** In the busiest metropolitan travel corridors, subways can move 20,000 to 40,000 people hourly in each direction, due to the use of multiple-car trains, long platforms and off-vehicle fare collection. Light rail systems can carry 10,000 to 20,000 persons per hour in each direction.

- **Speed.** By operating in a dedicated right-of-way, rail transit vehicles can avoid traffic congestion and offer attractive travel times. Typical light rail or subway vehicles can reach top speeds of 70 to 80 km/h, while commuter trains can reach 110 km/h or more.
- **Reliability.** Avoiding traffic congestion helps rail transit services stay on schedule. Light rail vehicles in mixed traffic can be given traffic signal priority to minimize any delay.
- **Environmental impact.** Subways and conventional light rail vehicles run on electricity and emit no air pollution, aside from that indirectly attributable to power generation.
- **Passenger comfort.** Passengers appreciate the ability of rail vehicles to accelerate, decelerate and manoeuvre smoothly and quietly. The quality of rail transit travel helps attract car drivers who can be more reluctant to use buses.
- **Ability to shape land use.** Rail transit has been shown to act as a structural catalyst for higher density, mixed land uses (known as transit-oriented development) at stations and along linear corridors.
- **Low operating costs.** High-capacity rail vehicles offer the potential for greater passenger-to-operator ratios than streetcars or buses, which reduces the operating cost per passenger.
- **Efficient use of existing rail lines.** Rail transit services can share rights-of-way with existing rail lines. In the case of commuter rail (and even light rail in limited situations) rail transit services can make use of existing tracks.

## Subway

Subways use steel-wheeled or rubber-tired trains on steel rails. Multiple-car trains provide high capacity. A high-voltage “third rail” provides power to electric motors, meaning that subways must be fully grade-separated.

**Toronto.** Ever since the historic opening of the Yonge Subway in 1954, the subway operated by the Toronto Transit Commission has had an enormous influence on the city’s form and quality of life. The network now includes three lines (Yonge-University-Spadina, Bloor-Danforth and Sheppard) with 62 kilometres of track and 64 stations. The 680 subway cars carry almost 1.2 million passenger trips each weekday. Planning is underway for a 6.2-kilometre extension of the Yonge-University-Spadina Line north to York University, Steeles Avenue and Vaughan Corporate Centre in York Region.

**Greater Montreal.** Montreal’s Metro, operated by the Société de transport de Montréal (STM), was opened in 1966 with three lines and 26 stations. The system has grown to include four lines with 65 stations mostly on the Island of Montreal. The Yellow Line connects to Longueuil on the south shore of the St. Lawrence River, and an Orange Line extension to Laval on the north shore is scheduled to open with three new stations in 2007. The Metro serves 218 million riders a year, and runs entirely underground on rubber tires rather than steel wheels.



Société de transport de Montréal

## Commuter rail

Commuter rail lines use diesel or electric locomotives to pull conventional passenger rail cars, or they can operate with self-propelled multiple-unit trains. Long trains and bi-level passenger cars can create very high capacity.

**Greater Vancouver.** West Coast Express, a subsidiary of the Greater Vancouver Transportation Authority (TransLink), links downtown Vancouver to the communities of Mission, Port Haney, Maple Ridge, Pitt Meadows, Port Coquitlam, Coquitlam and Port Moody. There are five westbound trains on weekday mornings and five eastbound in the afternoon, each consisting of a diesel-electric locomotive and four to nine bi-level passenger cars. Since opening in 1995, ridership has increased steadily from 5,000 to more than 9,000 riders each day.



Greater Vancouver Transportation Authority

**Greater Toronto.** GO Transit, an agency of the Province of Ontario, began its commuter rail service in 1967. Each weekday, about 165,000 passengers board 181 departing GO trains at 56 stations (most with park-and-ride facilities) on seven lines. The service is supported by 45 locomotives and 395 bi-level passenger cars, and is integrated with GO’s regional bus routes. More than 96% of GO train riders travel to or from downtown Toronto. VIA Rail also operates limited commuter rail services to downtown Toronto on four lines from more distant communities.



GO Transit

**Greater Montreal.** The Agence métropolitaine de transport (AMT) assumed responsibility for two existing commuter rail lines in Greater Montreal in 1996. It now operates five commuter rail lines with almost 50 stations (most having park-and-ride facilities) between downtown Montreal and the suburban communities of Candiac, Mont-Saint-Hilaire, Blainville (to be extended to Saint-Jérôme early in 2007), Rigaud and Deux-Montagnes. The first four lines are served by diesel locomotives, while the last uses electric multiple unit trains through the Mount Royal tunnel into Central Station. In March 2006 the Quebec government announced the creation of a new 51-kilometre commuter rail service between Montreal and Mascouche. Almost 15 million passengers use the service each year.

## Light rail transit

Light rail vehicles have steel wheels and run on rails that may be embedded in a road surface, permitting on-street operation. They can range from streetcars to multiple-unit trams or lightweight rail cars, and are usually propelled by electric motors that pick up power from overhead wires.

**Edmonton.** The City of Edmonton opened its light rail system in 1978. The line travels 12.3 kilometres from Clareview in the northeast to downtown in a shared rail right-of-way, then tunnels under Jasper Avenue and links across the North Saskatchewan River to the University of Alberta campus and hospitals. There are six underground stations, five at-grade stations and three free park-and-ride lots. About 46,000 passengers ride the LRT every weekday. A new 7.5-kilometre southern extension is under construction with completion scheduled for 2009.



Edmonton Transit System

**Calgary.** The City of Calgary's LRT system, known as the CTrain, opened in 1981. Its three lines link downtown to the south, northwest and northeast, with 36 stations extending over 42 kilometres. Most tracks are at-grade with on-street operation along 7th Avenue in the downtown core, which is also a free-fare zone. The CTrain has a higher ridership than any other LRT system in North America, with 250,000 weekday boardings. Calgary Transit has launched a program to extend the CTrain's northeast leg by the fall of 2007 and the northwest leg by 2008, build three additional LRT lines to the west, north and southeast, expand station platforms to accommodate four-car trains, construct a new LRT maintenance facility, and expand the LRT fleet by 40%.

**Toronto.** The eleven streetcar routes operated by the Toronto Transit Commission are mostly in the downtown and waterfront areas, and total more than 150 kilometres in length. They include four of Toronto's five most heavily travelled surface routes, and represent most of the transit service offered at street level in the downtown core. Much of the streetcar

network dates back to the 19th century, and features operations in regular traffic lanes with frequent stops rather than widely spaced stations. Some routes have protected rights of way in street medians. Two streetcar models have been designed to reflect a traditional style, and are unique to Toronto. The city's Official Plan calls for an expansion of the streetcar network.



Toronto Transit Commission

**Ottawa.** The O-Train is North America's first diesel-powered light rail service. It was originally introduced in 2001 as a two-year pilot project, and the City of Ottawa now plans to replace it with an expanded electric light rail corridor. The O-Train operates on eight kilometres of former private rail track from Ottawa's south end to the west edge of its downtown. Two of Ottawa's three trainsets are active at peak times, serving five stations with a central passing point at Carleton University. Initial ridership projections were quickly reached, and about 10,000 passengers now use the service each weekday.

**Greater Vancouver.** The Greater Vancouver Transportation Authority is planning a new conventional light rail service with 12 stations over 11 kilometres linking the Coquitlam, Port Moody and Lougheed city centres. The Evergreen Line will connect with SkyTrain, West Coast Express and bus services, and is projected to carry more than 22,000 daily riders by 2021.

**Waterloo.** Together with the federal and Ontario governments, the Region of Waterloo is studying a future rapid transit system in a 30-kilometre north-south corridor connecting the cities of Kitchener, Waterloo and Cambridge. Technologies under consideration include light rail as well as subways, busways and other options. Completion of an environmental assessment study to confirm the preferred technology, route and station locations is expected by the end of 2007.

**Quebec City.** A 2003 study for the Réseau de transport de la Capitale confirmed the feasibility of developing an LRT line over 21.5 kilometres of the Métrobus reserved bus lane network.

## 120 YEARS OF CANADIAN RAIL TRANSIT MILESTONES

**1886** Windsor operates the first electric streetcar in North America

**1954** Toronto's Yonge Subway is the first in Canada

**1966** Montreal's Metro opens as the first rubber-tired subway outside Europe

**1978** Edmonton's LRT is North America's first modern light rail line

**1986** Vancouver's SkyTrain opens as the first fully automated high capacity rapid transit service in North America

**2001** Calgary's CTrain becomes the world's first light rail system powered by wind energy

**2001** Ottawa opens North America's first diesel light rail line

## Automated guideway transit

Systems applying this technology use steel-wheeled vehicles on grade-separated rail tracks. Fully-automated vehicles require no operator. Several vehicles may be joined together to yield a higher capacity than light rail vehicles.

**Greater Vancouver.** SkyTrain is the world's longest automated light rapid transit system. It opened in 1986 and was extended in 1990, 1994 and 2002. There are 33 stations along the almost 50-kilometre length of the Expo and Millennium lines that serve Vancouver, Burnaby, New Westminster and Surrey. Driverless SkyTrain vehicles are propelled by linear induction motors, using electromagnetic forces to push against the electric current carried in a conductive strip between the rails. SkyTrain carries more than 220,000 people each day, and provides service every two to four minutes in peak hours.

A new automated light rapid transit service, the Canada Line, is under construction and scheduled to open in 2009. Using a different propulsion technology than SkyTrain, it will operate in a 19.5-kilometre corridor with 16 stations connecting downtown Vancouver to Vancouver International Airport and central Richmond. Canada Line represents a public-private partnership, and the contract to design, build, partially finance, operate and maintain it for 35 years has been awarded to a private company. The line will be fully integrated with other TransLink services including SkyTrain, SeaBus, West Coast Express and buses. It is projected to carry more than 100,000 daily passengers shortly after opening.



Greater Vancouver Transportation Authority

**Toronto.** The Toronto Transit Commission's Scarborough RT was opened in 1985. It joins suburban Scarborough to the eastern terminus of the Bloor-Danforth Subway, with six stations and over six kilometres of track. Its 28 vehicles use the same linear induction technology as Vancouver's SkyTrain.

## Rail transit suppliers

CUTA's 250 business members include three of the world's most important suppliers of rail transit vehicles, components and turnkey systems:

- Bombardier Transportation has supplied rail transit vehicles across Canada: subway, streetcar, Scarborough RT and bi-level commuter rail cars in Toronto; subway, bi-level commuter rail cars and self-propelled multiple units in Montreal; SkyTrain and bi-level commuter rail cars in Vancouver; and diesel-

powered O-Train vehicles in Ottawa. The firm's North American headquarters are in St-Bruno, Quebec. It has major production facilities in Thunder Bay, Ontario and La Pocatière, Quebec, and maintains GO Transit trains in Toronto.

- Siemens Canada has supplied light rail vehicles in Calgary and Edmonton. The firm is headquartered in Mississauga, Ontario and has regional offices and manufacturing facilities across Canada.
- Alstom Canada supplies rail transit vehicles and systems. The firm's two major facilities in Canada are a maintenance and overhaul facility in Calgary, and a worldwide centre for passenger information and security systems in Saint-Laurent, Quebec.

Several CUTA members, including Alcatel Canada Inc. and Vossloh Kiepe Corporation, offer rail transit propulsion, control, signalling and communications solutions. Many other members provide consulting services for rail transit planning, design, construction and operation.

## Looking to the future

Funding remains the most significant challenge to implementing rail transit in Canadian cities that have made it part of their vision. Capital-intensive rail systems are simply unaffordable for most communities without significant financial aid from provincial and federal governments. Fortunately, the financial feasibility of rail transit projects has improved dramatically in the last several years. Assistance is available from the federal government through the Gas Tax Fund, Public Transit Fund, Public Transit Capital Trust and various infrastructure programs. Provinces that have increased their support for major transit investments in the last few years include British Columbia, Alberta, Ontario and Quebec.

Recent legislation considered by the House of Commons could make it easier for transit systems to develop rail transit lines in future. If passed, Bill C-11 would amend the Canada Transportation Act and other legislation to guarantee that railway companies wishing to abandon a rail line must offer to sell or transfer the line to local transit authorities, among other public agencies, before offering it to the private sector.

Municipalities across Canada are increasingly relying on "higher order" transit systems to create more livable communities. Rail transit is gaining in profile and popularity, along with bus-based transit priority systems and dedicated busways. Ultimately, rail transit's capacity, efficiency, comfort, environmental benefits and potential to shape sustainable urban development will ensure its continued popularity among Canadian communities and transit users.

The Canadian Urban Transit Association (CUTA) is the voice of Canada's public transit industry. For additional information including research reports, industry updates, news bulletins and more, please contact us or visit our website.



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