Current Light Rail Developments in North America

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The term "light rail transit" (LRT) means different things to different people. Unlike the various monorails and "people movers," LRT is not a proprietary mode with a clearly spelled out design patent. Hence, the range of meanings. This paper provides a "snapshot" of the current status of light rail projects in North America. It is purposefully broad in its approach and includes systems with the most sophisticated technological advances. At the same time, it acknowledges that LRT's historical roots lie in the rural tramways and light railways of 19th-century Britain and other European countries as well as urban streetcar networks on both sides of the Atlantic. These systems were characterized by simpler infrastructure than that found with conventional railways. Rolling stock was capable of easy operation in or alongside city streets and, when on its own right-of-way, could cope with sharp curves and gradients and lightweight structures. The notion that the "light" in light rail transit refers to infrastructure is the definitional principle used in this paper. It is this element, and the corresponding wide variety of options available to the designers, that offers North American cities the promise of cost-effective rail transit.

WHY LIGHT RAIL?

The North American economy has been going through an extended period of structural change as the natural resources sector has increased in stature, as new technologies have overtaken the old in manufacturing, and as the professional or "information" services sector (e.g., finance, marketing, research, media, head offices) has expanded rapidly.

The growth in professional services is significant because (a) these activities tend to cluster and (b) there is a strong desire for an attractive environment. These two elements can be viewed as providing an impetus for new investment in downtown areas, which generally offer the best clustering possibilities in an urban area and which usually possess an abundance of interesting architecture and natural features laid out in a fashion amenable to walking.

These are all conditions well suited to LRT. Increased clustering poses a demand for higher capacity transport, and service quality is important to those working in the information sector. LRT can be designed to fit gently into a downtown setting without taking much land or throwing up barriers. Indeed, it can become a feature of landscape design in its own right, setting a special tone for a city.

Not all growing downtown areas will elect to invest in light rail and not all places that install LRT will have a rapidly growing information sector, but the three areas in which light rail can deliver so well (low-cost capacity, service quality, environmental appeal) are assuming an increased importance in any decision to invest as well as in subsequent design activities. Decision makers react not only to the benefits that can be provided by a transport facility or service but also to cost. Here LRT can perform especially well because design standards can vary from the simplest to the most elaborate, depending on the traffic to be handled, preferences of the designers, and capital and operating cost trade-offs. Furthermore, as techniques are relearned in this once-forgotten mode and as technology is transferred from elsewhere, the opportunities for cost reduction improve.

Physical characteristics of a mode provide the fundamental definition of how well it should perform in a given situation, but institutional factors will mask or enhance the results. Aside from such considerations as the operating efficiency of the proposed carrier, there are more subtle human factors at work:

- Confusion about how to treat infrastructure costs has caused more than one study to assume that buses have no infrastructure cost but to fully charge an LRT alternative for its track;
- A transit authority that operates solely buses will find itself with a built-in lobby among its operating and maintenance professionals to remain with that mode; and
- Engineers who are used to designing freeways may tend to propose LRT lines with an extensive amount of structures and "high" geometric standards whether the specifics of the application make such approaches essential or not (why incur the expense of articulated cars capable of operating on steep grades and on sharp curves if the infrastructure is designed with a maximum gradient of 2 percent and with 1,000-ft curves?).

New approaches to financing systems are appearing as well as technological advances. An increasingly popular technique is to obtain a contribution from the private sector for a section of line or a specific facility. Dallas had a piece of right-of-way offered by business people for an LRT network. Edmonton has had a developer contribute to the cost of extending its Northeast line from Belvedere to Clareview. Orlando, Florida (which ultimately changed from LRT to guided rubber-tire technology), has received private money to build its first section of line.

CURRENT DEVELOPMENTS IN LIGHT RAIL

This section deals with present-day developments in urban LRT systems in the United States and Canada. Information was obtained from a survey of 46 transit properties and planning authorities conducted in early 1985, supplemented as appropriate from other sources. The population surveyed was compiled from a list provided by the American Public Transit Association (APTA) of organizations involved in LRT. The data are generally effective March 31, 1985, and describe new lines, extensions, and renovations to lines or cars (rebuilding or replacement). Information is also provided on the status of the activity: planning, design and construction, and recently inaugurated service. Only additions to, or improvements of, systems are included; data on preexisting situations are not discussed.

At the time of the survey, some jurisdictions were in the midst of preliminary studies comparing light rail with other possible public transport improvements. Examples include Austin, Texas; Oklahoma City, Oklahoma; and Contra Costa County, California. Others have proceeded beyond this initial stage and information about them is given in the tables. These jurisdictions are doing detailed planning; have proceeded to design and construction; or have recently opened a new line, an extension, or a renovated line.

Western United States

Portland, Sacramento, Santa Clara, Los Angeles, San Francisco, and San Diego have under design or construction new lines or extensions (Table 1).

In 1986 Portland will open a 15-mile line that will run east of the central business district to the suburb of Gresham. It features downtown street trackage; shared right-of-way with a reconstructed freeway; a reserved section in an arterial street; and, at the outer end, the use of the independent alignment of a former interurban electric line. Twenty-six new cars have been acquired from Bombardier and, in addition, some historic cars will be used to augment headways on the inner portion of the line (Lloyd Center to downtown).

Sacramento is beginning with a two-line system that totals 18.3 miles in length. Due to open in late 1986 or early 1987, it features a downtown transit mall on K Street. Twenty-six Duewag type U2 cars are on order from Siemens-Allis.

Santa Clara County has a 21-mile system under construction; this system will link San Jose with other cities in the "Silicon Valley" area of the San Francisco Bay Area peninsula. Phase 1 is expected to be completed by late 1987, and the entire line, including a downtown transit mall, is to be ready for customers by September 1988. On a portion of the downtown San Jose trackage vintage trams will be operated as a central business district shuttle. Fifty six-axle cars are being acquired from the Urban Transportation Development Corporation (UTDC), Ltd., in Ontario. The expected cost of the system, in 1985 dollars, is $414 million. Possible extensions are being studied, including one running northeast to link the Santa Clara system with Bay Area Rapid Transit (BART).

Los Angeles is implementing a 17-mile LRT line in the median of the crosstown Century freeway with a 2-mile extension beyond to the high technology employment area of El Segundo. Design work is now under way for portions of the line and the 22 cars involved are expected to begin operation in 7 or 8 years. A second line, Los Angeles to Long Beach, is described in the section on interurbans.

San Francisco has a number of improvements and extensions planned or about to proceed:

- Extension of the "J Church" LRT line by 2.3 miles of street running in the Mission District (construction funds to be expended next year);
- Underground turnaround at the Embarcadero station to improve capacity and reliability (about to enter environmental impact statement and final design stage);
- Two miles of new track to link the Embarcadero station with the Southern Pacific depot and the 195-acre Mission Bay urban development will operate primarily on the surface with four stops (planning);
- Market Street to Fisherman's Wharf via Embarcadero streetcar line, using a mix of PCCs, Melbourne semiopen-type cars, and historic trams (planning).

TABLE 1 LRT in the Western United States

City	Planning	Design and Construction	Recently Inaugurated	Renewal of Line	Renewal of Cars	New Line or Extension	Miles	No. of Lines	Cars	Cost ($ millions)	Remarks
San Francisco		X				X	2.3	1			J extension. Embarcadero subterranean loop is about to enter final design
	X					X	2	1			Ferry Building to SP depot
	X					X					Market to Fisherman's Wharf via Embarcadero
Sacramento		X				X	18.3	2	26	131.0	Opens late 1986 or early 1987
Denver	X					X	10	1			Fixed guideway plus busway
Kansas City	X					X	20	2			
Houston	X					X	75	5	296	3,700	
Seattle		X				X	1.3				Facility is a trolleybus tunnel convertible to LRT
Seattle waterfront		X				X	2		2		Extension opens 1987
San Diego		X				X	4.5				Euclid line
	X					X		2			Two new lines plus extension of Euclid
Portland		X				X	15	1	26	310	Opens September 1986
Santa Clara		X				X	20	1	50	414	
LA "Century"		X				X	17		22	133[a]	Due to open with freeway in 1992-1993
Dallas	X					X	160		523	3,583[a]	
Minneapolis	X					X	10	1			Would include stubs of two other corridor lines
St. Louis	X					X	18.6	1	30		

[a] 1985 dollars.

San Diego is enjoying the success of its first line, opened in 1981, south to San Ysidro and the Mexican border. It is currently building to Euclid, the first 4.5-mile stage of its eastern line. Street running and railway rights-of-way figure in this route that will ultimately extend to El Cajon. Planning work has identified two other corridors.

Seattle has completed analysis work for a trolleybus subway that can be converted at a later time to LRT. It also has plans to extend its present waterfront streetcar line to increase riding potential, reaching the Space Needle to the north and the King Dome and the Amtrak station to the south.

Denver, Kansas City, St. Louis, Houston, Dallas, and Minneapolis are all actively planning LRT. Denver, Houston, and Dallas have geographically comprehensive plans that include a mixture of LRT and busways.

Denver has produced a plan providing for an extensive network of busways plus a single, close-in "guideway transit" line.

Houston has evaluated a number of busway and LRT combinations. Public comment thus far has favored an option with a central light rail loop plus key radial lines that total 75 miles. Bus infrastructure would also be built.

Dallas envisions completion of a 160-mile network of LRT by the year 2010 at a capital cost of $3,583 million (1982 dollars). An eventual fleet of 523 is thought to be needed. In concert with the light rail program will be a restructuring of the bus system along timed-transfer focal point principles. The resulting metropolitan cobweb of routes will have 21 major transfer nodes.

Kansas City, St. Louis, and Minneapolis (with St. Paul) are focusing on specific corridors and have both urban development and traffic issues in mind. Both Kansas City and St. Louis plan to make use of redundant railway facilities. Rapid downtown growth has been a factor prompting consideration of LRT in two of the three cities, and a desire for same has fueled interest in the third.

The Minneapolis-St. Paul Regional Transit Board has identified three significant travel corridors for LRT and has selected the University Avenue alignment as its priority for action. This was the region's major transit spine in the days of streetcars because it links the downtowns of the two principal cities. The line would be 10 miles long, including two short sections of other corridors out of downtown Minneapolis, which would have through-worked services to St. Paul.

Kansas City has recently begun an alignment study for two LRT corridors each 10 miles long and parallel to each other. One is located within a proposed freeway and the other employs, in part, a right-of-way from the days of the Country Club Plaza car line.

St. Louis has identified for early action an 18.6-mile line that would link the Lambert-St. Louis International Airport, the McDonnell-Douglas Corporation, the University of Missouri, the Washington University Medical Center, downtown St. Louis, and (across the Mississippi River) East St. Louis.

Eastern United States

Renovation has been more of a factor east of the Mississippi than in the West (Table 2). Philadelphia has replaced the bulk of its rolling stock in one 112-car order from Kawasaki (plus 29 cars for suburban "Red Arrow" lines), but it is proceeding stepwise with other refurbishing. New stops have just been opened and several LRT subway stations are being reconstructed.

Pittsburgh's 10.5-mile project encompasses almost half of the system's 22-mile LRT network and includes a new downtown subway, a tunnel in suburban Mount Lebanon, a new maintenance facility, and a general rehabilitation of surface track. Fifty-five new six-axle LRTs have been acquired from Siemens-Duewag and a program of major reconstruction of 45 PCCs is under way.

Cleveland has completed its renovation of the Shaker Heights LRT line, including new track and power distribution, revised stations, and 48 new Breda articulated light rail vehicles. These cars are similar to the Tokyu high platform cars delivered for the former Cleveland Transit System "rapid." Both types are maintained in the same facility and can be coupled for push-tow capability. A proposal is currently under consideration for development of the Van Aken terminus site, which would involve a 20-story building and an automobile parking structure.

Newark has a 4.3-mile system, built partly in subway, partly in cut, and partly on its own surface alignment. A $20-million rehabilitation has involved

TABLE 2 LRT in the Eastern United States

City	Planning	Design and Construction	Recently Inaugurated	Renewal of Line	Renewal of Cars	New Line or Extension	Miles	No. of Lines	Cars	Cost ($ millions)	Remarks
Columbus	X					X	10.6	1	22	132	
Buffalo			X			X	4.8	1	27		Opening May 1985
Cleveland			X	X	X		(+1.2)				New car shops open. Station site development at Van Aken proposed
New Jersey (Hudson River across from Manhattan)	X					X					Rights-of-way being protected for busway and LRT
Newark			X	X	X		4.3		30	22	
Philadelphia			X		X				112		New car shop at Woodland under construction; new cars received 1982; station renewal under way
Pittsburgh	X			X	X		10.5	4	55 (+45 rehab)	559	July 1985 downtown subway opens; 1986 full renovated system opens
Boston	X			X			8 (+28)		50		
Detroit	X										Also has line in downtown with historic cars
New York	X							1			Crosstown 42nd Street

station refurbishing, reconstruction of the track structure, and overhead current distribution. The fleet of 24 PCCs has been put into mint condition, and ceramic tile murals in the stations have been restored. The downtown terminus and maintenance facility is beneath the restored Penn Station, an intercity rail and bus facility.

LRT activity in New Jersey is not limited to Newark. On the western shore of the Hudson River opposite Manhattan there is considerable developer interest in urban rejuvenation. This in turn is prompting consideration of LRT and busways with the associated protection of rights-of-way.

In New York City a proposal for a surface car line on 42nd street is receiving considerable public discussion because of its value both as a quality transport service and as a stimulus to renewal of this historically significant street. The Hudson River terminus of such a line is viewed as a possible docking area for a proposed ferry to New Jersey.

In Boston 50 new light rail vehicles, with chopper DC controls by Westinghouse, are on order from Kinki-Sharyo. A number of extensions to existing LRT lines plus one long interurban route are planned as shown in the following table.

Route	Length (miles)
Lechmere-Medford	3.5
Dudley Square-Downtown Boston	2.2
Green line extension to Watertown	2.3

None of the mileage is currently under construction. The question of finance is still being pursued.

Buffalo provides the one eastern example of a new-from-the-ground-up offering. Opening this year, it operates in subway through residential areas and in the suburbs. In the central business district it operates on a transit mall using 27 four-axle LRVs manufactured by Tokyu Car in concert with Westinghouse. An interesting feature is the use of the former Lackawanna railway station as the new LRT maintenance base.

In Columbus a 10.6-mile line in the city and county North Corridor is under study. The expected capital cost would be $159 million for an alignment between two major railroads and a downtown transit mall.

Canada

There are LRT activities in five Canadian cities (Table 3).

Calgary has just opened its second line, to the northeast, and plans to open its third line, to the northwest, in the autumn of 1987. Ridership on the initial line, opened in 1981, is running at about 40,000 per day. The system has its downtown spine entirely on-street, making Calgary the first city on the continent to break the decades-long taboo against building street track for new systems.

Edmonton, the first North American city in postwar years to build a new LRT system from the ground up, has begun soil testing on its south LRT route that runs from the central business district across the North Saskatchewan River valley to the University (1990) and the University Farm (1992). Because most of the line is in a bored subway, staging of investment has resulted in a single-track line except at stations and on the surface or bridges.

Vancouver has nearly finished work on its 13.8-mile rail transit line and has already announced a 4.4-mile extension. Some observers believe that the system's use of a linear induction motor, with the consequent inability to run in a street setting, places it outside of the LRT field. Others disagree. However, as a public transport system it is more like LRT than any other category and thus is included here.

Because it is entirely grade separated and equipped with full automatic train operation, the Vancouver rail transit line offered interesting opportunities for a complete overhaul of operating practice. In place of a driver, each train in the base and evening period has a crew member who is qualified to

- Manually operate the train (the first trip out is to be manually driven);
- Provide information (and passive security) while walking through the train;
- Check fare receipts (self-service fare); and
- Make simple repairs (stuck doors, jammed fare machines, and the like).

During peak periods when extra trains are added, these operating personnel would work two or three trains on a rotating basis. The line is scheduled to open in time for Expo '86 in Vancouver.

TABLE 3 LRT in Canada

City	Planning	Design and Construction	Recently Inaugurated	Renewal of Line	Renewal of Cars	New Line or Extension	Miles	No. of Lines	Cars	Cost ($ millions)	Remarks
Calgary		X	X			X	6.2 (+3.4)	2		218 (+105)	First line opened 1981; northeast line opened 27 April 1985; northwest line (parentheses) opens fall 1987
Edmonton		X				X	2.5		37 (on hand)	173	Completion to university farm expected by 1992; dollars shown are for single-track subway
Vancouver		X				X	13.8 (+4.4)		114		Linear induction motor; fully grade separated; 4-axle cars; 4.4 additional miles approved
Toronto											
Scarborough			X				4		24		Studies are under way of possible busways, LRT, or conventional subway on 3 alignments; Scarborough line uses linear induction
Waterfront (and Spadina)	X						3.5				
					X				52		
Montreal	X						10				50% surface, 50% subway

Toronto had its inaugural run of its Scarborough rail transit line in March of 1985. Although it uses the same technology as the Vancouver system, conventional operating practice was retained. A driver is in charge of each train. The Toronto Transit Commission has plans for an at-grade LRT line to link the area around Union Station with the rapidly developing waterfront. This line would run westerly about 1 mile to Spadina and, in time, be extended north as a streetcar on Spadina Avenue to connect with the Bloor-Danforth subway line. This line has yet to receive Metro Council funding. Three other corridors are being studied for busway, LRT, or regular subway:

- Eglinton Avenue west of the Spadina subway line,
- East-west lines on a Sheppard-Finch or hydro right-of-way connecting with the Yonge subway and an extended Spadina subway, and
- A north-south downtown relief line located east of the Yonge subway.

At present, Toronto has 52 articulated LRVs on order from UTDC-Canadian Car for fleet upgrading and has an option to buy 12 more.

Montreal is well known for its breakthroughs in station design in the mid-1960s on its metro, which proved that subways could be attractive places for people. The provincial government (which provides 100 percent financing for new systems) has undertaken a feasibility study for metro line 7 that has shown that a light rail approach would be the most feasible. This line is envisioned as having 14 stations along its 10-mile length, and it would operate half of its distance in subway and half on surface. Part of the line would serve a corridor that some years back had a Canadian National Railways commuter operation. Discussions are continuing with the Montreal Urban Community (local government) on this subject.

VARIATIONS ON A THEME

The foregoing discussion has devoted considerable time to the subject of modern electric LRT within cities. Action has also spread out onto a number of fronts and further elaborations are in the wings.

Historic Services

Some historic services exist because the character of the lines in question remained constant over many years. San Francisco's cable cars offer one such example, the St. Charles streetcar line in New Orleans another. Both are busy transit facilities and play an essential role in the cities that they serve. In other situations, historic car lines have been opened recently to serve a park or other place with a historic theme. Lowell, Calgary, and Edmonton offer examples. Finally, historic cars may be operated on existing lines as an attraction in themselves or on lines constructed for this purpose.

In Philadelphia, San Francisco, Toronto and (soon) Portland and San Jose, historic cars are operated in public service providing, for the most part, regular per capita service (in Toronto use is made of the extensive track network to operate a sightseeing route). As noted earlier, San Francisco plans a new line to Fisherman's Wharf using vintage equipment as well as PCCs.

The San Francisco cable cars and the St. Charles line in New Orleans are examples of long-standing regular services that have become historic landmarks in their own right, adding character and flair to an area. The cable cars are beyond the scope of this paper, but it is worth noting that New Orleans' line will be undergoing a revitalization of track, vehicles, and maintenance facilities. More than 21,000 passengers are carried each day on a fleet of 35 Thomas-built four-axle cars dating from 1922-1924 (22 are required for the morning peak). The line is 6.6 miles long, most of it in a reserved median.

In Seattle and Detroit streetcar lines have been established, tracks and all, purely for the pleasure that they bring to an urban area. Seattle's current transit plans include extensions to the waterfront trolley, Route 99, to enhance its value as a regular transit route. In Lowell, Massachusetts, the National Park Service has established a streetcar system as part of the historic revival of this New England industrial town.

In Edmonton and Calgary, restored wooden four-axle cars are used to provide access to major urban parks within which automobiles are not permitted. Edmonton has plans to construct a line from its current historic operation through a number of river valley parks into the downtown. The first section of this multiyear plan has been funded.

Diesel and Diesel-Electric Light Rail Vehicles

For some jurisdictions, the cost of electrification is a concern, especially for thinly trafficked stretches of line. The following two types of equipment lend themselves to such situations:

- Linke-Hoffman-Busch has developed a diesel-electric six-axle articulated light rail vehicle (LRV). Operating in the suburbs of Hamburg on the AKN line, and in Austria on the interurban Graz-Koflacherbahn, these cars are much like the six-axle electric cars currently running in the United States and Canada. They have a full set of standard transit DC propulsion and controls plus an under-floor diesel-electric generator. This permits either mixed mode operation or the ability to function now without wires and convert later at a low cost.
- Leyland is offering a two-axle diesel-hydraulic railbus derived from its British urban motorbus, the "Leyland National." Its low purchase price could make it attractive for certain LRT operations and it is currently touring North America, including a stint on the former interurban Youngstown and Southern.

An 18-mile diesel LRT line is being planned for Norfolk-Virginia Beach, Virginia. Rapid growth in the former as a destination combined with residential growth in the latter provides ample demand. A former electric interurban line that was converted to railbus (and ultimately became freight only) offers an attractive right-of-way. As mentioned in the interurban section, diesel LRT is being considered as an option to replace conventional commuter train service from Oyster Bay to Mineola on Long Island.

Interurbans

Light railway lines serving the countryside, and linking cities and towns, grew rapidly in extent during the latter half of the last century and the early decades of this century. In countries such as the United States, Canada, and the Federal Republic of Germany, these lines were either abandoned or absorbed into main-line railways. In Belgium and France, they have been organized into national systems (the Vicinal and Departmental systems, respectively), albeit with much retrenchment in mileage.

In countries such as Switzerland and Japan, many have been continuously upgraded and modernized and function today as high-quality, regional electric railways (the Bern-Solothurn and the Kinki-Nippon are examples).

In the United States, there are three such operations and plans to establish new services, some on corridors once served by interurbans and some as replacements for traditional commuter railways:

- The Chicago, South Shore and South Bend extends 90 miles between its named end points. East of Gary, Indiana, it is a low-frequency rural line, popular with middle class families in spite of a more frequent intercity bus service on freeways. As it approaches the commuter shed of Chicago, it takes on the character of a busy commuter line, although it still possesses a mixed-traffic street alignment through Michigan City. Delivery has been completed on an order of 44 cars, to replace prewar equipment.
- Also operating out of Chicago is the 5-mile inner portion of the former Chicago, North Shore and Milwaukee. Linking some northern suburbs of Chicago with that city's rapid transit system, the "Skokie Swift" uses 12 high platform cars, 4 of them articulated. A program is currently under way to replace these with married pairs, rebuilt from existing urban cars.
- A re-equipping program has also recently been completed on Philadelphia's suburban division ("Red Arrow Lines") of the Southeastern Pennsylvania Transit Authority. Twenty-nine double-ended cars provided by Kawasaki were supplied to the Media and Sharon Hill lines in 1981-1982. The high geometric standard Norristown line continues to use its 1934 "Bullet" high-speed cars.
- California's last interurban to carry passengers ended its service between Long Beach and Los Angeles in 1961. Current plans of the Los Angeles County Transportation Commission include reinauguration of this route using the original Pacific Electric right-of-way where available, as well as a new alignment in subway under Flower Street, to access the Los Angeles city center. Twenty-one miles in length, this line will require 32 six-axle cars to begin service, planned for 1989. The $595 million (1985 dollars) cost is being paid for from Proposition A funds, and the project is in the final design phase.
- The Massachusetts Bay Transportation Authority has plans for a 28-mile LRT line from the Boston South Station to Scituate. This route would serve the general territory of the Old Colony Line. Considerations to be dealt with before proceeding include the status of this interurban light rail line vis-a-vis traditional commuter rail.
- A study conducted by the Long Island Rail Road has recommended the replacement of diesel-hauled commuter trains with LRT on its 14.5-mile Oyster Bay-Mineola line. This is viewed as less expensive than continuing with the traditional railroad service; it also has the potential of increasing ridership to more than the present 5,700 per day. Also being studied is a connection of the Oyster Bay and West Hempstead branches using a light rail line that would operate through downtown Hempstead. Diesel LRT is thought to be a less costly technology for this line. Implementation by 1989 would be coordinated with New York State DOT's Mineola grade crossing elimination project, which would save $10 million. Successful operation is dependent on transfer of the service from a commuter railroad institution to one that functions under transit operating rules.
- In the San Francisco Bay Area the Metropolitan Transportation Commission is undertaking a study of options for the upgrading of the 45-mile San Francisco-San Jose commuter rail line. One of the three options is the conversion of the line to an interurban LRT type of service.

In Canada all of the one-time interurban lines have been abandoned or are used only for freight. An interesting breakthrough, however, is the program of Ontario's GO Transit to build altogether new interurban lines where none existed before. Known as "GO-ALRT," the network as planned will consist of four sections as shown in the following table.

Section	Length in km (miles)
Pickering-Oshawa	25 (15.6)
Oakville-Hamilton	34 (21.3)
Central Lakeshore (Oakville-downtown Toronto-Pickering)	68 (42.5)
Northern section (Oakville-Toronto-International Airport-Scarborough-Pickering)	100 (62.5)
Total	227 (141.9)

The total cost of the first two sections is $690 million and includes planning work on other sections. Maximum loads of 15,000 passengers per peak-hour direction are foreseen for the planning horizon year of 2021 on the Lakeshore section, and 17,000 passengers per peak-hour direction are forecast by GO Transit for the northern section. Trains are to be composed of eight-axle married pairs, capable of sustained running at 120 km/hr (75 mph), on steerable trucks. Line voltage is to be 25,000 volts AC, with 600 volts DC at the traction motor.

CONCLUSION

In the past decade light rail transit has grown rapidly as a mode of urban transport, both in terms of planning interest and in the number of jurisdictions making investments.

LRT, with its range of design standards, is ideally positioned with respect to the public transportation needs of communities in the economy of the future. Its mix of service quality, cost, and environmental and design opportunity make it suitable for a wide variety of applications between the automobile on one hand and "heavy" rapid transit on the other.