

NO LITTLE PLAN:

# Electrifying GO Transit

Greg Gormick



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**BY**

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# Dedication



*This report is dedicated  
to the memory of the late John Bruce McCullum,  
President of Transport 2000 Ontario (now Transport Action Ontario)  
from 1988 to 1992.*

*Visionary, ecologist, and sustainable transportation advocate.*

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## Foreword

As readers of this report will find, the electrification of GO Transit has a long history. Following the innovative establishment of GO's commuter rail service in 1967, electrification was studied seven times, most recently with the Metrolinx GO Electrification Study that was released on January 19, 2011.

All these studies identified many positive attributes to electrification. However, not one centimetre of electrified commuter rail infrastructure has to date been built. The situation today remains perplexing and frustrating. Despite identifying many positive features, the most recent Metrolinx study recommends what can only be described as a leisurely implementation of electrification on two corridors only.

As readers will also find, the GO Electrification Study and the Air Rail Link plan both contain assumptions and omissions that must be challenged. In our minds, the worst issue is the difference between the 2021 reference case used in the Electrification Study and the 2031 vision in the Metrolinx Regional Transportation Plan, better known as *The Big Move*. It includes high-frequency, day-long express rail service, similar to that provided by the impressive urban rail systems in European cities like Paris and Berlin. This can only be accomplished with electrification. But the study doesn't quantify the benefits, alternatives and costs to attain this vision, sticking only to the 2021 scenario of modest service increases. It also under-emphasizes the very likely ability of electrification to reduce the required scope of Union Station's capacity increase and the magnitude of the planned Yonge subway capacity expansion.

We commissioned this report, *No Little Plan: Electrifying GO Transit*, to prod the Government of Ontario to look at the longer term – the period from 2031 onward – and commit promptly to an accelerated, expanded electrification plan. Written by Greg Gormick, an experienced and visionary transportation commentator who has written extensively about the transformational potential of electrification, this report identifies the key next steps to maintain momentum. His exploration of worldwide electrification experience demonstrates the lengthy implementation plan can definitely be shortened.

The need for a European urban rail approach is even more intriguing as a result of recent events in the City of Toronto. With the cancellation of planned LRT lines and the reduced coverage provided by proposed subways, a "surface subway" concept using electrified GO integrated with other transit lines is an important cost-effective option to consider.

We urge decision makers to read this report carefully and start down the implementation path now. We are greatly concerned that another opportunity to transform GO and our region-wide public transit network – and thereby improve the economic, social and environmental health of the Greater Toronto and Hamilton Area – is once again slipping through our fingers.

Peter Miasek  
President  
Transport Action Ontario

Carina Cojeen and Rick Ciccarelli  
Co-Chairs  
Clean Train Coalition

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## Executive Summary

### Introduction

GO Transit was launched by the Government of Ontario in 1967 as North America's first new commuter rail service in decades. It was an immediate success. Today, it is difficult to imagine what the Greater Toronto and Hamilton Area (GTHA) would be without the GO system. And GO's success has inspired other cities. There are now 10 commuter rail systems in other North American cities that are carbon copies of GO.

But GO and the region are at a crossroads. GO is slated to play a key role in altering the commuting habits and land development patterns in the GTHA. Vastly expanded GO service with more trains on more lines and quicker schedules are among the cornerstones of the Metrolinx Regional Transportation Plan (RTP), better known as *The Big Move*. To do this, the current provincial government is going to have to commit to a decision as bold as the launch of GO in 1967. There is compelling evidence to suggest that the only way to achieve the provincial goals is to progressively and aggressively convert GO to clean, quiet and cost-effective electric operation. This is the course that other large and medium-sized urban regions have followed worldwide.

This report has been commissioned to encourage the Government of Ontario to commit fully to an accelerated electrification plan now, thus avoiding the ongoing penalties on the region's economy, environment, public health and long-term sustainability.

### 1.0 Rail Electrification's History of Excellence

Rail electrification in North America is not new technology. The first application on a main line railway was in 1895 in Baltimore. The first example of "taking wealth from the air" by exploiting development rights over electrified lines was achieved above New York's Park Avenue in 1906. The first use of self-propelled electric multiple unit (EMU) cars for fast, frequent commuter rail service was implemented in New York at the same time. The first electrification of a major intercity network was undertaken by the Pennsylvania Railroad (PRR) from New York to Washington and Harrisburg, Pennsylvania, in 1928.

All these installations proved four advantages of electrification: lower emissions and noise, tunnel operation without massive ventilation systems, its superiority in conquering steep grades and its ability to squeeze more capacity from the same track and station infrastructure.

After World War Two, rail electrification continued in Europe, but stalled in North America. The main reason was the perfection of diesel-electric locomotives, which use onboard diesel engines to power electric traction motors. This had some of the benefits of the electric locomotive and lower upfront capital costs compared to electrification. In the 1950s and '60s, some aging electric lines were scrapped, especially short tunnel operations, such as CN's St. Clair River Tunnel electrification at Sarnia, Ontario. These were replaced by diesel operations with new ventilation systems to clear the tunnels of fumes.

But one major railway maintained its commitment to electric traction. On the PRR, studies concluded diesels still couldn't compete with electric operation. The result was renewal of the fleet with new EMUs for commuter service and high-horsepower electric locomotives for freight.

In the early 1970s, as a result of the OPEC oil crisis, several North American railways re-examined electrification, including Canadian Pacific. But once the OPEC crisis passed, oil prices stabilized and the rail industry returned to its pro-diesel stance.



Today, North America has re-awakened to electrification's potential. Part of this renewed interest revolves around the spate of high-speed rail projects now proposed in the U.S. Also, faced with automobile-fed urban sprawl, rising energy costs, uncertain future oil supplies and continued environmental degradation, there is a growing public call for the expanded rail electrification. There are currently 19 commuter rail electrification projects and proposals under way in North America.

## 2.0 GO Electrification Studies: 1980-2001

The benefits and the means of electrifying GO have been studied on numerous occasions in the past. Each of the previous studies contains data still relevant to the issue today.

The first series of studies was carried out in 1980-1982 and concluded, *"The province should prepare for future change by completing current planning studies and carrying out detailed design of financial implementation studies needed to validate and implement electrification of the Lakeshore portion of the GO Transit commuter rail network."*

A detailed implementation plan followed. However, the plan was derailed by the Province's insistence that GO use the unproven, made-in-Ontario Advanced Light Rail Transit (ALRT) technology. By the time it was determined that the cost of ALRT was excessive, the momentum for electrification had been lost.

In 1992, another comprehensive study clearly spelled out the virtues of electric traction. Electric multiple units (EMUs) vis-à-vis electric locomotives received serious study. It was concluded it was not possible to convert GO's non-powered bi-levels to self-propelled EMU operation, as there was little under-floor space for traction equipment. It was suggested that new motorized driving cars could be paired up one-for-one with the existing bi-levels. The study team recommended the preferred traction power system to be +/-25,000 volts AC (now known as 2x25 kV). The report also dealt extensively with emissions and noise, demonstrating that electrification would result in significant reductions in both types of pollutants.

Exhaustive though it was, nothing came of the 1992 study, even though the government of Premier Bob Rae was philosophically supportive. The global economy had receded and there were no provincial funds available to move forward.

The GO electrification issue slumbered until 2001, when an opportunity arose to purchase surplus electric locomotives from Mexico. A study confirmed the incremental capital and operating costs for electrification from 2004 to 2021 would be less than \$100 million. This did not account for the significant health, environmental and ridership benefits. Although GO electrification had never been more affordable, the government of Premier Mike Harris did not act.

## 3.0 Enter Metrolinx

Metrolinx is the provincial government agency established in 2003 to plan and coordinate transportation within the Greater Toronto and Hamilton Area (GTHA). A takeover of provincially-owned GO Transit was later added to its mandate.

In 2007, prior to release of the Metrolinx Regional Transportation Plan, *The Big Move*, the Premier released his Move2020 plan, an \$11.5 billion commitment to 52 priority transit projects in the GTHA, including *"increasing speed and reducing emissions by electrifying the GO Lakeshore line and expanding capacity on all GO lines"*.

The government's endorsement of electrification escalated in 2008 with its acceptance of *The Big Move*. Express rail, defined as *"high speed trains, typically electric, serving primarily long-distance regional trips with two-way all-day service"*, was a cornerstone of the plan. *The Big Move* proposed express rail on GO's Lakeshore and Brampton lines within 15 years and on the Milton and Richmond Hill lines within 25 years. Additional express rail service was identified for beyond the 25-year planning horizon.

The inspiration for this program was provided by the electrified, high-frequency urban rail systems of Western Europe, such as the Paris RER and the German S-Bahnen, which are much like high-capacity surface subway systems serving suburban and inner-urban passengers.

Metrolinx then commissioned a follow-up study for the Lakeshore. Electrification of the full line was pegged at \$4 billion, including contingency. This large price tag seemed to discourage Metrolinx and electrification started to fade away once again.

Electrification was revived soon thereafter as a result of the Air Rail Link (ARL) project. Conceived as a diesel multiple unit (DMU) service, it would operate up to 150 trains between Union Station and Pearson International Airport daily. Added to the expansion plans of GO and VIA Rail, this would result in more than 400 diesel trains passing through well-developed neighbourhoods daily. In 2005, the Weston Community Coalition addressed the issue and then spearheaded the 2009 formation of the Clean Train Coalition (CTC). Composed of residents' associations along the line, the CTC dedicated itself to presenting citizen concerns and advocating improvements, including electrification. The urgency increased when the diesel-powered ARL was attached to Toronto's bid for the Pan Am Games, to be held July 10-26, 2015.

In May, 2009, under pressure from the CTC, local politicians and MPPs, the McGuinty government announced it would undertake a \$4 million "comprehensive review" of GO electrification.

## 4.0 The Metrolinx GO Electrification Study

The 1,705-page GO Electrification Study Final Report was released January 19, 2011. Observers were pleasantly surprised that a phased electrification plan was recommended for the ARL/Georgetown and Lakeshore corridors, with the former as the first priority. The two-route plan was approved unanimously by the Metrolinx directors one week later and, within minutes of the board's decision, Minister of Transportation Kathleen Wynne announced the initiation of the Environmental Assessment process.

The decision was based on a combination of journey time savings, operating and maintenance cost savings, anticipated future ridership growth and electrification's contribution to the long term goals of *The Big Move*.

The estimated cost was \$1.6-1.8 billion. It was recommended that the implementation be phased in over 21-24 years. This time line struck many as extremely slow when compared with the implementation schedules of other railways around the world.

CORRIDOR SEGMENT	COMPLETION
Union Station-PIA and Willowbrook (EA and Design)	2011-2015
Union Station-PIA and Willowbrook (Construction)	2018-2020
Airport Spur Junction-Brampton Mount Pleasant	2020-2022
Union Station-Oshawa	2024-2026
Willowbrook-Oakville	2026-2028
Oakville-Hamilton James Street	2028-2030
Oshawa-Bowmanville	2030-2032
Brampton Mount Pleasant-Kitchener	2032-2035

Perhaps the most useful revelation in the report concerned the cost of GO electrification. The estimated cost to electrify the full GO system was \$3.7-4.2 billion, much lower than previous estimates.

Although the report was generally positive, there were a number of contradictions, false assumptions and omissions that still need to be challenged:

1. The Reference Case selected was GO's 2021 benchmark consisting of a limited amount of service expansion using diesel-hauled bi-level trains of 10-12 cars, except for the ARL which assumed single-level diesel-motorized units. The result is that electrification was assessed against a case that falls far short of what was envisioned in *The Big Move*, which contemplated high-frequency, all-day service in both directions on all routes. This results in a report that views electrification as far less of a system development tool that it should be.
2. Tier 4 diesel motive power was assumed to be available and it was against this form of traction that electrification was compared. Tier 4 aims to significantly reduce particulate and nitrogen oxide emissions versus today's diesel engines. However, no manufacturer has yet produced a commercially viable Tier 4 diesel.
3. The equipment selected was electric locomotives rather than EMUs, largely because the study concluded EMUs would have higher total costs over the 30-year life cycle. However, many senior railroaders feel these costs were overstated, especially in view of the superior performance of EMUs. A bi-level EMU strategy should have been studied in detail. For example, the 1992 GO Electrification Study found the design of existing bi-levels could be adapted to create bi-level EMU power cars capable of hauling existing GO bi-level coaches.
4. Health, environmental, social and community benefits were undervalued. The study claimed these benefits are small. To make this case stick, Metrolinx reported the benefits in the context of GO's anticipated emissions on a regional basis, not directly on the affected corridors. This contradicts the opinion of Toronto's Medical Officer of Health.

The beneficial economic impact of electrification is substantial. Using accepted industry multipliers, it is estimated electrification of the ARL/Georgetown and Lakeshore corridors would generate \$5-7 billion in economic benefits. Electrification of the full GO system would generate \$11-17 billion. Much of this activity would occur in Ontario.

It is difficult to fathom how electrification of two GO corridors could possibly require the 21-24 years proposed by Metrolinx. There are numerous techniques and technologies around the world to make it happen quicker and without unduly disrupting existing rail traffic. Metrolinx must be encouraged to study this issue in much greater detail and move in concert with other planned infrastructure investments.

The most controversial aspect of the report was the recommendation to proceed with the ARL as a diesel service to be completed in time for the two-week Pan Am Games in July, 2015, with future conversion of the units to EMUs. If the approved plan is followed, the ARL will be electrified by 2018-2020 and some further reduction in the level of diesel-powered GO service on the Georgetown Corridor will occur by 2020-2022. The complete elimination of diesel-based service on the line will not occur until 2032-2035.

It has become clear that the 2015 start-up of the ARL as a diesel-powered service is a "done deal". The contract with Japan's Sumitomo for 12 diesel multiple unit (DMU) rail cars was signed on March 29, 2011.

Still, many issues and concerns remain:

- There is doubt the passenger volumes and automobile trip replacements predicted for the ARL will materialize.
- With its low projected ridership, the diesel-powered ARL may actually increase fuel consumption and emissions vis-à-vis the automotive trips it will allegedly replace.
- The future conversion of the DMUs to EMUs is risky and highly unlikely.
- The ability of the Sumitomo DMUs to meet Tier 4 emission standards is unknown.
- The final price for the Sumitomo DMUs is surprisingly high when compared to the price paid by the Sonoma-Marín Area Rail Transit District.

- The addition of more station stops should be explored in the context of using the large investment in the ARL as a springboard for a high-frequency urban rail service.
- GO's questionable decision to spend \$400 million to build a fourth track on the Weston Subdivision to protect for the construction of electrification infrastructure after ARL diesel service begins requires further investigation and justification.
- Delaying the ARL until electric service can be launched from the start ("do it once, do it right") would avoid this \$400 million expenditure. Other green transportation alternatives can be put in place for the two-week Pan Am Games.

## 5.0 Conclusions and Recommendations

Despite initiation of the Environmental Assessment process, the fight for GO electrification has not yet been won. As with many other Ontario transit programs that were supposedly assured, there has been far too much talk and too little action.

If GO electrification is to be implemented as promised, there are measures that need to be taken soon:

- **Accelerated and Expanded Electrification Program:** The leisurely timelines must and can be accelerated. The scope of the lines to be converted can be increased.
- **International Peer Input:** This will advance the implementation in the most expeditious and cost-effective manner possible.
- **Freight Railway Consultation:** Most of the track for the approved plan is owned by freight railways. The involvement and approval of these railways is critical to successful implementation.
- **European Urban Rail Concept:** In *The Big Move*, a vision was presented that transformed GO into a higher speed, higher frequency urban rail service. Electrification is critical to such a plan, along with high-performance EMUs, full fare integration and numerous physical connections with other transit lines. Some have termed this a "surface subway" or "overground" system.

The implementation of an urban rail strategy should be accelerated within the City of Toronto. With the cancellation of Toronto's Transit City LRT plan and the reduced coverage to be provided by the proposed subway alternatives, a fully-integrated GO rail system providing subway-like service on existing and re-aligned rights-of-way is an attractive option. A failure to embark on such a project will only condemn the GTHA to more gridlock, lost productivity, environmental degradation, excessive automobile dependency and a loss of global competitiveness.

- **Public Scrutiny and Oversight:** GO electrification only became an issue because of public scrutiny and advocacy. If electrification is to be implemented as promised by the current government, and even expanded, then the public will need to keep up the campaign. And if the government is sincere in its stated desire to involve citizens in this process, it should maintain and strengthen the stakeholder workshop process that was in place throughout the one-year GO Electrification Study. Few of the public recommendations made in those sessions were investigated, let alone incorporated into the final plan.