

This document summarizes recent updates to the TransLink **LOW CARBON FLEET TRANSITION PLAN**, aggressive investment option, which was published in February 2020.

The broad outline of TransLink's original Low Carbon Fleet Strategy (LCFS) plan has not changed, however, there has been a change in the sequencing of depots where battery-electric buses are deployed and cost assumption updates based on new information. This re-sequencing does not alter continuing with the aggressive electrification plan endorsed by TransLink's Board of Directors and Mayors' Council. The update also continues to realize the greenhouse gas (GHG) reductions supported by the aggressive electrification pathway.

LCFS UPDATES

The update to the LCFS plan, as summarized in this document, demonstrates a re-ordering of the initial electrification investments, to accommodate the opening of Marpole Transit Centre (MTC) occurring in 2024 instead of the original scheduled 2023. Under the original plan, the following sequencing was detailed:

- Electric buses delivered from 2023 through to 2025 were to be assigned to MTC.
- A small number of buses delivered in 2024 and all buses purchased for delivery in 2025 were to be assigned to Port Coquitlam Transit Centre (PTC).
- Electric buses delivered from 2026 through 2029 were to be assigned to Burnaby Transit Centre (BTC).

Under the revised plan:

- Buses delivered in 2023 will be assigned to PTC, which will require the investments to install in-route chargers in the PTC service area to be advanced by several years.
- Most of the battery-electric buses purchased to be delivered in 2024 and 2025 will then be assigned to MTC after it opens.
- Bus purchases and depot assignments for the remaining years of the plan will stay as originally proposed (a combination of PTC and BTC)

What remains the same between the original and the update?

- Between 2021 and 2029 TransLink will purchase only battery-electric buses to replace retiring 40-ft and 60-ft diesel and hybrid-electric buses¹.
- By 2031 Route 100 and approximately 95% of routes operating from PTC will be electrified, using battery buses with in-route charging. In addition, the new MTC will open as a 100% electric capable depot, and BTC will be converted and expanded for 100% electric operation.
- By 2031, 100% of routes operating from MTC and approximately 90% of routes operating from BTC will be electrified, using battery buses with depot charging.
- Almost a 45% GHG reduction will be realized by 2030 under the original and the updated LCFS plan.

¹ In 2021 TransLink will also purchase 50 new compressed natural gas (CNG) buses to replace retiring CNG buses. These buses will operate on low-carbon renewable natural gas (RNG).

LCFS cost updates and rollout details

This update also reflects a technical adjustment to the number of buses to be replaced in the last year of the plan², and updated cost assumptions based on newly available information. The most significant cost update is an increase in the projected purchase price of in-route charged battery buses, based on updated information. Projected future fuel, labour, and maintenance cost inflation assumptions were also updated based on current conditions (post-COVID), consistent with the TransLink financial plan. Finally, estimated increased labour hours to accommodate in-route charging were adjusted downward based on an updated analysis of the recovery time available for charging in current bus schedules.

Updated inflation and charging labour assumptions do not affect the magnitude or timing of capital investments required to implement the LCFS but do affect estimated annual cost savings relative to the continued replacement of retiring buses with hybrid buses (base case).

See Table 1 and 2 for updated electric bus purchases compared to the original LCFS, and Table 3 and 4 for updated Depot and Charging Investments compared to the original LCFS.

Table 1 Electric Bus Purchases –LCFS UPDATE

Length	Charging Type	Award Year										TOTAL
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	
40-ft	Depot			145	79	153			20		52	449
	In-route	15	57			64						136
	<i>Subtotal</i>	15	57	145	79	217			20			585
60-ft	Depot			18		45			29			92
	In-route											
	<i>Subtotal</i>			18		45			29			92
TOTAL		15	57	163	79	262			49		52	677
INCR COST (nom \$ mill)		NA ¹	\$12.8	\$61.9	\$28.9	\$92.6			\$21.7		\$19	\$236.9

¹ These buses were funded under the current capital program

Table 2 Electric Bus Purchases – LCFS Original

Length	Charging Type	Award Year										TOTAL
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	
40-ft	Depot		66	138	36	127			20		20	407
	In-route	15		7	43	71						136
	<i>Subtotal</i>	15	66	145	79	198			20		20	543
60-ft	Depot			18		45			29			92
	In-route											
	<i>Subtotal</i>			18		45			29			92

² The number of 40-ft diesel and hybrid buses to be replaced in 2031 (2029 purchase year) increased from 17 to 45.

TOTAL	15	66	163	79	258			49		20	635
INCR COST (nom \$ mill)		\$24.1	\$59.6	\$14.7	\$71.7			\$21.7		\$7.3	\$199.1

Table 3 Depot and Charging Investments – LCFS UPDATE

Purpose	Location	Scope	Completion	Bus Numbers
In-route Charging	PTC service area	Install 8 in-route chargers	2023	115
	PTC	Install depot chargers and maintenance area upgrades	2024	
	PTC service area	Install 8 in-route chargers	2026	
Depot Charging	MTC	Make ready for full depot electrification; installation of 163 SAE J3105 chargers	2024	280
	MTC	Installation of 79 SAE J3105 chargers	2025	
	MTC	Installation of 38 SAE J3105 chargers	2025	
Depot Charging	BTC	Make ready for full depot electrification; installation of 127 SAE J3105 chargers	2026	267
	BTC	Depot expansion	2029	
	BTC	Installation of 140 SAE J3105 chargers	2029	
			Total Cost	\$246.4M

Table 4 Depot and Charging Investments –LCFS Original

Purpose	Location	Scope	Completion	Bus Numbers
Depot Charging	MTC	Make ready for full depot electrification; installation of 66 SAE J3105 chargers	2023	280
	MTC	Installation of 156 SAE J3105 chargers	2024	
	MTC	Installation of 58 SAE J3105 chargers	2025	
	Route 100	Install 1 in-route charger	2021	

In-route Charging	Routes 159, 169, 188	Install 3 in-route chargers	2024	136
	HTC, PTC	Install depot chargers and maintenance area upgrades	2025	
	PTC service area	Install 13 in-route chargers	2025	
Depot Charging	BTC	Make ready for full depot electrification; installation of 127 SAE J3105 chargers	2026	267
	BTC	Depot expansion	2029	
	BTC	Installation of 140 SAE J3105 chargers	2029	
TOTAL COST				\$248.4

Projected incremental bus purchase costs (compared to baseline) have increased by \$37.8 million (nom \$) due to both the purchase of additional replacement buses in 2029, and a projected increase in the cost of in-route charged buses. The original LCFS assumed that buses used for in-route charging could have smaller batteries than those used with depot charging. However, manufacturers bidding on the recent procurement of 15 battery-electric buses to be deployed on Route 100 only offered buses with larger, more expensive battery packs. While more expensive than originally anticipated, buses with larger battery packs will offer greater flexibility to move buses between depots in the future, greater resiliency in the event of grid or charger outages, and longer effective battery life.

Despite adding additional bus replacements in 2029, total charging infrastructure costs under the revised LCFS have not increased, because the original plan included the full deployment of chargers at BTC, despite the fact that the last buses to be deployed there were to be purchased in the first year of the next capital plan (2030).³ The originally planned charging investments at BTC are sufficient to handle the increased number of battery buses to be purchased under the revised plan.

See Table 5 for an updated estimate of incremental operating cost savings, based on revised inflation and in-route charging incremental labour assumptions.

Table 5 Projected Incremental Operating Costs –Aggressive Investment Option

Cost Type	million nominal \$											
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	TOTAL

³ Also note that costs associated with adding an in-route charger to support full electrification of Route 100 have been removed from Table 2, because this project has already been awarded.

Bus Maintenance	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.1	(\$2.0)	(\$3.9)	(\$4.0)	(4.0)	(\$4.5)	(\$18.5)
Charger Maintenance	\$0.0	\$0.0	\$0.0	\$0.0	\$0.1	\$0.4	\$0.6	\$1.4	\$1.4	\$1.4	\$1.5	\$6.9
Fuel	\$0.0	\$0.0	\$0.0	\$0.0	(\$1.5)	(\$5.8)	(\$9.0)	(\$17.3)	(\$17.9)	(\$18.3)	(\$20.4)	(\$90.0)
Bus operator Labor ¹	\$0.0	\$0.0	\$0.0	\$0.0	\$0.1	\$0.3	\$0.4	\$1.0	\$1.0	\$1.3	\$1.2	\$5.3
TOTAL	\$0.0	\$0.0	\$0.0	\$0.0	(\$1.2)	(\$4.9)	(\$9.9)	(\$18.9)	(\$19.5)	(\$19.6)	(\$22.1)	(\$96.3)

¹ Bus operator labour costs increase due to increased dead-head time (depot charging) and additional on-route lay-over time (in-route charging).

Estimated operating cost savings over the next 10 years (relative to the baseline) have fallen by \$28 million, primarily due to lower projected future diesel fuel costs.

Given the increase in battery size for in-route charges buses, and recent improvements in manufacturer battery warranty terms it is possible that mid-life battery replacements will not be required for in-route charged buses. If so, this will further increase net operating cost savings under the LCFS. For conservatism, these potential cost reductions were not included in this update, given that they would not occur until after 2028.