



# PUBLIC MEETING AGENDA

**Version:** September 17, 2018

**September 21, 2018, 9:00AM to 9:20AM**  
Metro Vancouver, Committee Room (Rm. 2816), Burnaby, B.C.

**Chair:** Mayor Derek Corrigan      **Vice-Chair:** Mayor Richard Walton

<b>9:00AM</b>	<b>1. PRELIMINARY MATTERS</b>	
	1.1. Call to order	
	1.2. Adoption of agenda .....	Page 1
	1.3. <a href="#">Approval of Minutes (July 26, 2018)</a> .....	2
<b>9:05AM</b>	<b>2. REPORT OF TRANSLINK MANAGEMENT</b>	
	2.1. <a href="#">Report on GHG Emissions Targets and Renewable Energy Goals</a> .....	7
	2.2. <a href="#">For information: Integrated North Shore Transportation Planning Project</a> .....	31
<b>9:20AM</b>	<b>3. OTHER BUSINESS</b>	
	3.1. Upcoming meetings:	
	• Mayors' Council:	November 15, 2018 at 9AM
	• Mayors' Council:	December 13, 2018 at 9AM
<b>9:20AM</b>	<b>4. ADJOURN to closed meeting</b>	

## MEETING OF THE MAYORS' COUNCIL ON REGIONAL TRANSPORTATION PUBLIC MEETING MINUTES

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Minutes of the Public Meeting of the Mayors' Council on Regional Transportation (Mayors' Council) held on Thursday, July 26, 2018 at 10:00 a.m. in Rooms 427/428, TransLink Offices, 287 Nelson's Court, New Westminster, BC.

### PRESENT:

Mayor Derek Corrigan, Burnaby, Chair  
Mayor Richard Walton, North Vancouver District, Vice-Chair  
Mayor Wayne Baldwin, White Rock  
Mayor John Becker, Pitt Meadows  
Mayor Malcolm Brodie, Richmond  
Mayor Karl Buhr, Lions Bay  
Mayor Mike Clay, Port Moody  
Mayor Jonathan Coté, New Westminster  
Mayor Ralph Drew, Belcarra  
Mayor Jack Froese, Langley Township  
Director Maria Harris, Electoral Area A

Mayor Linda Hepner, Surrey  
Councillor Craig Keating, North Vancouver City  
Mayor John McEwen, Anmore  
Mayor Greg Moore, Port Coquitlam  
Mayor Nicole Read, Maple Ridge (arrived 10:24 a.m. )  
Mayor Gregor Robertson, Vancouver (departed 11:15 a.m.)  
Mayor Ted Schaffer, Langley City  
Mayor Murray Skeels, Bowen Island  
Mayor Michael Smith, West Vancouver  
Mayor Richard Stewart, Coquitlam

### REGRETS:

Mayor Lois Jackson, Delta Q

Chief Bryce Williams, Tsawwassen First Nation

### ALSO PRESENT:

Mike Buda, Executive Director, Mayors' Council on Regional Transportation Secretariat  
Lorraine Cunningham, Chair, TransLink Board of Directors  
Geoff Cross, Vice-President, Transportation Planning and Policy, TransLink  
Kevin Desmond, Chief Executive Officer, TransLink  
Andrew McCurran, Director, Strategic Policy and Planning, TransLink

### PREPARATION OF MINUTES:

Rae Ratslef, Recording Secretary, Raincoast Ventures Ltd.

## 1. PRELIMINARY MATTERS

### 1.1 Call to Order

A quorum being present, the Chair called the meeting to order at 10:18 a.m.

### 1.2 Adoption of Agenda

*Draft Agenda for the July 26, 2018 Public Meeting of the Mayors' Council on Regional Transportation, version dated July 20, 2018, was provided with the agenda material.*

**It was MOVED and SECONDED**

That the Mayors' Council on Regional Transportation adopts the agenda for its Public meeting scheduled July 26, 2018, version dated July 20, 2018, with amendment to remove Item 4, Public Delegates.

**CARRIED**

**1.3 Approval of Minutes (April 20, 2018)**

*Draft Minutes of the April 20, 2018 Public Meeting of the Mayors' Council on Regional Transportation, was provided with the agenda material.*

**It was MOVED and SECONDED**

That the Mayors' Council on Regional Transportation adopts the minutes of its Public Meeting held April 20, 2018, as circulated.

**CARRIED**

**1.4 Approval of Joint Meeting Minutes (June 28, 2018)**

*Draft Minutes of the June 28, 2018 Joint Public meeting of the Mayors' Council on Regional Transportation with the TransLink Board of Directors, was provided with the distributed agenda material.*

**It was MOVED and SECONDED**

That the Mayors' Council on Regional Transportation adopts the minutes of its Joint Public meeting with the TransLink Board of Directors held June 28, 2018, as circulated.

**CARRIED**

**2. REPORT OF THE JOINT PLANNING COMMITTEE**

Joint Planning Committee Co-Chair Hepner discussed key findings relative to the transit fare review; and referenced principles of simplicity and affordability, and the need to ensure that the move to distance-based and station-to-station pricing is easily understood. There is considerable merit to off peak discounts, an interest to have pilot projects and develop a business case, and interest in pursuing the opportunity to work with the Province to expand discounts for low-income residents. A lot of technical work is needed to affect these changes.

Mayor Read arrived at the meeting at 10:24 a.m.

**2.1 Transit Fare Policy Review**

*Report dated July 26, 2018 from Geoff Cross, Vice-President, Transportation Policy and Planning, regarding "Item 2.1 – Summary of Final Recommendations and Proposed Next Steps", was provided with the agenda material.*

Geoff Cross, Vice-President, Transportation Planning and Policy, TransLink, and Andrew McCurran, Director, Strategic Policy and Planning, TransLink, jointly reviewed the distributed presentation and highlighted:

- Summary of actions requested for information, for endorsement and for information
- Recent engagement with Mayors' Council

- Summary of draft recommendations for public input in Phase 4 engagement
- High levels of input during the Phase 4 engagement period
- Key findings and recommendations on distance and fare products, time of travel, and discounts as a result of Phase 4 engagement
- Proposed implementation approach and next steps.

Discussion ensued on:

- How the tap cards will work in the new system
- Support for a pilot project to test the effectiveness of off peak discounts
- Possibility that a mid-day incentive to travel may be more effective than years ago.

**It was MOVED and SECONDED**

That the Mayors' Council on Regional Transportation:

1. Endorse the policy recommendations proposed in the Transit Fare Review;
2. Direct staff to develop an implementation plan consistent with the approach described in the final report;
3. Receive this report.

**CARRIED**

**2.2 Regional Transportation Strategy**

Mr. Cross referenced the Regional Transportation Strategy (RTS) engagement to date, and the proposal to sync processes with Metro Vancouver, which is updating its Regional Growth Strategy (RGS), in early 2019. Staff will report to the Joint Planning Committee in the fall of 2018 with a detailed engagement strategy.

**It was MOVED and SECONDED**

That the Mayors' Council on Regional Transportation receives the report.

**CARRIED**

**2.3 B-Line Implementation Update**

*Report dated July 28, 2018 from Geoff Cross, Vice-President, Transportation Policy and Planning, regarding "Item 2.3 – B-Line Program Update: Work with Municipalities", was provided with the agenda material.*

Mr. Cross and Daniel Freeman, Manager, Rapid Bus Projects, TransLink, referred to the presentation provided with the agenda material, and highlighted:

- Worsening traffic is reducing bus speed
- Transit passenger delay is widespread
- New funding available to tackle problems
- Expected improvements relating to B-Lines:
  - Marine-Main Corridor: up to 30 min (42%) faster
  - Fraser Highway Corridor: up to 29 min (42%) faster
  - Lougheed Corridor: up to 25 min (42%) faster

- 41<sup>st</sup> Avenue Corridor: up to 25 min (33%) faster
- Municipal support required for B-Line bus priority
- Bus priority opportunity on other corridors
- Next steps for Phase 1 B-Lines, Phase 2 B-Lines, bus priority cost-share funding programs, pilots on other corridors, and ongoing monitoring
- Strong incentive to reinvest services to increase the frequency of bus service.

Discussion ensued on:

- Rationale for North Shore B-Line buses to be operated from the Burnaby Transit Centre
- Interest in a report on the cost of transit priority measures on each route as compared to the value of the travel timesavings.

**It was MOVED and SECONDED**

That the Mayors' Council on Regional Transportation receives the report.

**CARRIED**

(Mayor Moore absent at the vote)

**2.4 Transit Service Guidelines**

*Report dated July 26, 2018 from Geoff Cross, Vice-President, Transportation Policy and Planning, regarding "Item 2.4 – 2018 Transit Service Guidelines" was provided with the agenda material.*

Mr. Cross referred to the presentation provided with the agenda material and highlighted:

- Why new transit service guidelines?
- Example Application #1 – Transit-Supportive Land Use and Demand
- Example Application #2 – Stop Spacing
- Taking action: Area Transport Plan assessments, Investment Plans, service change analysis and integration with Transit Service Performance Review.

Discussion ensued on the value of the guidelines to the development community, community associations and business agencies, and support was expressed for the guidelines to be broadly distributed.

**It was MOVED and SECONDED**

That the Mayors' Council on Regional Transportation receives the report.

**CARRIED**

Mayor Robertson departed the meeting at approximately 11:15 a.m.

**3. REPORT OF TRANSLINK MANAGEMENT**

**3.1 Phase One and Two Implementation Update**

Kevin Desmond, Chief Executive Officer, TransLink, reviewed a projected presentation and highlighted major implementation milestones of the Mayors' Plan in 2018, 2019, 2020, 2021, 2024 and 2025. He spoke of the positive reception of TransLink's presentations to local Councils, and advised of efforts to hire 1,000 transit operators for the expansion of the system and for attrition.

Mr. Desmond continued with note that:

- Procurement for Surrey LRT and MLBE will be released in the coming months
- Staff has been working with the municipal staff on the Major Roads Network expansion; expectation is that recommendations will be brought to the Board in the next few months
- TransLink is on target for delivering Phase One and is gearing up for Phase Two
- Ridership continues to rise in terms of monthly and year to date (YTD) boardings, and by mode
- Rapid transit stations are attracting Transit Oriented Developments (TODs) with high density residential, retail and/or mixed-use developments around stations; TOD developments resulted in ridership growth upwards of 30% at some locations
- There has been more than one million tap to pay transactions to date with few card clashes
- The new voice of TransLink is Seth Rogen
- A NightBus District Update pilot was developed based on feedback from the Late Night Stakeholder Committee; this includes creation of an easy-to-find and user-friendly hub at West Granville and Georgia.

Discussion ensued on:

- Impacts that the opening of the Evergreen Line has had on West Coast Express (WCE) ridership
- TransLink engagement with the Province on ride-hailing, and interest in partnering with ride-hailing services particularly for first mile/last mile and late night services
- Importance of accessibility of ride-hailing services, and their sharing of data as part of the legislative regime.

**It was MOVED and SECONDED**

That the Mayors' Council on Regional Transportation receives the report.

**CARRIED**

**4. OTHER BUSINESS**

**4.1 Upcoming Meeting**

The Agenda noted the following upcoming meetings:

- Mayors' Council – September 21, 2018.

**5. ADJOURN**

**It was MOVED and SECONDED**

That the Mayors' Council on Regional Transportation Public Meeting held July 26, 2018 be now terminated.

**CARRIED**

(Time: 11:43 a.m.)

Certified Correct:

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Mayor Derek Corrigan, Chair

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Rae Ratslef, Recording Secretary  
Raincoast Ventures Ltd.

**TO:** Mayors' Council on Regional Transportation

**FROM:** Kevin Desmond, CEO  
Sarah Buckle, Director Enterprise Risk and Sustainability

**DATE:** September 6<sup>th</sup>, 2018

**SUBJECT:** **ITEM 2.1 – Greenhouse Gas Emissions Target and Renewable Energy Goal**

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**RECOMMENDATION:**

That the Mayors' Council on Regional Transportation:

1. Adopt the targets of 80 per cent reduction of GHG emissions by 2050, and 100 per cent renewable energy by 2050; and,
  2. Direct staff to bring forward by Q3 2019, GHG emission reduction targets and renewable energy goals for 2030 and 2040 to support the 2050 commitments; and,
  3. Request that TransLink consider the procurement of renewable fuels when available and cost-effective in support of these goals; and,
  4. Direct TransLink to seek external grant funding from Green Infrastructure Fund, and other sources of provincial and federal funding for the upfront capital investments required to transition to electrification; and,
  5. Receive this report.
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**PURPOSE**

This report provides information and recommendations on the feasibility of and actions required to meet the greenhouse gas (GHG) emission reduction target of 80 per cent by 2050, and the target of utilizing 100 per cent renewable energy in operations by 2050.

**BACKGROUND**

The motion below was brought forward and approved by both bodies at the Joint Public Meeting of the Mayors' Council and TransLink Board of Directors on June 28, 2018.

**Notice of Motion**

**Reducing TransLink's climate impact with clear GHG emissions targets and a 100% renewable energy goal.**

**WHEREAS** the Province of BC, Metro Vancouver, and many other jurisdictions similar to our region have adopted clear GHG emissions targets and a 100% renewable energy goal.

Be it resolved,

**THAT** Translink and its operating companies and contractors (CMBC, BCRTC, WCE, Transit Police) align with British Columbia's GHG target of 80% or greater reduction between 2007 and 2050,

**THAT** Staff bring back to the Board and Mayors' Council in September 2018 with a recommended policy and High-Level Plan to commit to an 80% or greater reduction in GHG emissions (base year 2007) and utilize 100% renewable energy by 2050 in all TransLink operations, and include interim 2030 and 2040 GHG and renewable energy targets; and,

**THAT** the High-Level Plan include an analysis of air quality and financial implications.

## **DISCUSSION**

Due to the service life of our fleet and useful life of our facilities, TransLink's current policy decisions and investments have the potential to lock-in high or low levels of carbon emissions for up to a century. Although ambitious, our analysis shows that moving to zero and low-carbon operations is achievable with existing fuels and technologies, but it means that bold action is required through policy decisions, investment planning, and funding support. Many of the low-carbon actions will pay for themselves over the long term and will support the achievement of:

- Cleaner air as the combustion of fossil fuels for transportation is one of the highest-impact pollutions sources;
- Expanding mobility options and embracing electrification, opening up new opportunities in smart grid applications that integrate electric mobility with new types of customer experience;
- Improved energy performance and cost savings by retrofitting existing buildings and designing new facilities;
- Healthier buildings by improving the indoor environmental quality, providing more comfortable indoor air temperatures and improved circulation of fresh intake air;
- Reduced costs of renewable fuels (renewable natural gas and renewable diesel) through increased demand; and
- Cost saving opportunities through the generation of renewable energy on-site, such as solar photovoltaic panels.

### **Overview of Policy Commitments**

#### Global:

The Paris Agreement, which came into force in April 2016, provides the world's first global framework to respond to climate change and has the support of all but three countries globally. This includes over 100 cities and regions that are working towards 100% renewable energy commitments.

#### Canada:

Nationally, the Pan-Canadian Framework on Clean Growth and Climate Change was signed by the federal government and 11 provinces and territories in December 2016. The agreement provides a pathway for progress on a number of fronts including low carbon transportation and buildings, carbon pricing, and clean electricity grids. Canada aims to reduce its GHG emissions to 30% below its 2005 emission levels by 2030, and 80% by 2050.

#### Province of BC:

In 2007, the BC government set targets to reduce GHG emissions in the province by 33 per cent by 2020 and 80 per cent by 2050 from 2007 levels. In May 2018, the provincial government introduced legislation to update the Province's GHG reduction targets. The *Climate Change Accountability Act* sets new legislated targets of a 40 per cent reduction of GHG emissions by 2030, a 60 per cent reduction by 2040, and an 80 per cent reduction by 2050 (all from 2007 levels).



Provincial legislation adopted in 2008 requires all local governments to identify GHG reduction targets, policies, and actions in their Official Community Plans (OCP) and Regional Growth Strategies.

#### Metro Vancouver:

Transportation accounts for over 35 per cent of GHG emissions in Metro Vancouver, and is the largest single source of air pollutants having a direct impact on human health. Second to transportation, buildings (commercial, institutional and residential) account for approximately 30 per cent of GHG emissions in Metro Vancouver.

Through their Regional Growth Strategy (Metro 2040 Vision), Metro Vancouver made the commitment to reduce GHG emissions within the region by 33 per cent by 2020 and by 80 per cent by 2050 compared to the 2007 baseline.

#### Municipalities:

Municipalities in Metro Vancouver have adopted targets for GHG reductions. In addition to GHG reduction targets, The City of Vancouver's Renewable City Strategy commits to deriving 100% of the energy used in Vancouver from renewable sources before 2050<sup>1</sup>.

### **GOAL 1: 80% REDUCTION OF GHG EMISSIONS BY 2050, INCLUDING INTERIM 2030 TARGETS**

TransLink's GHG emissions are predominantly from fleet operations versus facilities (94 per cent and 6 per cent, respectively). Our analysis shows that by transitioning to a full low carbon bus fleet, TransLink would be able to achieve the goal of an 80 per cent reduction of GHG emission by 2050.

A commitment was made in Phase One of the 10-Year Mayors' Vision to develop Low Carbon Fleet Strategy (LCFS) with the goal of reducing fleet emissions across the region of Metro Vancouver. TransLink has spent the past year on the development of Phase I of the LCFS with the goal of:

- Comparing bus technologies and fuels that:
  - are expected to be commercially available in 2020 and later years;
  - can significantly reduce fleet GHG emissions; and
  - will be consistent with projected future funding and CMBC service requirements.
- Identifying the level of additional funding that would be required to meet an 80 per cent reduction of GHG emissions from our revenue bus fleet by 2050.

The objectives and tasks of the LCFS were presented to the Metro Vancouver's Finance and Intergovernmental Committee on October 11, 2017 and results of the analysis have been presented to Metro Vancouver staff. The findings were presented at the April 2018 Board strategy session and the Board supported moving to the next phase of analysis which will include a detailed roadmap for bus purchases, charging infrastructure design and installation, and a financial plan.

#### High-Level Findings of the Low Carbon Fleet Strategy (refer to Attachment 1 for further details)

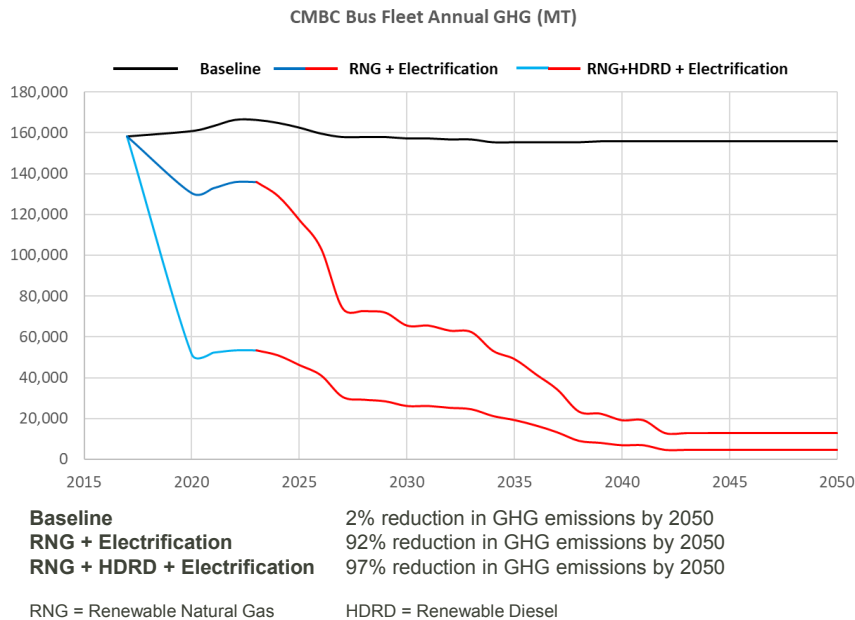
There are realistically only two options for a significant reduction of GHG emissions (>60%) from TransLink's fleet: renewable fuels (using renewable natural gas and/or renewable diesel) or electrification (expanding the trolley bus network, using battery electric buses, and/or using hydrogen fuel cell buses). The analysis concluded that the use of renewable fuels in existing buses can provide a

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<sup>1</sup> The reason that 100% renewable energy does not translate to a 100% reduction in GHG emissions is that biofuels will likely have some sources of GHG emissions even if there is a successful transition to entirely renewable energy.

cost-effective way to get early GHG reductions, but only significant electrification can achieve the 80 per cent reduction of GHG emissions by 2050 (refer to Figure 1 below).

**Figure 1: Projected GHG Emissions from Fleet Transition**



While current electric buses are more expensive than diesel buses, the costs are projected to come down as the technology matures. Life-cycle cost parity for electric battery buses is expected by model year 2023 and this timing aligns well with TransLink/CMCB’s fleet procurement schedule where a large number of buses (>560) are to be replaced in the 2024-2026 timeframe (refer to TransLink/CMBC Revenue Fleet Procurement Plan 2019-2033 in Attachment 2).

The life-cycle fleet costs for electrification over the next 30 years are projected to be marginally less expensive compared to diesel primarily because of fuel cost savings<sup>2</sup>. Transitioning to battery electric buses will require significant charging infrastructure development and changes to bus operations. The required incremental capital investment is estimated to be on the order of \$250M upwards to \$780M depending on the electrification scenario and whether or not trolley buses are replaced with trolley buses or are replaced with battery-electric buses. The capital investments will be offset by significant operating savings – primarily fuel cost savings. The breakeven point is expected to be in 2029-2039, and net savings are estimated to be in the average of \$24-\$50M annually.

**GOAL 2: 100% RENEWABLE ENERGY BY 2050, INCLUDING INTERIM 2030 TARGETS**

To achieve the goal of 100 per cent renewable energy, TransLink’s entire fleet including highway coaches, SeaBus vessels, West Coast Express, Community Shuttles, HandyDART vehicles, and non-revenue Transit Police cars, pool cars and maintenance vehicles would be battery-electric, hydrogen fuel

<sup>2</sup> The total fleet costs take into account bus driver labour, bus purchase, annual bus maintenance, overhauls, battery pack replacement midlife, fuel and fueling infrastructure, annual infrastructure maintenance and depot expansion.

cell, or run off of renewable fuels. Our facilities would be primarily powered by electricity, and where required, by renewable natural gas. New buildings would be designed and built to be near zero GHG emissions, and building scale renewable energy, such as solar photovoltaic panels could be utilized. This is an ambitious target; however, we have the next 32 years to plan and execute accordingly and transition away from fossil fuels.

Currently 26 per cent of the energy consumed in TransLink's fleet is electricity. By transitioning the bus fleet to battery-electric buses and with the interim use of renewable fuels, TransLink would move closer to achieving the goal of 100 per cent renewable energy by 2050. However, further study will be required to assess the feasibility of renewable energy and technologies for the remaining revenue and non-revenue diesel and gasoline vehicles in the fleet.

Approximately 60 per cent of the energy consumed in TransLink's facilities is electricity, and 40 per cent is natural gas. Shifting to 100 per cent renewable fuels for our facilities would be part of an effort to reduce the overall energy intensity, shift to electricity where possible and practical, and for remaining uses, shift from conventional natural gas to renewable natural gas.

The majority of natural gas consumed by TransLink's building portfolio is from CMCB's transit centres primarily for water and space heating - boilers and make up air units. CMBC has developed a robust Strategic Energy Management Plan with support from BC Hydro. As part of the Plan, CMBC has set a target to reduce energy intensity by 10% from 2015 baseline by 2020. Energy audits and retro commissioning studies have been conducted at many of CMBC's transit centres and energy efficiency projects are planned or have been completed. The energy studies provide a detailed review of energy consumption and identify energy efficiency opportunities and return on investments on projects such as lighting upgrades, control optimization and mechanical upgrades. Further study will be required for the facilities that have not yet been studied, including but not limited to BCRTC's SkyTrain Operations and Maintenance Centres, West Coast Express and HandyDART offices, and SeaBus terminals. In addition, the design for new facilities such as CMBC's new Silvertree bus depot and BCRTC's new operations and maintenance centre will have to target zero GHG emissions.

## **CONSIDERATIONS**

Achieving the 2050 targets will require ambitious and ongoing action that builds on actions taken to date in a way that is coordinated across the Enterprise. TransLink cannot do this alone – we will need support from our municipal partners, the province and the federal government. Some of the key federal and provincial actions include policies that increase the supply of zero emissions vehicles, policies that increase the availability of renewable fuels, and policies that increase the incentives to improve energy efficiency and switch to renewable energy. While the long-term targets are achievable, there are risks to achieving them:

1. **Funding support:** for TransLink to achieve its targets, full electrification of the fleet will be more capital intensive and will require leveraging capital contributions from external sources, such as the Green Infrastructure Fund, and/or require diversion of TransLink operating dollars to capital to support the charging infrastructure. With respect to the funding strategy, staff are monitoring and engaging with provincial and federal counterparts in pursuit of available funding that is aligned with TransLink's Low Carbon Fleet Strategy.

2. **Technology advancements:** while the pathways to achieving the targets don't depend on new technologies, existing technologies are expected to improve in quality and/or price over time. For example: the cost of batteries for electric buses is expected to drop almost 50 per cent in the next ten years. If the availability and cost of renewable fuels doesn't improve over time, it will be difficult to justify the transition. Conversely, if existing technologies advance faster than anticipated and/or new technologies emerge, achieving the targets will become easier.

Management recommends that adopting the proposed targets is consistent with TransLink's policy objectives and is ambitious but feasible given our current assessment of the opportunities and risks.

#### **ATTACHMENTS**

Attachment 1: Summary of Low Carbon Fleet Strategy Findings

Attachment 2: TransLink/CMBC Revenue Fleet Procurement Plan 2019-2033



Attachment 1

# Low Carbon Fleet Strategy (2020-2050)

# LCFS Scope of Work

- Identify and compare on a life-cycle cost and emissions basis technologies and fuels that:
  - ▶ can significantly reduce fleet GHG emissions
  - ▶ are expected to be commercially available in 2020 and later years
- Develop technology recommendations for future bus fleet and fuel purchases between 2020 and 2050:
  - ▶ Transition CMBC fleet to *the lowest practical* levels of fleet GHG emissions
  - ▶ Consistent with projected future funding and service levels, and CMBC service requirements
- Identify the level of additional funding that would be required (if any) to fully meet local, provincial, and federal climate goals through 2050.

# Low Carbon Fleet Options

Realistically, only two broad options for significant GHG reduction (>60%) from transit buses:

## 1. Decarbonize existing liquid and gaseous fuels

- ▶ Hydrogenation-Derived Renewable Diesel Fuel (HDRD)
- ▶ Renewable Natural Gas (RNG)

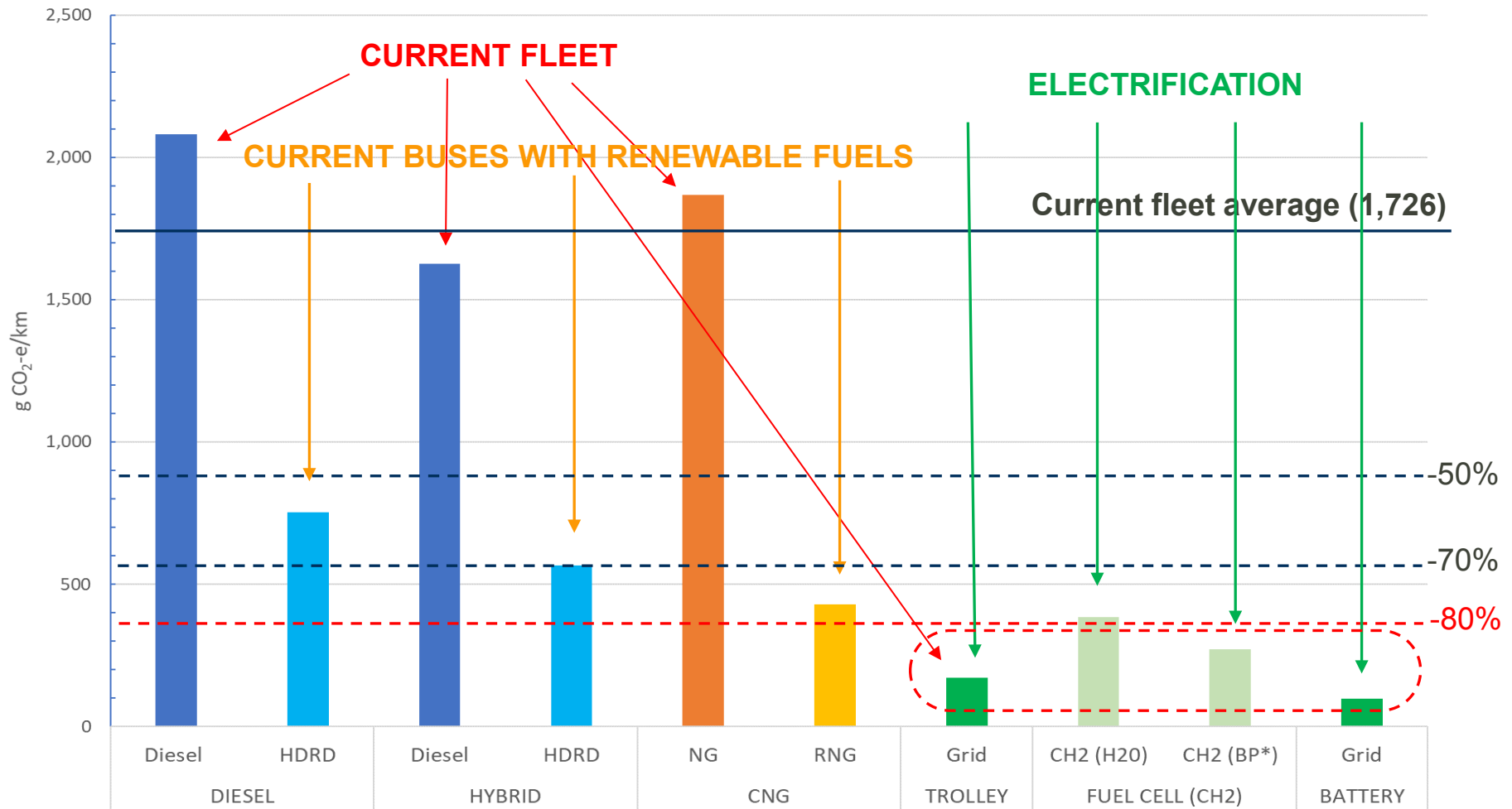


## 2. “Electrify” bus operations

- ▶ Expand trolley bus network
- ▶ Use battery-electric buses
- ▶ Use hydrogen fuel cell electric buses



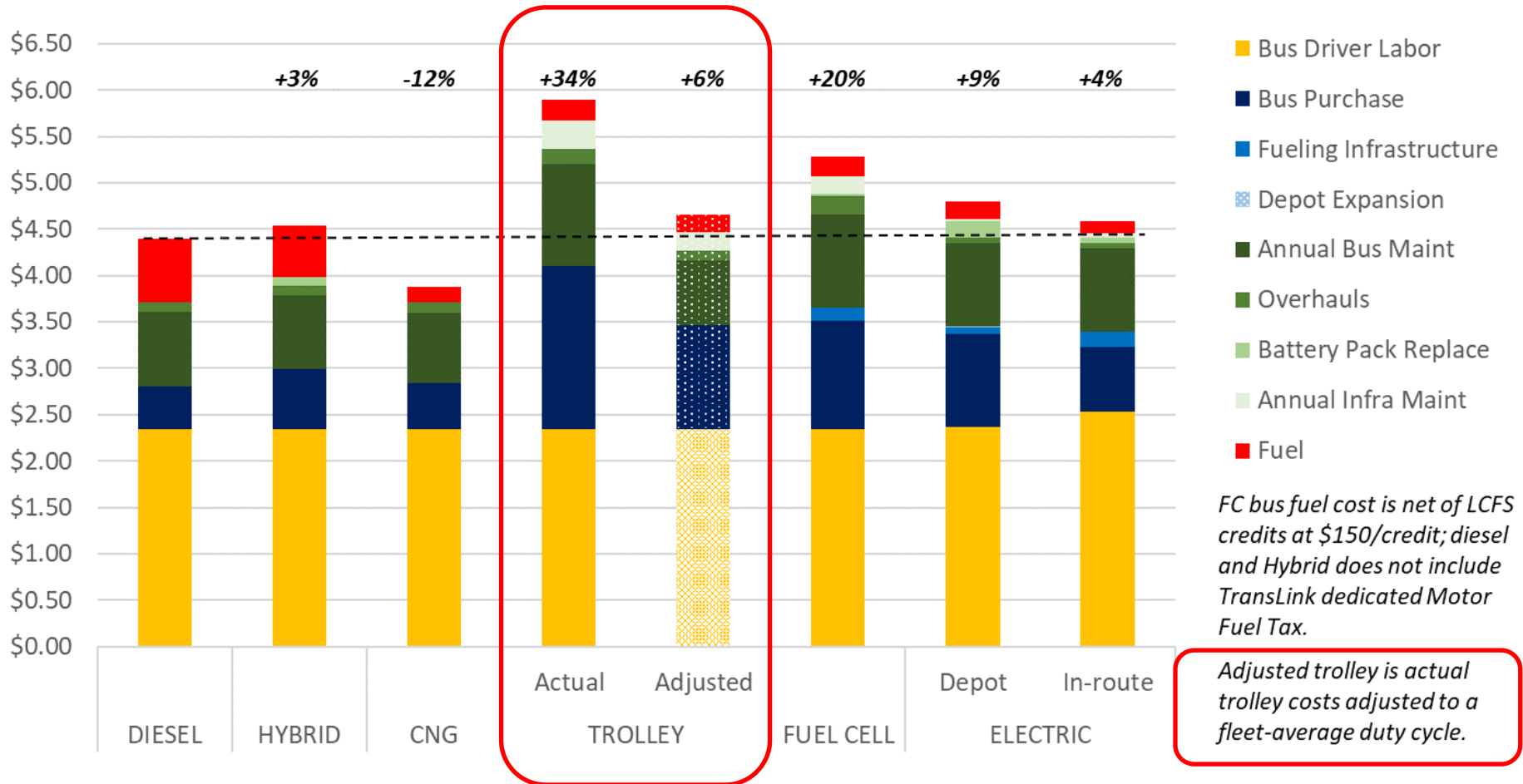
# Life-Cycle GHG Emissions 40 Foot Bus (g CO<sub>2</sub>-e/km)



\* CH<sub>2</sub> (BP) is a blend with 36% hydrogen produced as a by-product of chemical manufacturing



# Projected Life Cycle Cost MY2017 Buses (2017 \$/km)



# Overview of Renewable Fuels



## Renewable Natural Gas (RNG)

- RNG is biogas collected from landfills, wastewater treatment, & manure digesters
  - ✓ Processed to upgrade to pipeline quality
- RNG is available from Fortis
  - ✓ Sourced from local landfills
  - ✓ Sold at incremental cost of \$7.00/GJ (~2x)
  - ✓ Fortis is pursuing certification of RNG under LCFS – which would generate up to \$10/GJ in credits
  - ✓ If certified, net cost to TransLink will be on par or lower than current NG costs



## Hydrogenated-Derived Renewable Diesel (HDRD)

- Made via hydrogenation of vegetable oils using normal refinery processes
  - ✓ NOT bio-diesel
  - ✓ Can be used in current buses
- Production cost is \$0.26 to \$0.40 per liter more than petroleum diesel, but
  - ✓ Up to \$0.05/L lower carbon tax
  - ✓ Up to \$0.31/L LCFS credit
  - ✓ Net cost should be on par with diesel
- Available in Vancouver at wholesale
  - ✓ Could be made available to fleets
  - ✓ Will be sourced from Singapore

RENEWABLE FUELS COULD PROVIDE INTERIM GHG REDUCTIONS DURING  
TRANSITION TO ELECTRIFICATION

# Battery Bus Charging Scenarios



SCENARIO	DEPOT CHARGING	IN-ROUTE CHARGING
CONCEPT	All energy added “overnight”, using 50-100 kW chargers located at each Transit Centre	All energy added “in-route”, using 500-600 kW chargers located throughout service area
ISSUES	<ul style="list-style-type: none"> <li>• Very large battery required on bus, high bus cost</li> <li>• Practical limitation on battery size limits range – in the near term additional buses will be required</li> <li>• Large number of chargers required – space claim at Transit Centres</li> </ul>	<ul style="list-style-type: none"> <li>• Smaller battery required on bus, lower bus cost</li> <li>• Smaller number of chargers required, but much higher cost/charger</li> <li>• Siting in-route chargers could be difficult</li> </ul>
	Future technology development & cost reductions	

THERE ARE SIGNIFICANT CONSIDERATIONS INVOLVED IN CHARGING SCENARIOS AND BOTH MAY PLAY A ROLE FOR TRANSLINK

# Summary of Electrification Analysis

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## DEPOT CHARGING

- With current buses practical range per charge will be ~240 km (at bus mid-life)
- Will require every 100 buses to be replaced with ~115 battery buses (depot charging)
  - ✓ Existing daily bus assignments >240 km must be re-configured to be shorter
- Space claim for depot chargers will result in 10% - 40% loss in depot parking capacity

## IN-ROUTE CHARGING

- To keep charging time below typical bus headways, 500 kW chargers will be needed
  - ✓ Daily bus assignments will need to increase to accommodate charging
- For entire CMBC service area need 150 – 250 charge ports in at least 75 locations
- Existing off-street bus exchange locations will likely need to be supplemented with chargers in at least 30 additional locations

## ELECTRICITY COST

- Under current BC Hydro rates, depot charging will have higher electricity cost than in-route charging, due to higher demand and higher demand charges

EITHER CHARGING SCENARIO WILL REQUIRE CHANGES TO CURRENT BUS OPERATIONS,  
AND SIGNIFICANT INFRASTRUCTURE DEVELOPMENT

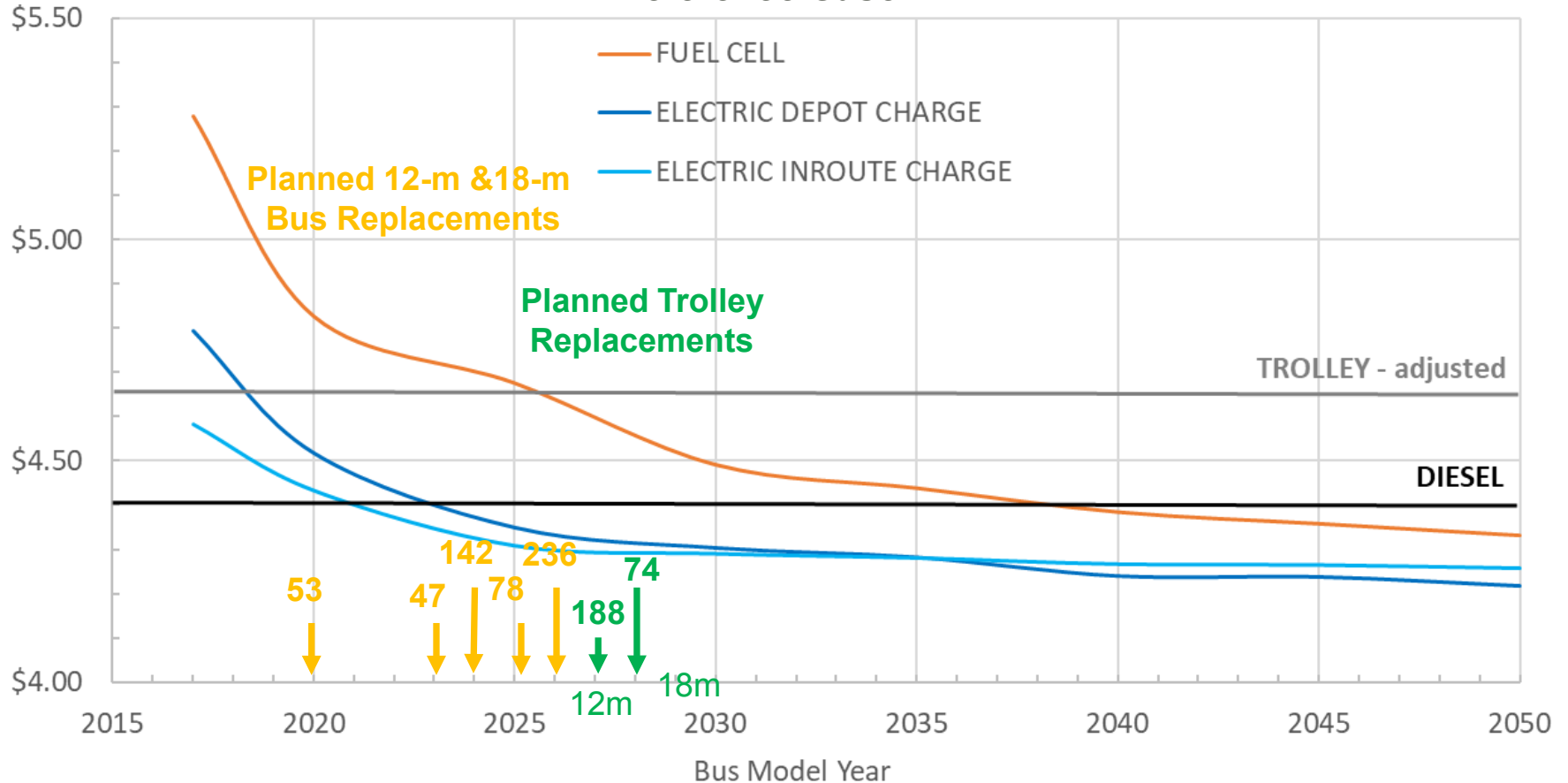
# KEY ASSUMPTIONS – Battery Electric Bus

METRIC	REFERENCE CASE	LOW COST CASE	HIGH COST CASE
Bus Purchase (40 ft)	MY2017 → MY2030 \$1 mill → \$860,000	MY2017 → MY2030 \$1 mill → \$860,000	MY2017 → MY2030 \$1 mill → \$860,000
Depot Chargers	50 kW/peak bus \$220,000/charger	50 kW/peak bus \$170,000/charger	50 kW/peak bus \$300,000/charger
In-Route Chargers	500 kW 200 system-wide \$1.4 million/charger	500 kW 150 system-wide \$1.2 million/charger	500 kW 250 system-wide \$1.7 million/charger
Charger Maintenance	\$0.020/kWh (depot) \$0.028/kWh (in-route)	\$0.015/kWh (depot) \$0.023/kWh (in-route)	\$0.025/kWh (depot) \$0.035/kWh (in-route)
In-route Charger Lease	\$300/month/charger 60% of chargers	\$0/month/charger	\$600/month/charger 60% of chargers
Depot Parking Expansion (Depot charging)	MY2017 → MY2030 + 25% → +11%	MY2017 → MY2030 + 15% → 0%	MY2017 → MY2030 + 30% → +12%
Annual Maintenance (relative to diesel)	MY2017 → MY2030 + 12.5% → - 12.5%	MY2017 → MY2030 + 12.5% → - 20%	MY2017 → MY2030 + 12.5% → - 8.5%
Energy Use	1.44 kWh/km → 1.35 kWh/km	90% of reference case	110% of reference case
Energy Cost	Depot: \$0.125/kWh In-route: \$0.09/kWh	Depot: \$0.09/kWh In-route: \$0.09/kWh	Depot: \$0.125/kWh In-route: \$0.09/kWh

THERE REMAINS UNCERTAINTY IN FUTURE COSTS – BUS PURCHASE AND CHARGING INFRASTRUCTURE AND BUS MAINTENANCE

# Projected Life Cycle Costs of Future Buses (2017\$/km)

## Reference Case



BY MODEL YEAR 2025 ELECTRIC BUSES ARE PROJECTED TO BE LESS EXPENSIVE OVER THEIR LIFE THAN DIESEL OR TROLLEY BUSES

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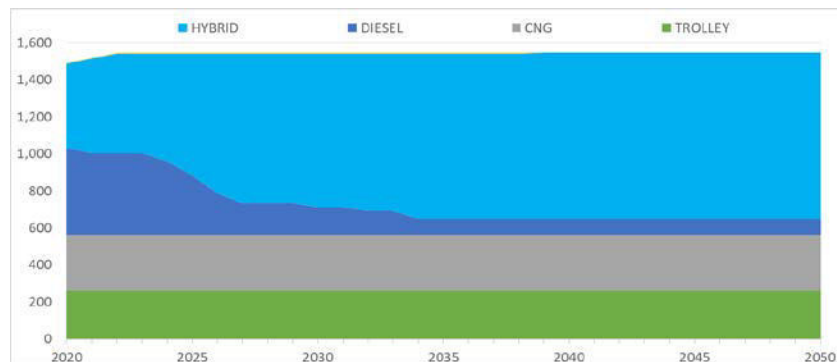
# Practical Application of LCFS for TransLink

# Fleet Transition Scenarios

All scenarios: All current buses in the fleet retired after 17 years in service (trolleys 20 yrs)

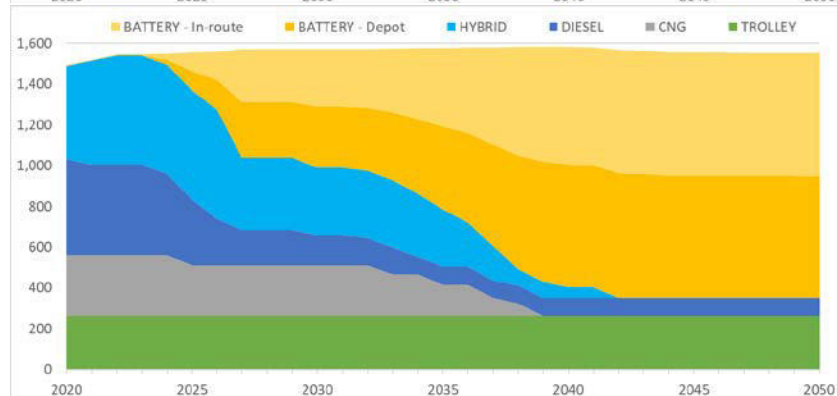
## BASELINE

- Diesel buses except Highway Coaches replaced with hybrids
- CNG buses replaced with CNG
- Trolleys replaced with trolleys



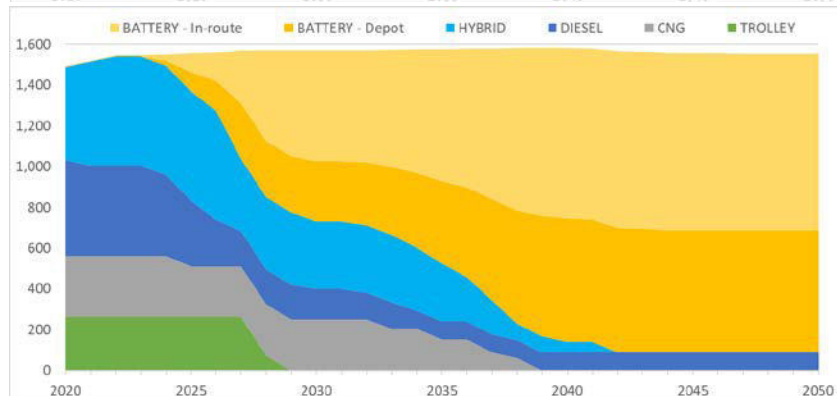
## ELECTRIFICATION 1 – *starting in 2023*

- Diesel bus except Highway replaced w/ battery bus
- CNG bus replaced with battery bus
- Battery buses 50% depot & 50% in-route charge
- Trolleys replaced with trolleys



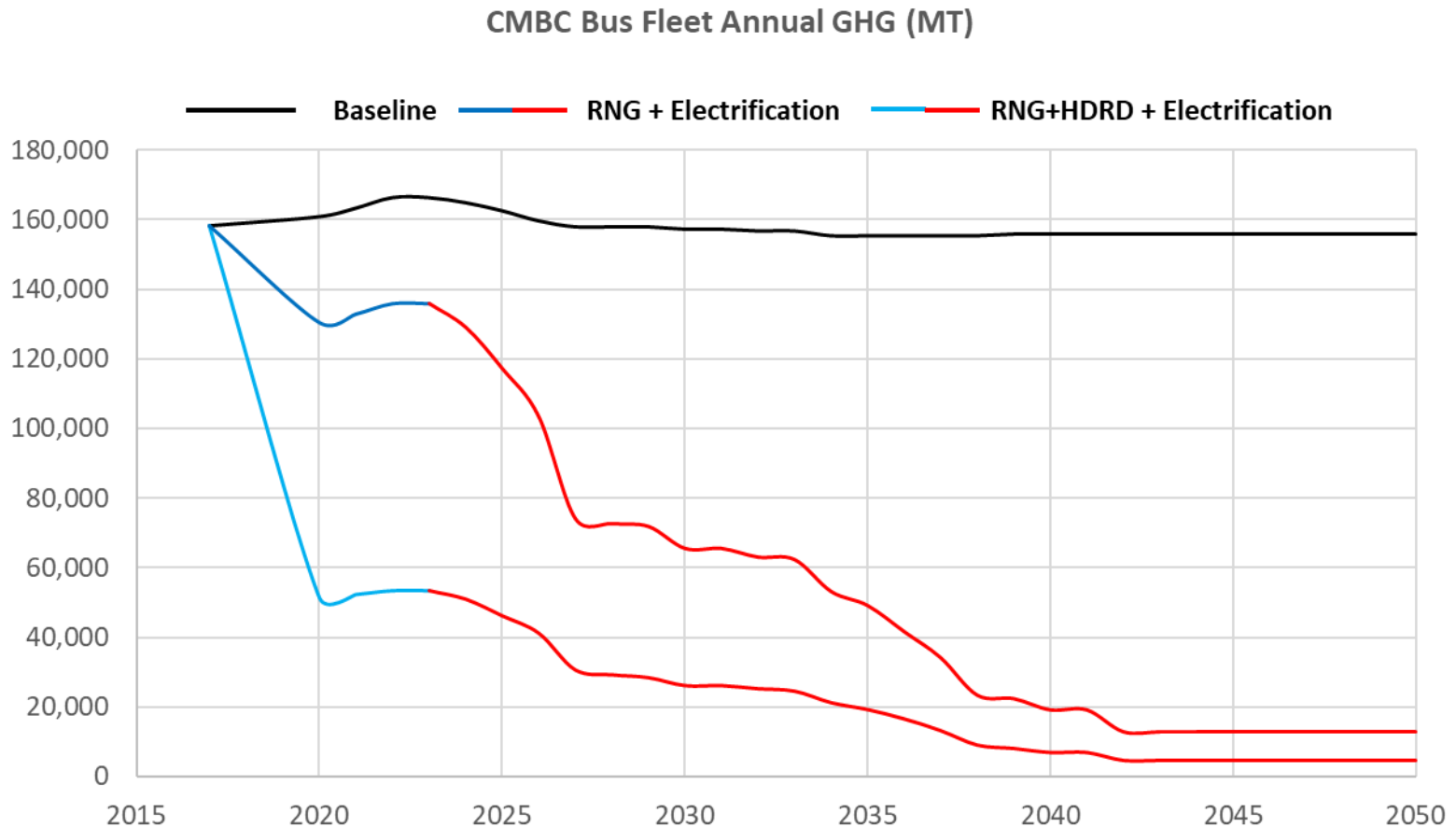
## ELECTRIFICATION 2 – *starting in 2023*

- Diesel bus except Highway replaced w/ battery bus
- CNG bus replaced with battery bus
- Other battery buses 50% depot/50% in-route charge
- Trolleys replaced with in-route charged battery bus





# Projected GHG Emissions from Fleet Transition

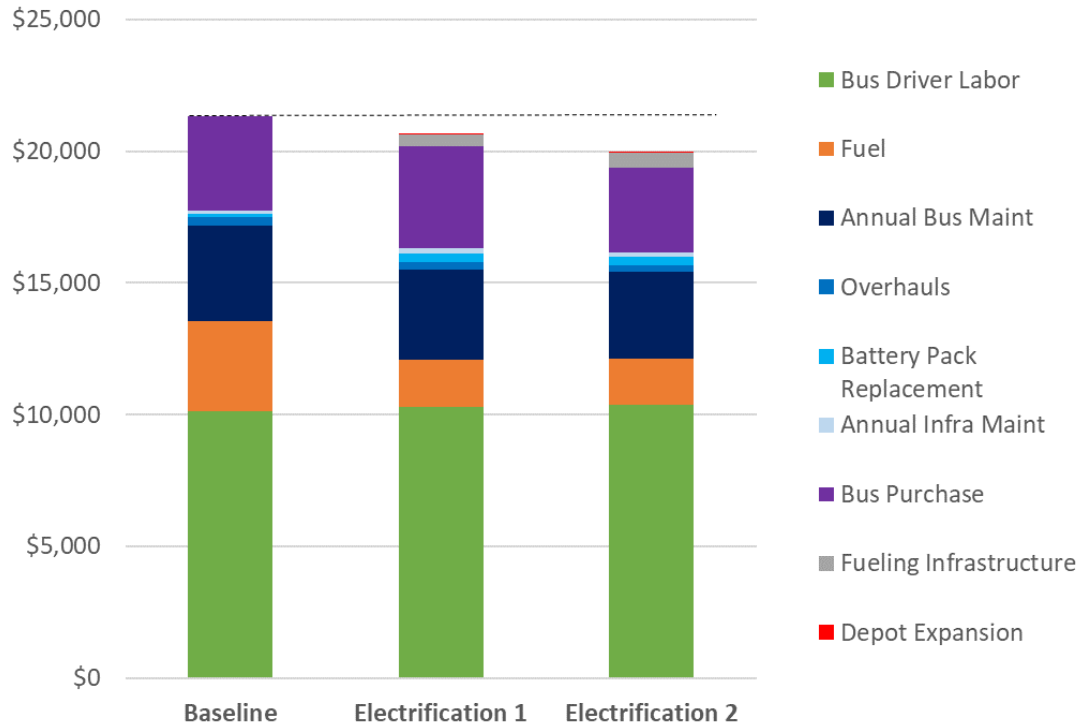


## 2017 – 2050 Fleet GHG Reduction

BASELINE	- 2%
RNG + ELECTRIFICATION	- 92%
RNG + HDRD + ELECTRIFICATION	- 97%

# Projected Total Fleet Costs 2020 - 2050

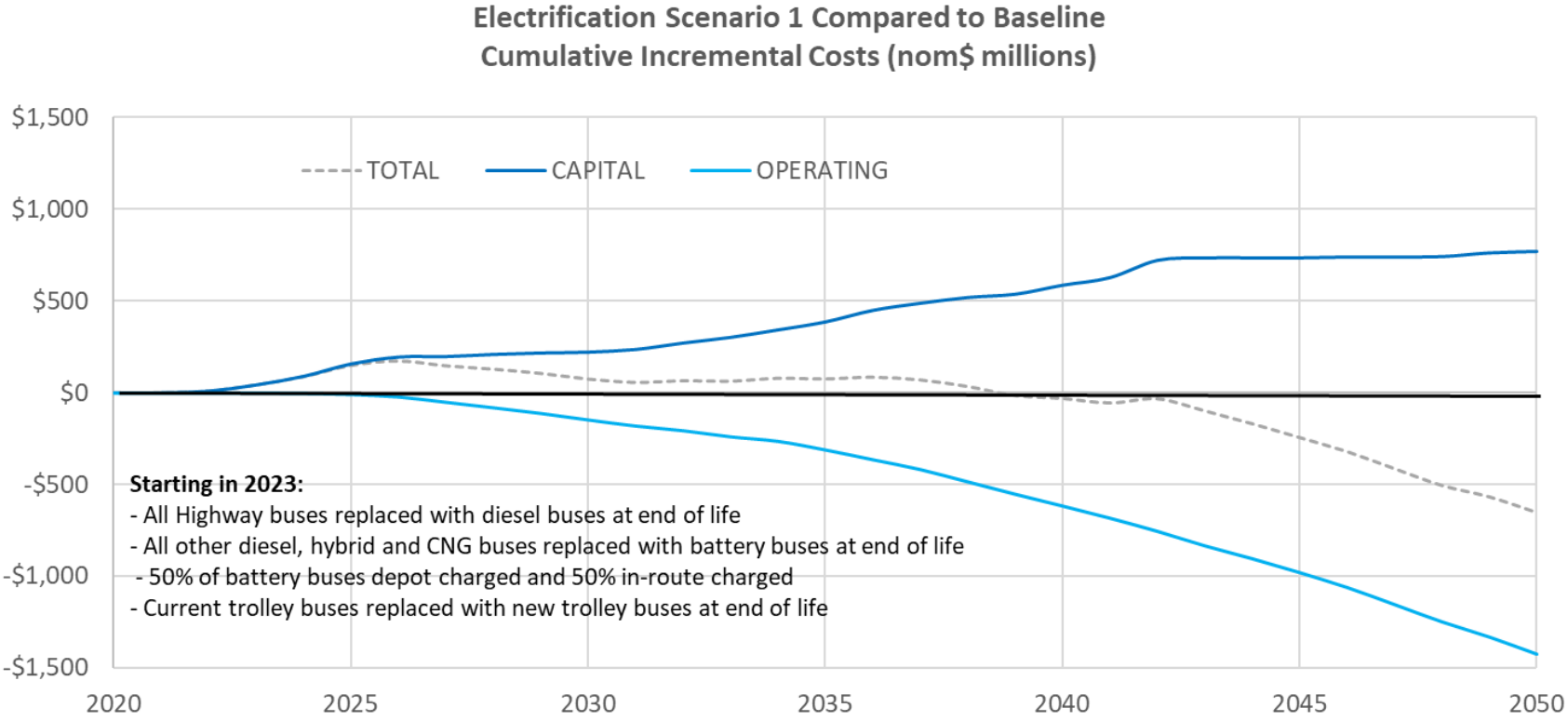
Projected CMBC Bus Fleet Costs 2020 - 2050  
(nominal \$ millions)



- Over the next 30 years electrification scenarios are projected to be marginally less expensive than baseline
- Will require an upfront investment which will be paid back over time
- Will involve a permanent shift of operating to capital funding

NPV 4% discount rate	AVERAGE ANNUAL	AVERAGE	% Difference
	\$ millions	\$/km	
Baseline	\$373.3	\$3.79	
Electrification 1	\$364.4	\$3.70	-2.4%
Electrification 2	\$355.3	\$3.61	-4.8%

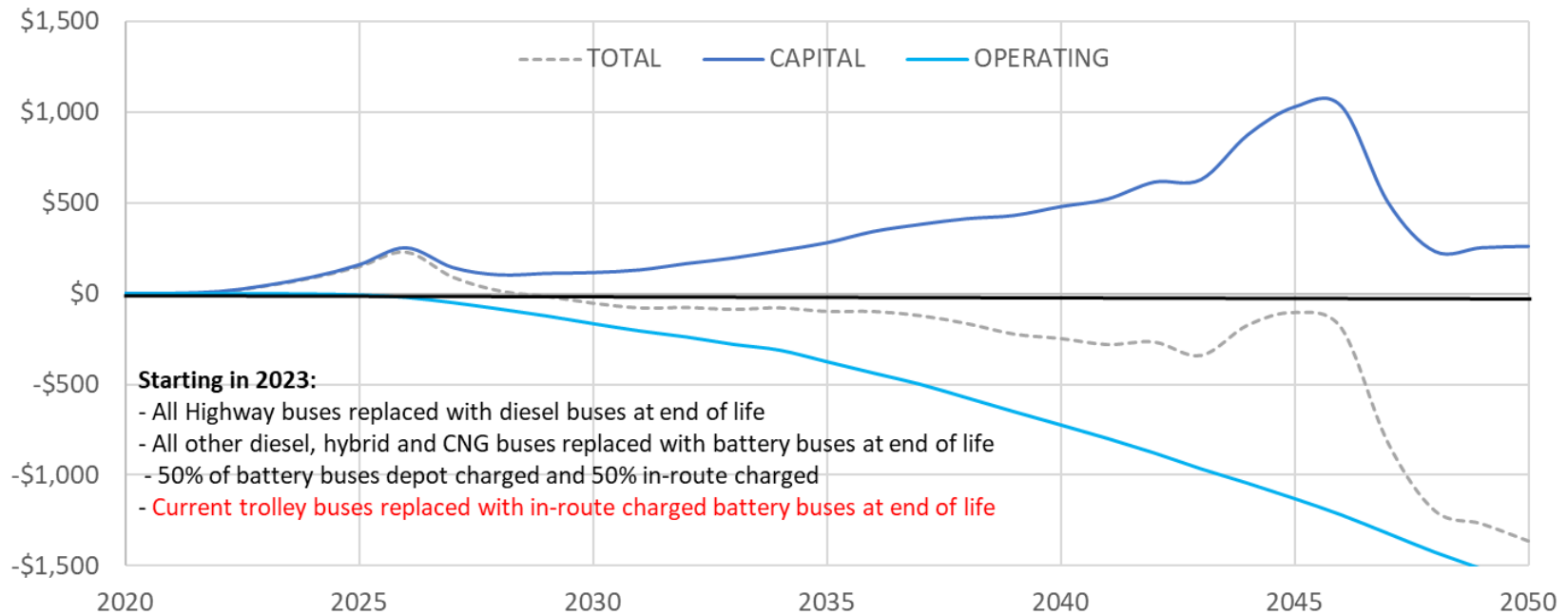
# Cumulative Incremental Costs of Electrification Scenario 1



- By 2050 will need to spend \$767 million additional capital funds, but save \$1.4 billion in operating funds
  - ✓ NET SAVINGS of \$655 million compared to baseline (average of \$24 million/year)
- Net incremental investment peaks in 2026 at \$173 million; break-even point is 2039

# Cumulative Incremental Costs of Electrification Scenario 2

Electrification Scenario 2 Compared to Baseline  
Cumulative Incremental Costs (nom\$ millions)



- Through 2050 will need to spend \$258 million additional capital funds, but save \$1.6 billion in operating funds
  - ✓ NET SAVINGS of \$1.3 billion compared to baseline (average of \$50 million/year)
- Net incremental investment peaks in 2026 at \$173 million; break-even point is 2029
- Significant capital cost savings in 2027-2028 from replacing trolley with battery buses

# Low Carbon Fleet Analysis – Summary

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- Only significant fleet electrification can achieve reduction of GHG emissions 80% by 2050
  - ▶ Use of renewable fuels in existing buses provides a cost-effective way to get early reductions while the fleet transitions
- While current electric buses are more expensive than diesel buses, costs are projected to come down as the technology matures
  - ▶ Life-cycle cost parity is expected by model year 2025 or earlier
- Fleet transition to battery electric buses will require
  - ▶ Significant charging infrastructure development
  - ▶ Changes to bus operations
- Fleet electrification will require additional CAPITAL funding, but this will be more than offset by OPERATING savings – primarily fuel cost savings

**Attachment 2: TransLink/CMBC Revenue Fleet Procurement Plan 2019-2033**

<b>TransLink/CMBC Revenue Fleet Procurement Plan 2019-2033</b>																
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
<b>Replacement</b>																
Standard Bus (40-ft)	92					107	126	78	197			17		45		96
Articulated Bus (60-ft)							16		39			25			21	26
Standard Trolley (40-ft)										188						
Articulated Trolley (60-ft)											74					
Double-Decker (42-ft)		27	25													
Community Shuttle	20	49		62	64	32	49	9	71	64	32	49	9	71	64	32
HandyDart	40	40	40	42	44	46	46	46	46	48	48	48	48	48	48	48
SeaBus						1										
<b>Expansion</b>	Phase 1		Phase 2		Phase 3											
Standard Bus (40-ft)	94		6	30												
Articulated Bus (60-ft)	11	47	62	23												
Double-Decker (42-ft)		5														
Battery-Electric Bus (40-ft)		4														
Community Shuttle	12		9	9		12		3	2							
HandyDart	13	10	10	10				13	10	12	12					
SeaBus		1														
Notes:																
<b>Ordered</b>																
<b>In Procurement</b>																
1) -Community shuttle replacement based on 5 year replacement cycle for van-based cut-aways, 7 year replacement cycle for truck-based cut-aways.																
2) -HandyDART vehicles service life estimated at 7 yrs/250,000+ kms (Micros/Midis)																
3) -Conventional 40' & 60' fleet assets replacement cycle assumed at 17 years/1,000,000+ kms																
4) -Trolley bus service life estimated at 20+ years/1,000,000+ kms																
5) -SeaBuses have an estimated in service life of 40 years																

**TO:** Mayors' Council on Regional Transportation

**FROM:** Geoff Cross, Vice President, Transportation Planning and Policy

**DATE:** September 7, 2018

**SUBJECT:** **ITEM 2.2 – FOR INFORMATION: Integrated North Shore Transportation Planning Project (INSTPP)**

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## **PURPOSE**

The purpose of this report is to provide an overview of the process used to complete the Integrated North Shore Transportation Planning Project (INSTPP) that was released on September 13, 2018, a summary of major findings and a [link to a copy of the final report](#) that was produced.

## **BACKGROUND**

Road congestion and transportation in general are major issues for the North Shore. Multiple agencies have planning, investment and operating responsibilities for the transportation network. With all agencies concurrently undertaking projects and planning processes, government and community leaders on the North Shore recognized the importance of establishing an integrated and comprehensive approach to transportation solutions to address concerns about access and mobility.

In January 2018, the Government of Canada, the Squamish and Tsleil-Waututh First Nations, the Government of BC, the three North Shore municipalities and TransLink came together to collaborate on the Integrated North Shore Transportation Planning Project, with a mandate to:

1. Complete a comprehensive assessment of current and future transportation needs on the North Shore and determine gaps in meeting the existing and long-term needs.
2. Identify collaborative opportunities for short-term transportation improvements on the North Shore.
3. Develop a collective, long-term transportation framework for the North Shore between multiple transportation agencies.
4. Enable a multi-level, multi-agency forum for the sharing of transportation and planning information, and transportation-related problem identification and problem solving.

INSTPP was completed in late July and a final report was produced in August (available on <https://www.instpp.ca/>). The report was released on September 13<sup>th</sup>.

## **DISCUSSION**

A two-tier management structure was used to guide the process - a Steering Committee to provide strategic oversight which included Mayors of each North Shore municipality, federal MP and provincial government's Parliamentary Secretary and North Shore MLA, and representatives of TransLink, and the Squamish and Tsleil-Waututh First Nations; and a Staff Working Group to implement the work program to achieve the project mandate.

The work program followed a structured approach of 1) establishing a set of shared objectives and measures of success, 2) defining the problems to be solved, 3) developing an evaluation framework, and 4) assessing a broad range of options consistently.

Although the work was completed over a very compressed five-month period, the project incorporated significant partner and stakeholder engagement which included eight SWG workshops and five Steering Committee meetings. Two stakeholder workshops were also held with additional representation from partner agencies and the business and non-profit sectors to review and confirm challenges and options. Finally, four City Council presentations and a workshop with the North Shore Congress of elected officials occurred in June 2018, to present the INSTPP process and high-level recommendations. Feedback from all of this engagement was used as input both to shape the process and output of the project.

Key INSTPP recommendations which have direct planning and service delivery implications for TransLink are summarized below:

- Introduction of a new express bus across the Second Narrows Bridge
- Strong partner support to implement transit priorities to support the Marine-Main B-Line, on key bus corridors and around bridgeheads
- Issues that have been talked about for years by one or more agencies (such as a new third crossing) were addressed to provide clarity for all and achieve common agreement
- Examination of rapid transit between the North Shore and Burrard Peninsula as part of a strategic network review within the Regional Transportation Strategy process
- Further dialogue with partner agencies with respect to how transportation could play a role in better aligning housing and jobs
- More emphasis around improving road network resiliency as part of on-going road network planning and investment programs
- Actively look for opportunities and innovative ways to accelerate timeline for the implementation of other transit service improvements outlined in the Investment Plan
- Partner agency support for a comprehensive and proactive approach in demand management solutions including further evaluation of mobility pricing
- Funding for further transportation studies are already included in the RTS and other programmatic planning budgets, and additional transit services could be funded from reallocation of existing operational budget earmarked for North Shore services.

Importantly, the findings included conclusions on projects that are not feasible and shouldn't be considered further, but are commonly raised as potential solutions. This included widening either of the existing bridges, adding a third crossing for vehicles or adapting the CN Rail bridge to be multi-modal.

A summary of key success factors are provided below:

- Having the right agencies at the table and full buy-in for the process was key. In particular, having elected officials representing these agencies and not just staff was essential. The provincial and federal governments' participation enabled more meaningful dialogues in matters that go beyond regional interests. The project was a truly multi-partner collaboration and not seen as a single-agency initiative. All partner agencies committed significant time, staff resources and budget to implement the intense work program under a tight timeline.



- An external consultant team undertook the project coordination and partner engagement functions, providing a neutral environment where all partners have an equal voice. It facilitated genuine engagement and candid dialogues, which occurred at both the decision-maker and staff levels throughout the entire process.
- TransLink took on a number of other functions in order to drive the process forward – acting as project secretariat, providing procurement and contract management support, and most importantly providing specialized analytical expertise and support for the project.
- The project scope was intentionally broad and multi-modal in nature allowing for an integrated approach which drew out synergies between different actions.
- Significant emphasis was placed on quantitatively defining the root causes of the problems (as opposed to the symptoms) which broke through anecdotal commentaries and deepened the understanding and shaped the solutions, as opposed to the other way around.
- An evidence-based approach was used, research and analysis was conducted using a wide range of transportation data and analytical tools.
- There was explicit recognition at the onset that the project needs to respect existing planning and decision-making process and protocols (such as the Regional Transportation Strategy and 10-Year Investment Plan), which avoided the creation of decision-making silos.
- While the process was rooted in planning, the final report was action-based and clearly laid out a pragmatic path for moving forward in the near term.

Incorporating these success factors into the new Regional Transportation Strategy process increases the likelihood that all levels of government will feel ownership over the resulting strategies and plans. And, like the INSTPP report, the resulting strategy and plans should encompass the performance of the whole network within the region and not be constrained by which agency owns or manages the infrastructure.

The next steps for TransLink include participation on a yet-to-be-established elected official steering committee and senior staff committee to make sure the momentum continues and to oversee ongoing collaborative planning and decision-making. There are a number of technical and policy initiatives that will commence: continuation of project planning and implementation for projects contained in the Phase 1 and 2 Investment Plan; dialogue with municipal partners on ways to accelerate other Investment Plan projects; initiation of rapid transit and other strategic network planning work as part of the Regional Transportation Strategy; and, participation in further planning coordination with other agencies on projects that would be delivered by others like improvements to the road network.