



Green Bus Program Update

April 14, 2022

Bem Case
Executive Director, Innovation and Sustainability



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Green Bus Program Overview

Targets



TransformTO Net Zero Strategy:

Outlines a pathway to achieve net zero in Toronto by 2040.



TTC Target:

Steady-state procurement of zero-emissions buses by 2025 and an all zero-emissions bus fleet by 2040.

Green Bus Program Overview

Low-Emissions and Zero-Emissions Bus Procurement Schedule

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
Hybrid	0	0	298 → 38										336
eBus	0	0	0	100	133	168	170	175	175	189	190	190	1490
Total	0	0	298 → 138	133	168	170	175	175	175	189	190	190	1826

Current Plan:

- Accelerate procurement of only zero-emissions buses from 2025 to 2023.
- Accelerate the transition to a zero-emissions fleet from 2040 to 2037.

Key Interdependency:

Electrification infrastructure construction to support the electric buses.



eBus Head-to-Head Evaluation

eBus Fleet Overview



K9M



NEW FLYER

XE40



PROTERRA

E2



NOVABUS

**Hybrid-Electric Vehicle
(HEV)**



eBus Head-to-Head Evaluation

Evaluation Domains

TTC's head-to-head evaluation of the only 3 vendors currently offering long-range electric buses in North America is the first of its kind.

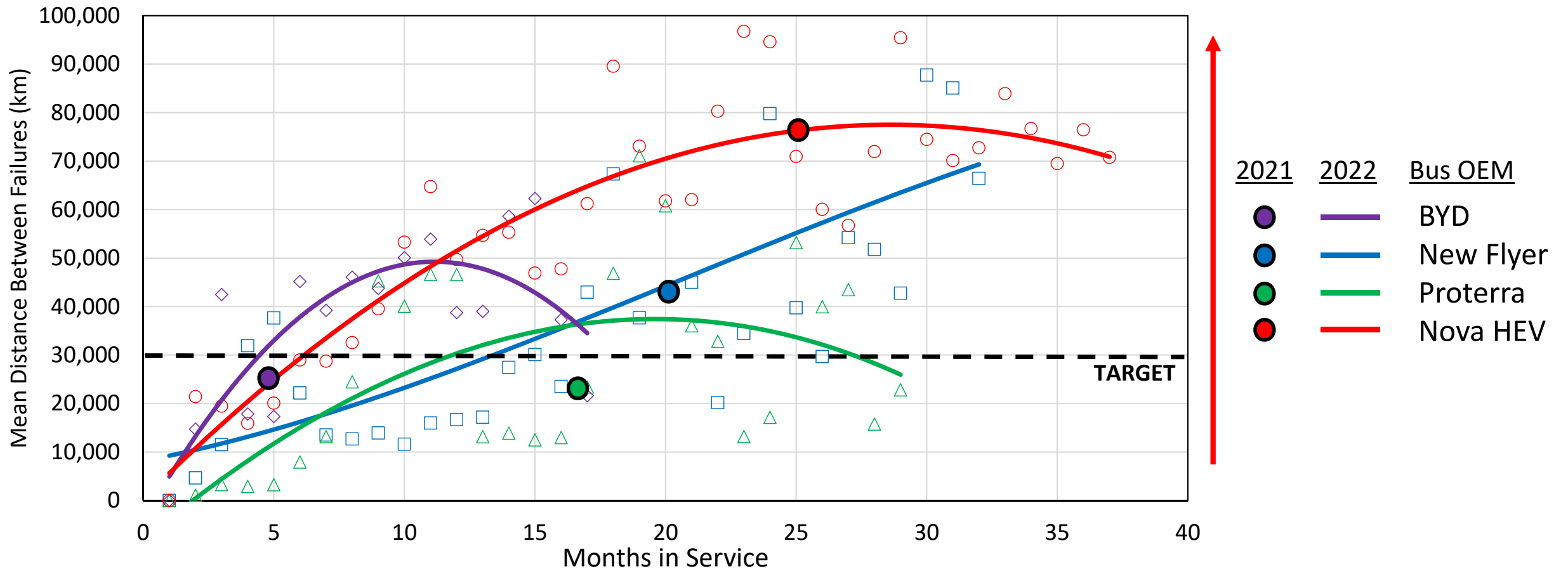
Evaluation Domains:

- Accessibility
- System Compatibility
- Customer Experience
- Operator Experience
- Maintainer Experience
- Maintainability
- Cost
- Vendor Performance
- Vehicle Performance
- Charging System Performance

eBus Head-to-Head Evaluation

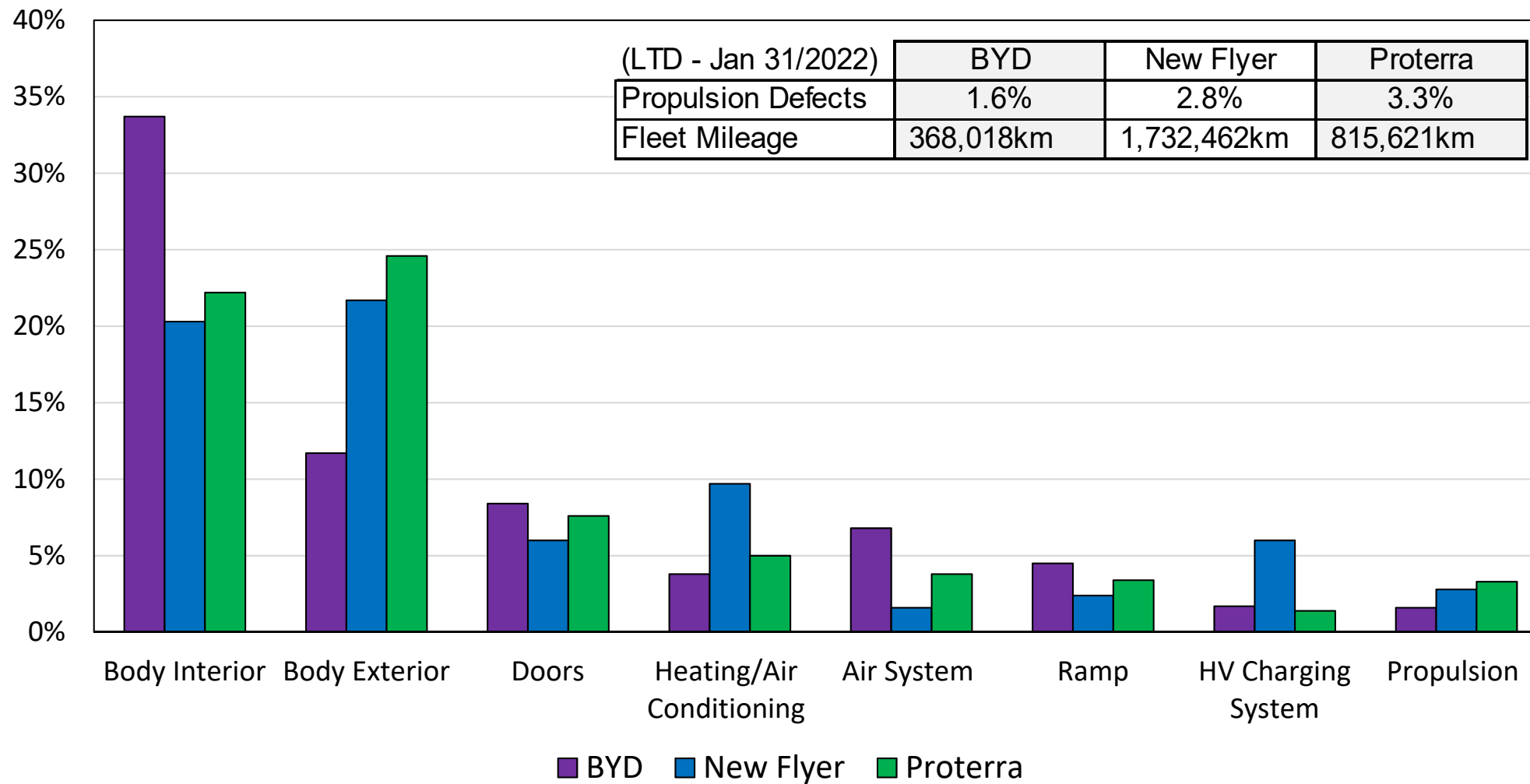
Vehicle Reliability

	Baseline	Battery-Electric Buses		
	Nova HEV	BYD K9M	NFI XE40	Proterra E2
April 2021	✓	!	✓	!
April 2022	✓	!	✓	!



Lessons Learned

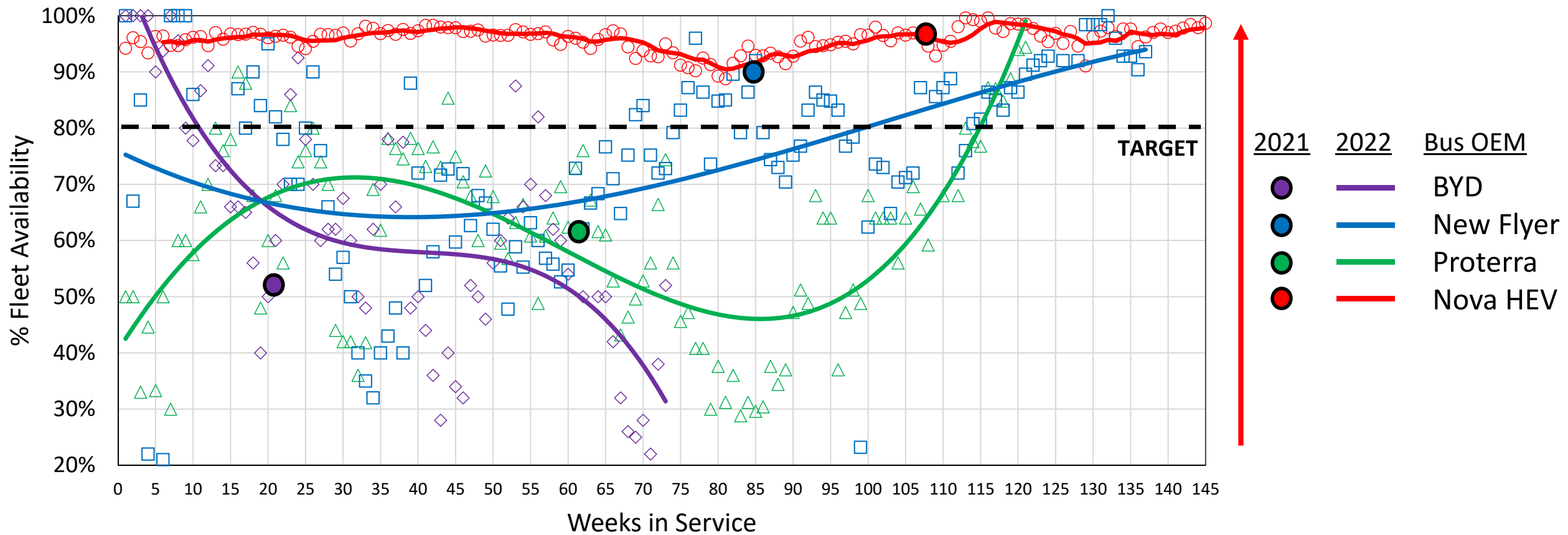
Fault Analysis – Top Defects



eBus Head-to-Head Evaluation

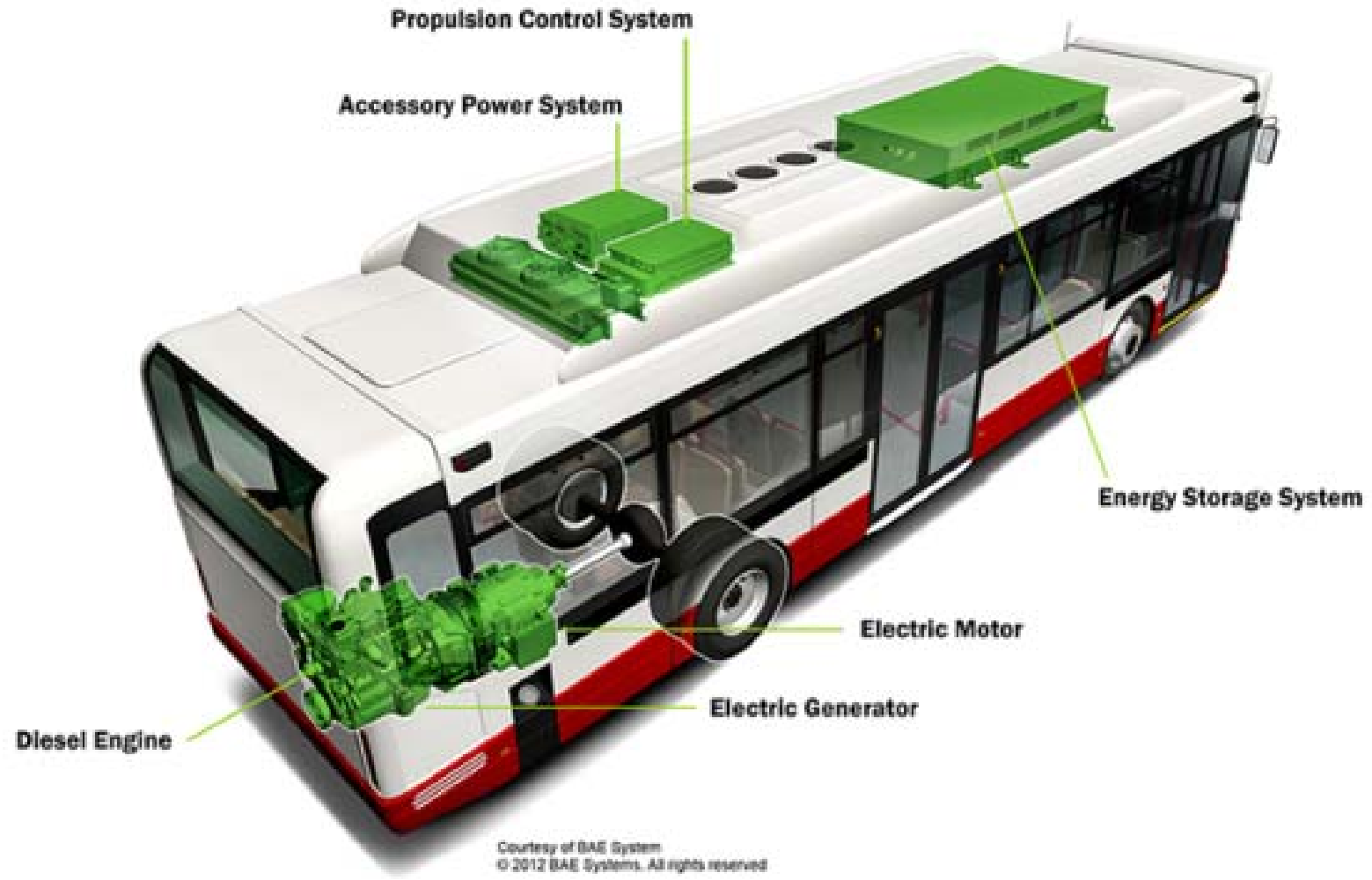
Fleet Availability

	Baseline	Battery-Electric Buses		
	Nova HEV	BYD K9M	NFI XE40	Proterra E2
April 2021	✓	!	✓	!
April 2022	✓	!	✓	✓



Lessons Learned

Need to Pre-Qualify Based on System Compatibility



eBus Head-to-Head Evaluation

Summary Results – April 2022

	BYD K9M		NFI XE40		Proterra E2		Nova HEV	
	2021	2022	2021	2022	2021	2022	2021	2022
System Compatibility	!	!	✓	✓	!	!	✓	✓
Accessibility	✓	✓	✓	✓	✓	✓	✓	✓
Vehicle Performance	!	!	⊖	✓	!	!	✓	✓
Vendor Performance	!	!	⊖	✓	!	!	✓	✓

	BYD	New Flyer	Proterra	Nova
Overall Performance	!	✓	!	✓

Legend:  Very Good  Satisfactory  Needs Improvement



Lessons Learned

TTC's Current Large-Scale Procurement Zero-Emissions Buses

- Pass / fail criteria to ensure platform that is proven in TTC's operating environment

Emerging Technologies

- Quantity of buses (40' x25)
- Minimum 'Must Have List' only
- Continue to explore developments in the electric / hydrogen bus industry

TTC's Ongoing Commitment to Learn and Share



Chair OPTA ZEB Committee (Monthly)



Chair of TTC ZEB Technical Call (Bi-Monthly)

Toronto – TTC

Maryland - MTA

San Antonio – ViaMetro

Austin – Cap

Metrolinx – MX

San Francisco – SFMTA

Boston – MBTA

Metro Los Angeles – LA Metro

Seattle – KCM

Brampton – BT

Minneapolis – Metro

Seattle – Sound Transit

Chicago – CTA

Montreal – STM

Utah – UTA

Durham Region – DRT

New York – NYCT

Vancouver – CMBC

Edmonton – ETS

Oregon – TriMet

Washington – WMATA

Foothill, CA - FT

Ottawa – OC Transpo

Woodland, CA – YCTD

Guelph – GT

Philadelphia – SEPTA

York Region – YRT

Kingston – KT

Quebec – ATUQ



| Next Steps: Green Bus Program Funding Status

Approved 10-Year Capital Budget and Plan:

- \$688.6 million for approximately 600 of the 1,826 buses required; and
- \$77.6 million toward eBus electrification infrastructure.

Unfunded 10-Year Capital Investment Plan:

- \$1.6 billion for additional 1,226 zero-emissions buses required; and
- \$579.2 million for remaining electrification infrastructure

Intergovernmental Advocacy:

Staff is actively working with its government partners to secure net new funding.

Timing of Need for Funding and the Next eBus Procurement:

Target to issue contract award in Q3 2022, following funding commitment.

Recommendation

It is recommended that:

1. Receive for information the results of the eBus Head-to-Head Evaluation as outlined in this report; and
2. Delegate authority to the TTC Chief Executive Officer to:
 - a) Enter into contribution agreement(s), where required, with government partners to receive any net new funding / financing for TTC's Green Bus program; and
 - b) Subject to commitment of matching funds from provincial and/or federal government partners, amend existing and pending contract(s) to increase the eBus procurement quantity and associated infrastructure works in proportion to the additional funds committed.





Thank you

