



TTC Green Bus Program

eBus Head-to-Head Evaluation
Preliminary Results

April 14, 2021

Bem A Case, Head of Vehicle Programs



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- 1. Overview**
- 2. eBus Head-to-Head Evaluation**
- 3. TTC-OPG-THESL Framework for Agreement**
- 4. Recommendations**

Overview

- A Clean Diesel Buses
- 1 Hybrid-Electric Buses
- 2 All-Electric Buses
- 3 Infrastructure
- 4 Business Transformation



eBus Head-to-Head Evaluation

eBus Fleet Overview



K9M



NEW FLYER

XE40



PROTERRA

E2



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:

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



eBus Head-to-Head Evaluation

System Compatibility

	Battery-Electric Buses			Baseline
	BYD K9M	NFI XE40	Proterra E2	Nova HEV
Physical Compatibility				
Charging Technology Interoperability				N/A
Corrosion Resistant Frame				

Legend:  Very Good  Satisfactory  Needs Improvement



eBus Head-to-Head Evaluation

Battery-Electric Buses

Baseline

BYD K9M

NFI XE40

Proterra E2

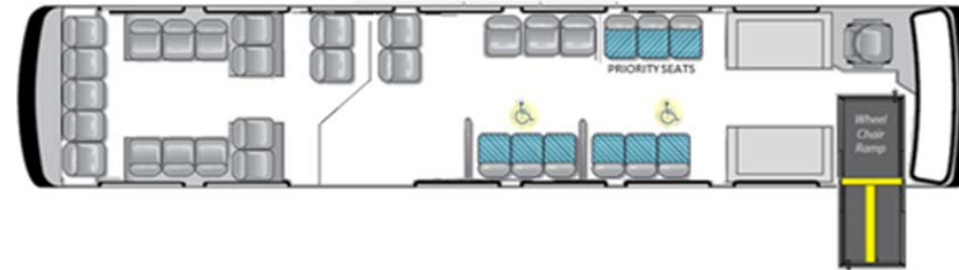
Nova HEV



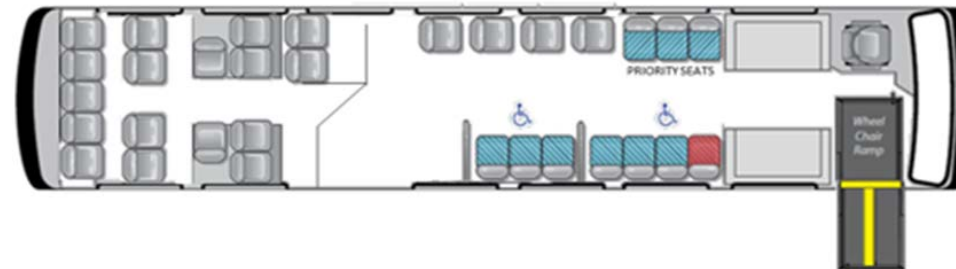
Accessibility



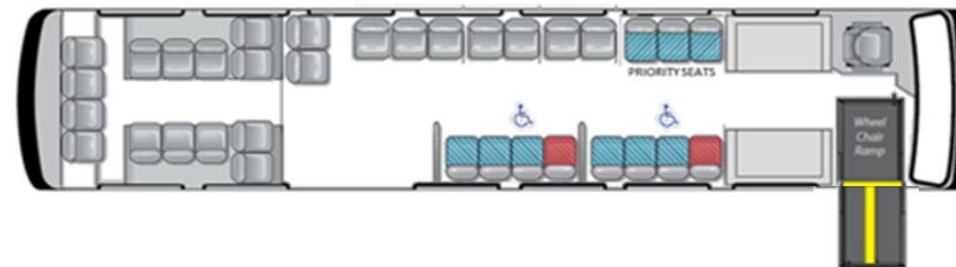
K9M



XE40



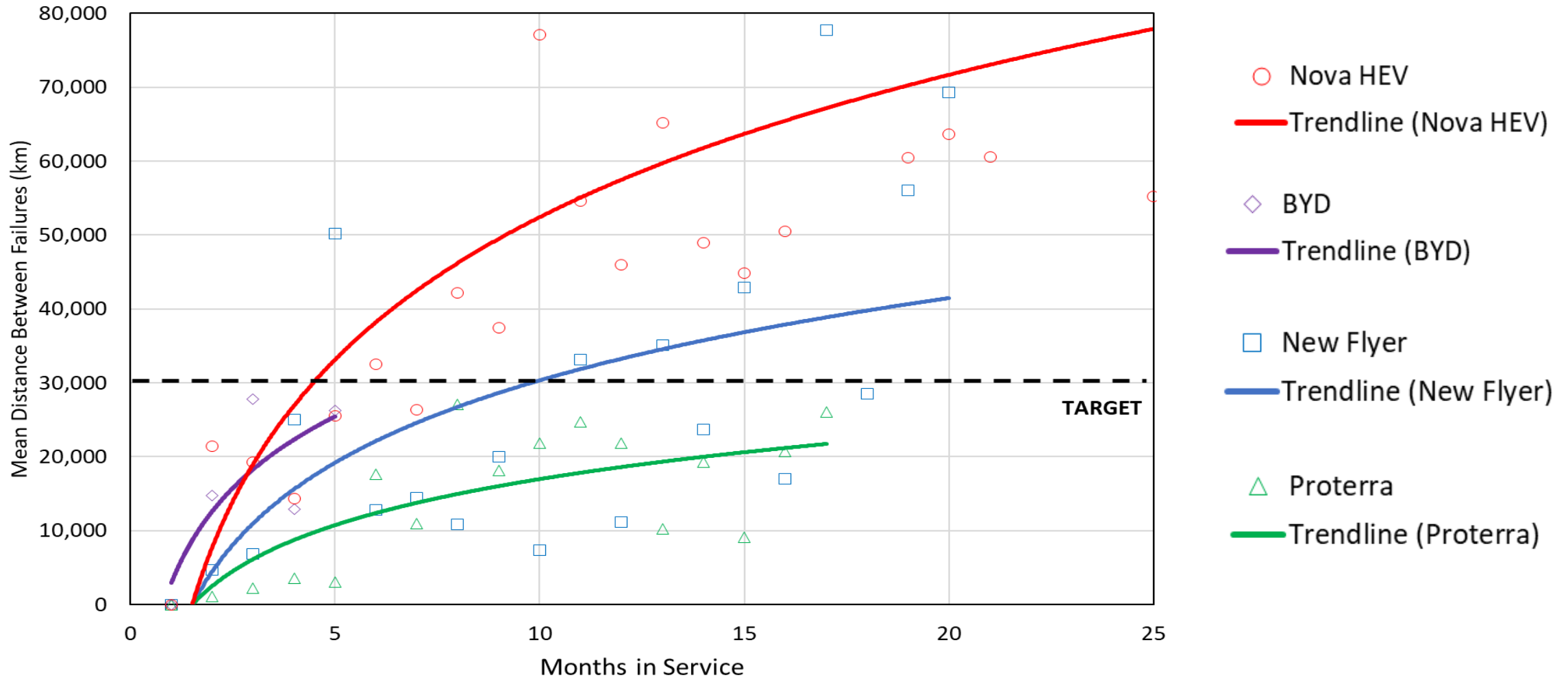
E2



eBus Head-to-Head Evaluation

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

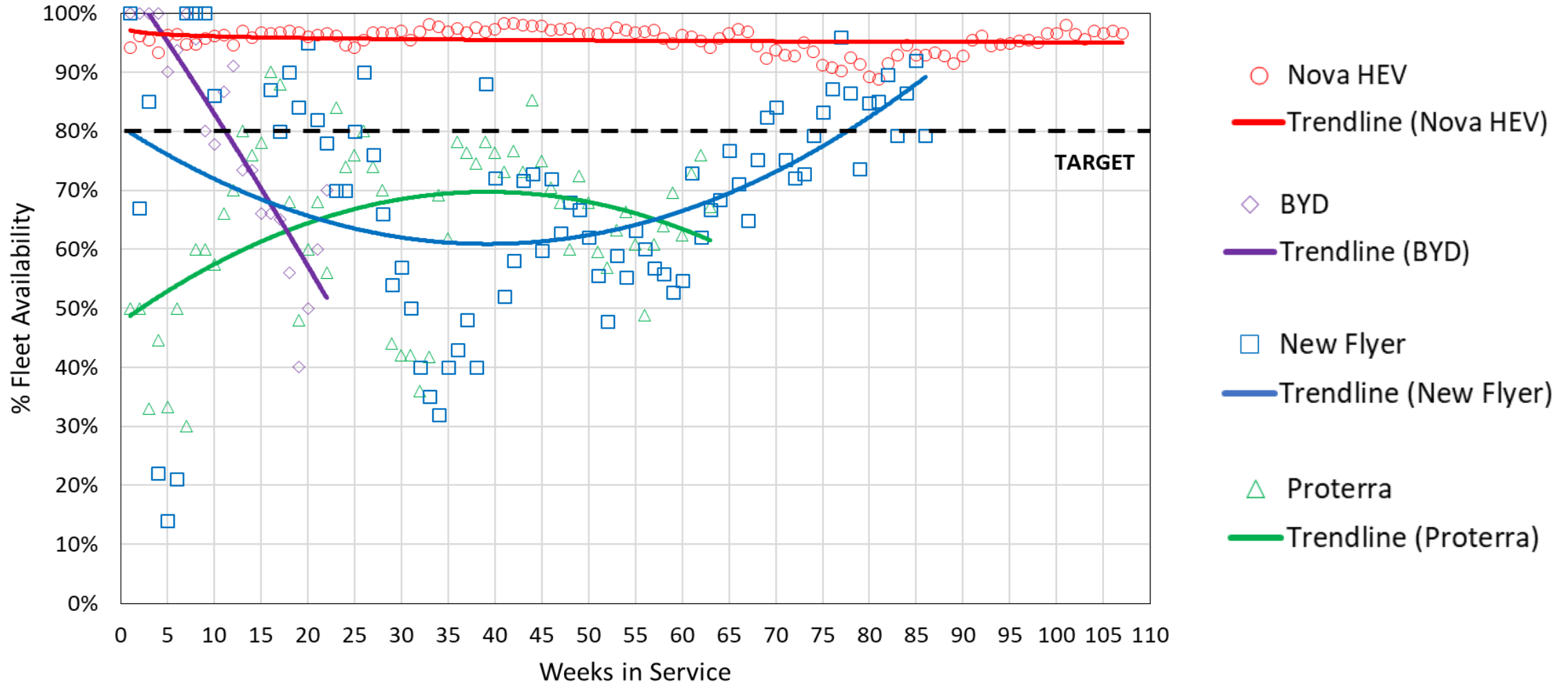
Vehicle Reliability



eBus Head-to-Head Evaluation

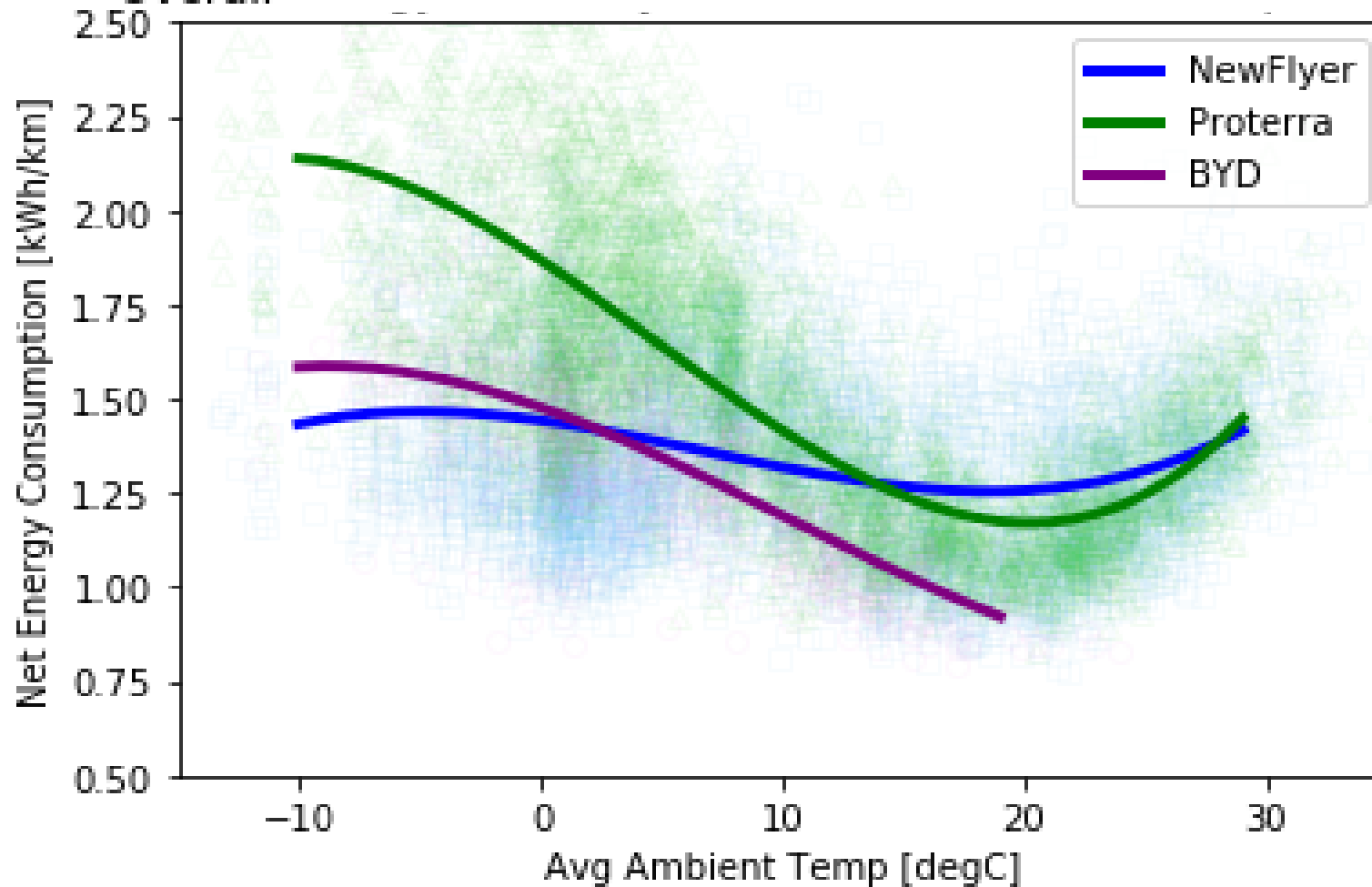
Battery-Electric Buses			Baseline
BYD K9M	NFI XE40	Proterra E2	Nova HEV
!	✓	!	✓

Fleet Availability



eBus Head-to-Head Evaluation

Energy Consumption



















Battery-Electric Buses			Baseline
BYD K9M	NFI XE40	Proterra E2	Nova HEV
!	✓	!	Not Evaluated




eBus Head-to-Head Evaluation

Summary Results

	Battery-Electric Buses			Baseline
	BYD K9M	NFI XE40	Proterra E2	Nova HEV
System Compatibility				
Accessibility				
Vehicle Performance				
Vendor Performance				

Legend:  Very Good

 Satisfactory

 Needs Improvement

Key Takeaways

- Preliminary results have successfully informed our next procurements
- Evaluation must continue with focus on improving reliability, availability, and reducing variation in energy consumption
- Industry is maturing – we expect strong competition
- Operational risk can be managed through strong commercial and technical requirements
- A negotiated request for proposal provides the flexibility required to maximize potential for meeting business objectives





Thank you

