

Zero-Emissions Bus Propulsion

CEO Recommendation

December 2023

Agenda

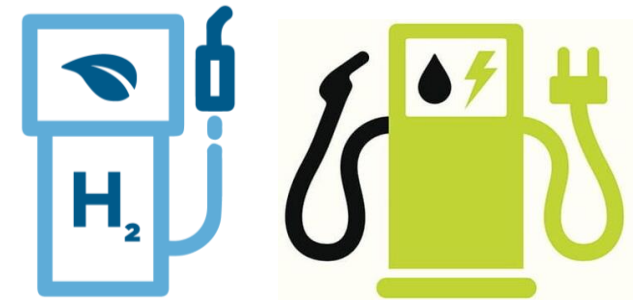
- I. Recap
 - I. Zero-emission: Hydrogen
 - II. Addition of Hybrids
- II. Next Steps & Decisions
- III. Closing
- IV. Discussion



CEO Recommendation Recap

CEO has changed recommendation to include two parts:

- **Part I:** Hydrogen Pilot
- **Part II:** Hybrid Bus Replacements (New)



Part I: Hydrogen Pilot Project

- Pilot project (4 years)
 - 2 hydrogen fuel-cell buses
 - 1 outdoor tank/fueling station
 - Workforce Training
-
- Final cost to TheRide: \$2.2 million
 - Total Cost: \$9.3 million
 - Dependent on Fed/State grant (Low-No)



Battery / Hydrogen Comparison

	<u>BATTERY</u>	<u>HYDROGEN</u>	<u>ADVANTAGE</u>
Public/political familiarity	High	Low	BEB
Future energy costs	Unknown	Unknown	TBD
Future emissions from energy production	Unknown	Unknown	TBD
Tailpipe Emissions	None	None	Tie
Expense of back-up energy supply	High	None	Hydrogen
Charging time	4 Hours	15 Minutes	Hydrogen
Range Implications	Too low	Adequate	Hydrogen
-Fleet growth (for same service)	30-40%	None	Hydrogen
-Costs for additional garage space	Very High	None	Hydrogen
-Operational complexity	High	Low	Hydrogen
-Hidden costs	Likely	None	Hydrogen
Expensive garage modifications	Yes	Yes	Tie
Risk of fire	High	Low	Hydrogen
Risks to passenger services (via operating costs)	Mid	None	Hydrogen
Speed of Implementing	2+ years	2+ years	Tie
Costs for small deployment	Lower	Higher	BEB
Costs for large deployment (ie scalability)	High	Lower	Hydrogen

Public feedback: What We Heard

11 comments (10 in October)

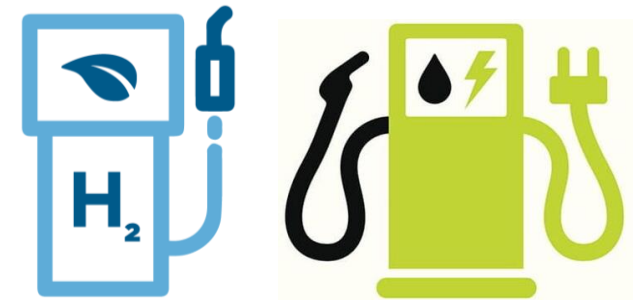
- Service-first (4), pro ZEB (2)
- Pro hydrogen (1), BEB (1), unclear (2), Trolley-bus (1)
- Other: Go faster (1), Pro pilot (1),
- Little social media feedback (3 posts)
- Have not heard from any elected officials or institutions
- No sign of huge interest or political pressure



CEO Recommendation Recap

CEO has changed recommendation to include two parts:

- **Part I:** Hydrogen Pilot
- **Part II:** Hybrid Bus Replacements (New)
- Why the change?



Part II: Hybrid (Diesel/Electric)

What is a hybrid diesel/electric bus?

- Small motor charges battery
- Mechanically better than early hybrids
 - Engine off much of time
 - Batteries better
 - Problematic components engineered out
- No range limits, facility upgrades, new skills or tools
- About 25% less emissions than diesels, older hybrids
- About 25% more expensive than diesels. Still cheaper than ZEBs.



Part II: Hybrid (Diesel/Electric)

Initial Recommendation:

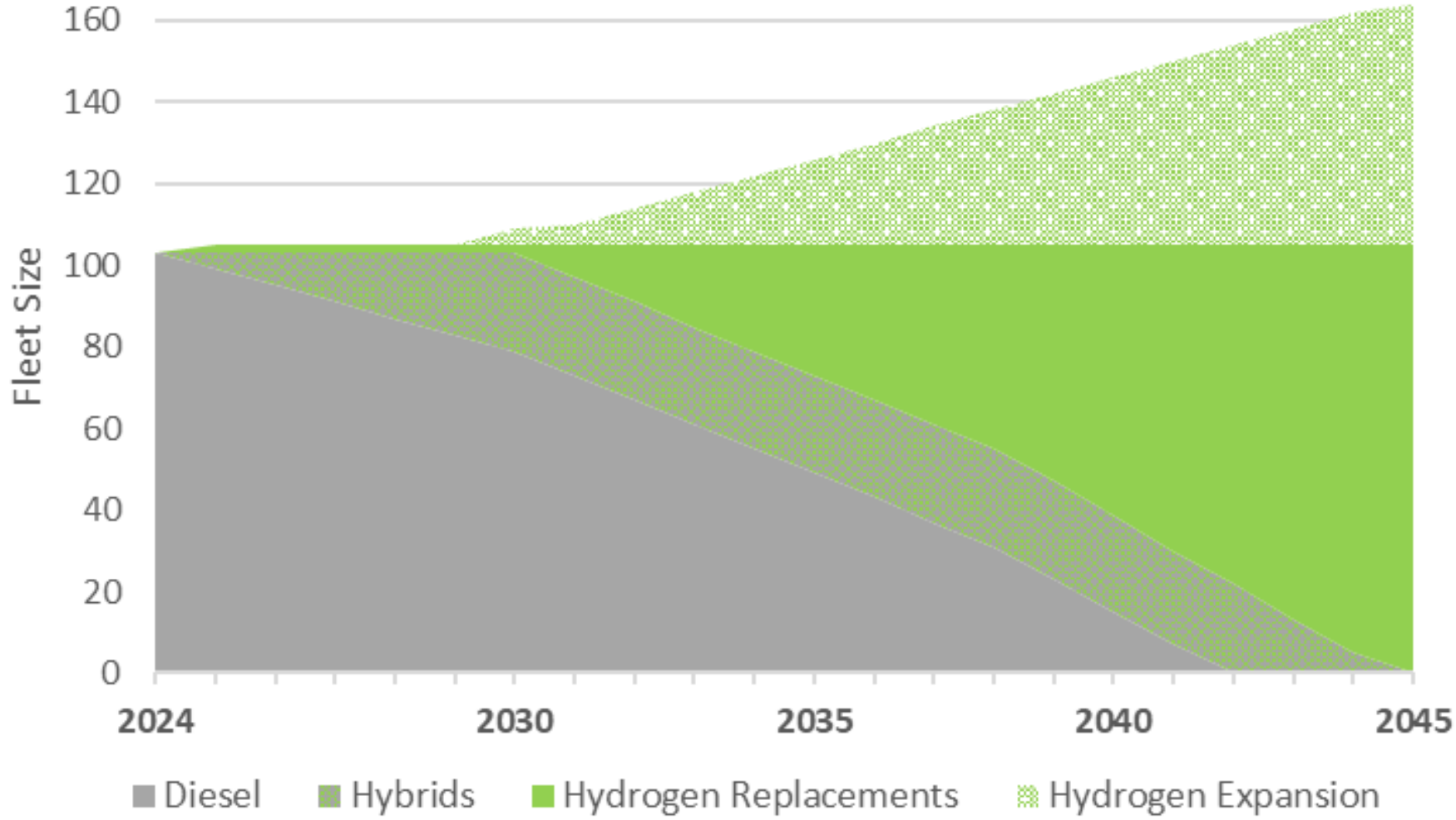
- Replace old buses w/diesels during pilot
- Lower total cost, but no outside grants

New approach:

- Replace w/ hybrids not full diesel
- Outside funding is high
- More emission reductions faster



Bus Fleet by Propulsion Type (Example)



Part II: Hybrid (Diesel/Electric)



Strong financial incentive

- Two funding pots:
 - Formula capital and Low-No grant (competitive)
 - Low-No will pay 80% of hybrids but not diesels
 - Could pay 100% of diesels from formula, or 10%-20% for hybrids (new money) freeing up formula funds
- \$2.4m from Capital Reserve for hybrids frees up \$12m (1:6 ROI)
- Supports other capital projects, pays for hydrogen pilot



Estimate of Capital Funding Impact of Hybrid Bus Replacement

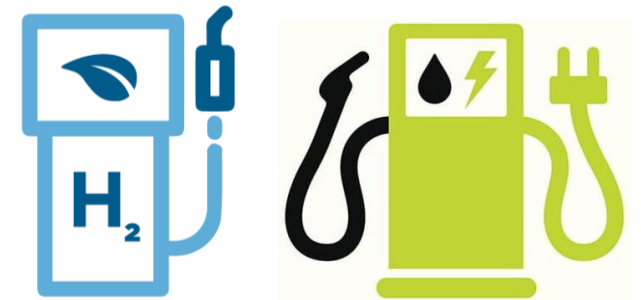
(\$ in thousands)

	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	Total
Number of Buses	4	4	4	4	4	20
Diesel Replacement Scenario						
Cost Per 40' Diesel Bus	\$ 750	\$ 810	\$ 870	\$ 940	\$ 1,020	
Total Bus Cost	\$ 3,000	\$ 3,240	\$ 3,480	\$ 3,760	\$ 4,080	\$ 17,560
<i>Funding Sources</i>						
<i>Federal Formula Funding (5307), 80%</i>	\$ 2,400	\$ 2,592	\$ 2,784	\$ 3,008	\$ 3,264	\$ 14,048
<i>State Match, 20%</i>	600	648	696	752	816	3,512
Hybrid Replacement Scenario						
Cost Per 40' Hybrid Bus	\$ 1,020	\$ 1,100	\$ 1,190	\$ 1,290	\$ 1,390	
Total Bus Cost	\$ 4,080	\$ 4,400	\$ 4,760	\$ 5,160	\$ 5,560	\$ 23,960
<i>Funding Sources</i>						
<i>Federal Low-no Funding Opportunity, 80%</i>	\$ 3,264	\$ 3,520	\$ 3,808	\$ 4,128	\$ 4,448	\$ 19,168
<i>State Match, 10% (TBD, could be up to 20%)</i>	408	440	476	516	556	2,396
<i>Local Funding, 10%</i>	408	440	476	516	556	2,396
Summary of Impacts to Capital Funding						
Federal Formula Funding Decommited	\$ 2,400	\$ 2,592	\$ 2,784	\$ 3,008	\$ 3,264	\$ 14,048
Local Funding Cost (<i>likely the Capital Reserve</i>)	(408)	(440)	(476)	(516)	(556)	(2,396)
Net Additional Funding Available for Capital Projects	\$ 1,992	\$ 2,152	\$ 2,308	\$ 2,492	\$ 2,708	\$ 11,652

CEO Recommendation Recap

CEO has changed recommendation to include two parts:

- **Part I:** Hydrogen Pilot
- **Part II:** Hybrid Bus Replacements (New)



Summary of Estimated Zero and Low Emissions Project Costs and Funding Sources

(\$ in thousands)

Funding	Federal	State	Local	Total
Zero Emissions - Hydrogen Fuel Cell Bus Project				
Capital Costs	\$ 7,113	\$ -	\$ 1,778	\$ 8,891
Operating Costs*	-	-	452	452
<i>Subtotal</i>	<u>\$ 7,113</u>	<u>\$ -</u>	<u>\$ 2,230</u>	<u>\$ 9,343</u>
Low Emissions - Hybrid Bus Replacements				
Capital Costs	\$ 19,168	\$ 2,396	\$ 2,396	\$ 23,960
Operating Costs	-	-	-	-
<i>Subtotal</i>	<u>19,168</u>	<u>2,396</u>	<u>2,396</u>	<u>23,960</u>
Total Zero and Low Emissions				
Capital Costs	\$ 26,281	\$ 2,396	\$ 4,174	\$ 32,851
Operating Costs	-	-	452	452
<i>Total</i>	<u>\$ 26,281</u>	<u>\$ 2,396</u>	<u>\$ 4,626</u>	<u>\$ 33,303</u>

*Local operating costs do not reflect the impact of state funding for eligible operating expenses.



Agenda

- I. Recap
 - I. Zero-emission
 - II. Addition of Hybrids
- II. Next Steps & Decisions
- III. Closing
- IV. Discussion



Decision Timeline (Not Tonight)

1. **January 2024:** Congress appropriates grant funds. Initial Board Decision (AAATA)
2. **February:** Grant opens
3. Feb-March: Final Board approval
4. March: Staff submits application
5. **April:** Grant Deadline
6. **July-Oct:** Grant Awards
7. **Post Fed Award:** MDOT finalizes their local share. AAATA Costs finalized



Board options

Board can:

- A. Approve CEO Recommendation
- B. Modify recommendation
- C. Create new direction
- D. Defer decision



Board Authorizations

January 2024:

Need soft decision on scope and costs

1. To submit a construction grant
2. To use Capital Reserve in future (2.5.7)

Feb/March 2024:

Firmer financial commitment to feds

3. Approve “Transition Plan”



Closing

- Deadlines approaching but still time for deliberation
- Board has choices, staff need clear decision
- Hard to set priorities, judge risk in fast changing and uncertain times



Closing

CEO Recommendation

- Staff are confident and in agreement
- Hydrogen is best option
 - Visible zero-emission progress
 - Better chance for full deployment
 - Risks and impact to other priorities reduced
- More emissions reductions sooner
- Improved financial benefit
- Best policy compliance



Continuing Public Feedback

- Visit www.TheRide.org for information and feedback opportunities
- Submit written comments via web form or email
- Attend TheRide board meeting to make public comment



Zero-Emissions Bus Propulsion

CEO Recommendation

December 2023