



LAVTA ZEB Transition Study Update

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CARB Innovative Clean Transit Regulation

100% ZEB Fleet by 2040 is not a mandate, but a goal

There is only a *purchasing* mandate:

ZEB Purchase Requirements

Starting January 1	ZEB Percentage of Total New Bus Purchases
2026	25%
2027	25%
2028	25%
2029	100%

- Small CA Transit Agencies (<100 buses) are required to submit a board-approved ZEB Rollout Plan by **July 1, 2023**.

Battery Electric Buses & Fuel Cell Electric Buses

Battery Electric Buses (BEB)

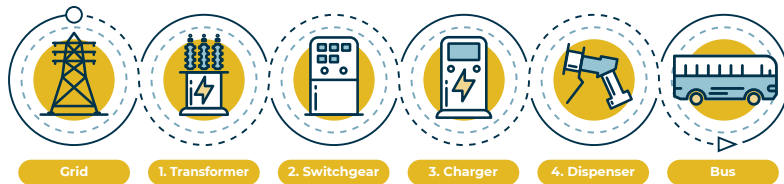
- May need to increase fleet size
- Fueling time longer than ICE* bus
- Fuel cost highly variable could be higher or lower than fossil fuels
- BEB bus cost approximately 50% higher than LAVTA diesel bus
- Infrastructure costs increases per bus when scaled up

*Internal Combustion Engine

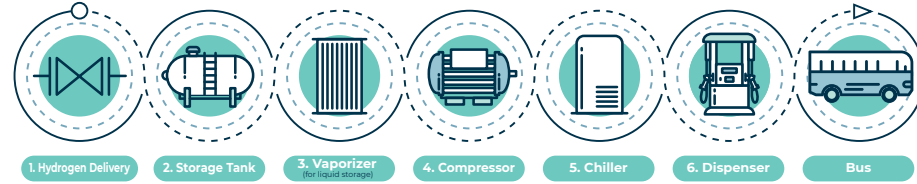
Fuel Cell Electric Buses (FCEB)

- Comparable range to ICE bus – 1:1 replacement ratio
- Fueling time comparable to ICE bus
- Fuel cost moderately higher than fossil fuel
- Bus cost 70% higher than LAVTA diesel bus
- Infrastructure costs reduce per bus when scaled up
- Greater resilience

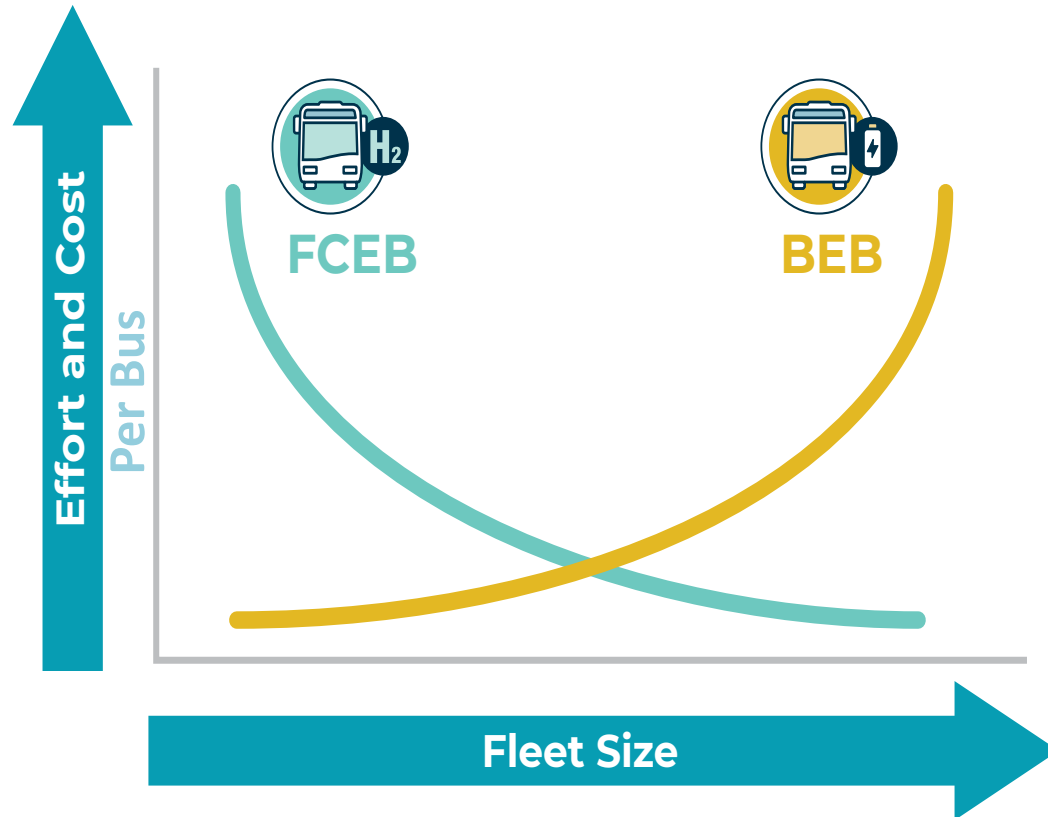
BEB Fuel Delivery Pathway



FCEB Fuel Delivery Pathway

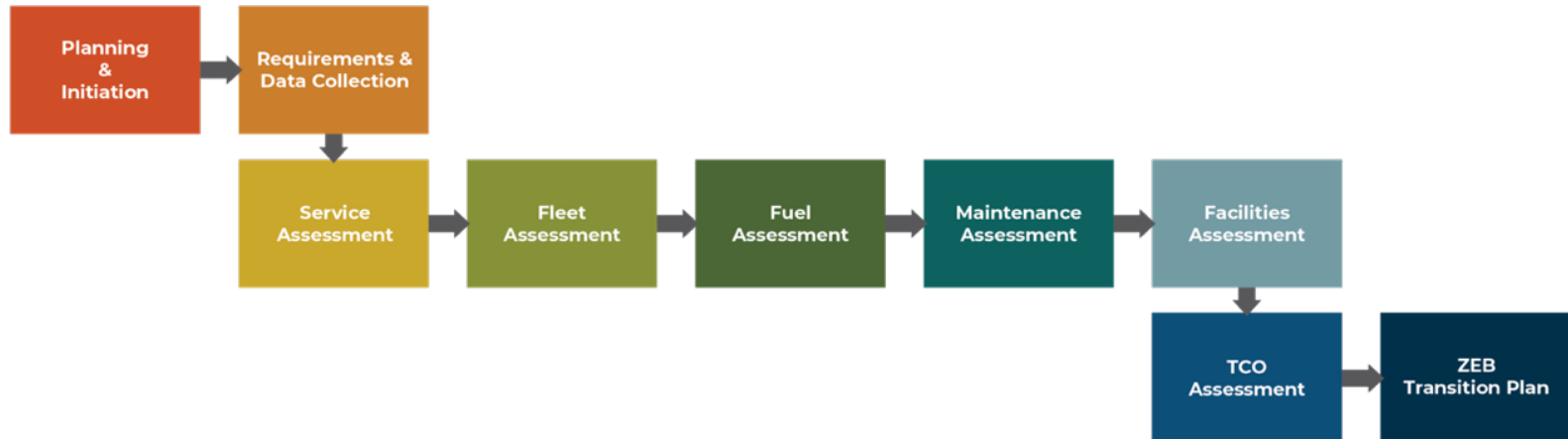


ZEB Infrastructure Scalability

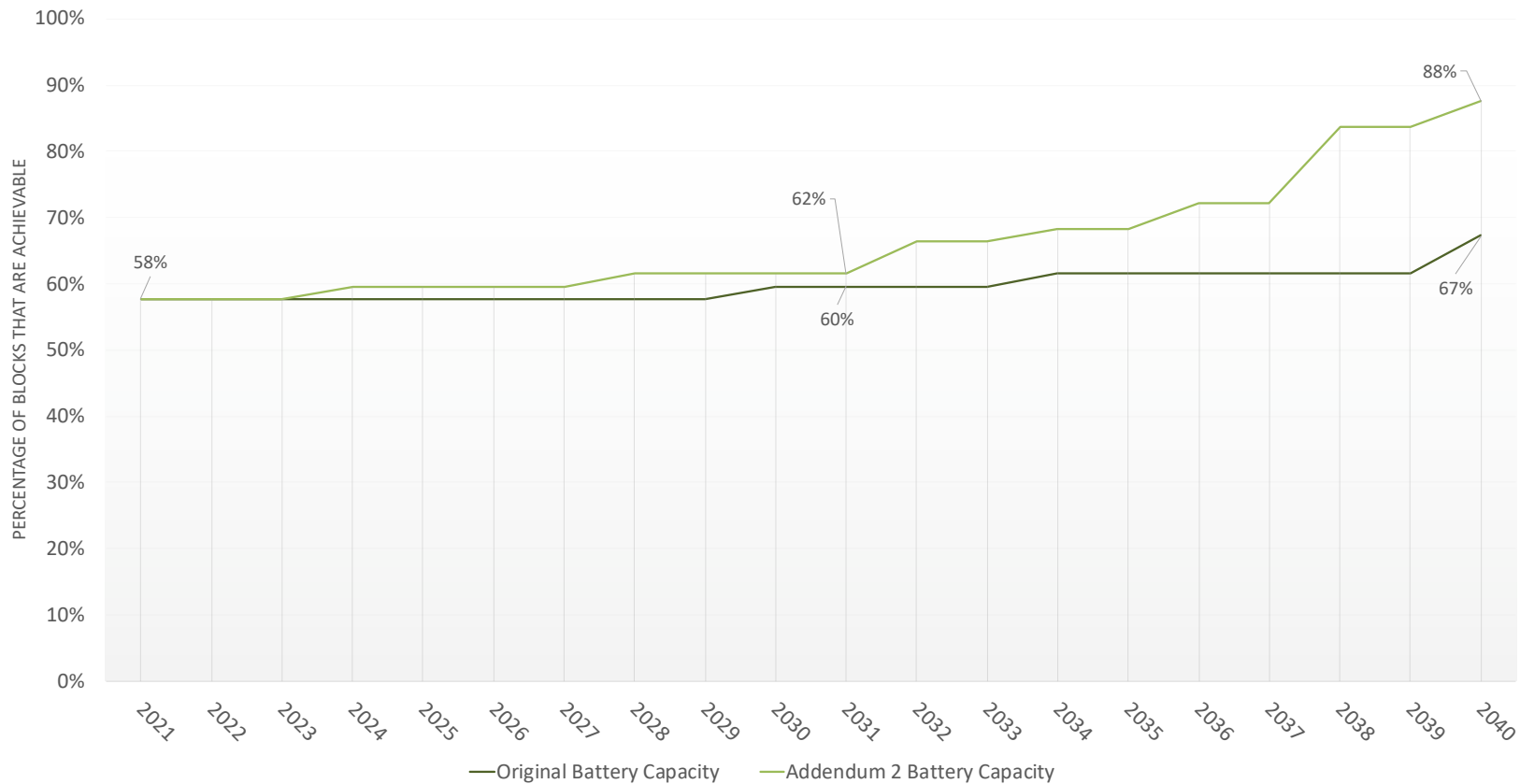


- FCEB: High initial cost for H2 fueling stations can be leveraged over many buses in larger fleets
- BEB: More equipment and infrastructure is needed to support larger fleets

ZEB Transition Methodology



Overnight Depot-Charged BEB Service Feasibility



ZEB Technology Fleet Transition Scenarios

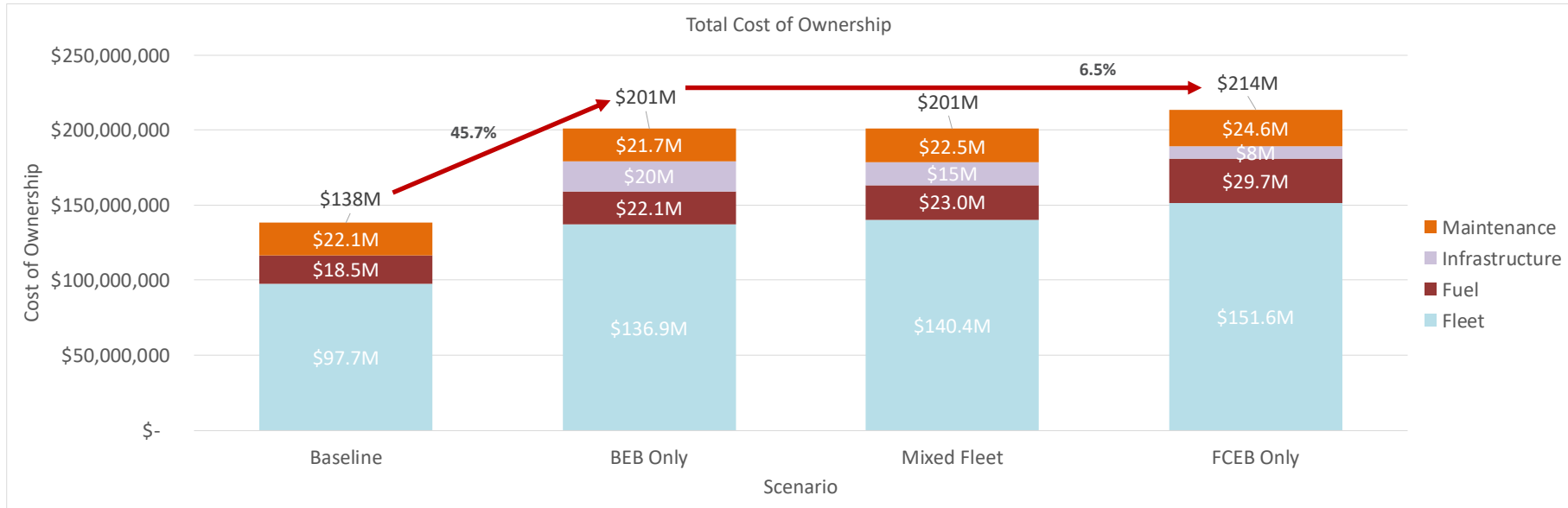


Additional ZEB technology solutions are required to achieve a 100% zero-emission fleet transition

- Depot & on-route charged battery-electric buses (BEBs)
- Depot charged battery-electric buses (BEBs) & fuel cell electric buses (FCEBs)
- Fuel cell electric buses (FCEBs) only

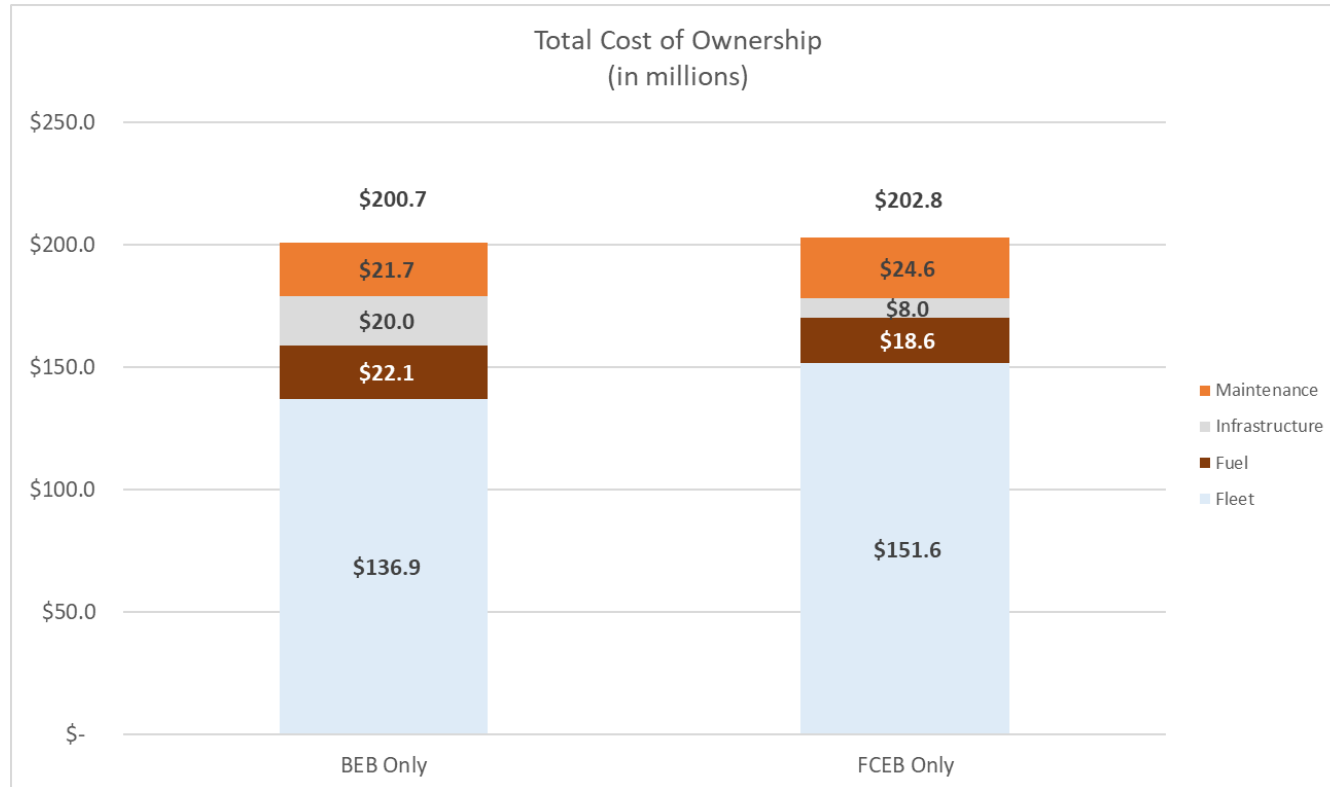
Total Cumulative Capital & Operating Costs

All Scenarios, 2021-2040



Total Cumulative Costs - Adjusted

BEB VS FCEB, 2021-2040



Staff Recommendation: FCEB

- More flexibility in deployment of fleet
- Higher reliability rate (57% BEB vs 90% FCEB)*
- General consensus is that hydrogen fuel prices will trend lower in next decade, with growing opportunities for green hydrogen. Opportunities to collaborate with Valley Link project.
- Greater chance of fleet deployment following a major disaster.
- Less infrastructure needed at Atlantis and transit centers

* AC Transit ZETBTA report (Part 1)



Hydrogen Transition Timeline

- [LAVTA Roadmap to H2 infographic](#)



Next Steps

- January 10 – Livermore City Council presentation
- January 24 – Project and Services Committee
- February 7 – Board of Directors Meeting: Zero-emission transition scenario selection
- **April 4** – Board of Directors Meeting: ICT Rollout Plan Final and Approval by Board

Questions?

