Zero Emission Bus Program Update

May 2023

Background

- In 2018, The California Air Resources Board's (CARB) Innovative Clean Transit (ICT) regulation mandated that all transit agencies in the state operate all-zero emission (ZE) fleets by 2040.

- In July 2017, Metro's Board of Directors approved Motion #50 (File 2017-0524) which endorsed a ZEB Strategic Plan (SP) to transition the entire bus fleet to zero-emissions bus (ZEBs) by 2030, contingent on:
  - envisioned cost and performance equivalence with compressed natural gas (CNG) buses as a result of continued advancements in battery-electric bus (BEB) technology.

- Given the current status of the ZEB industry, staff finds that these program challenges (i.e., costs, performance, electrical grid capacity, supply chain and utilities' lead times, and market availability) are exacerbated by trying to achieve a full transition by the 2030 target date.

- Shifting the program implementation from **2030** to no later than **2035** will help mitigate above challenges by allowing grid capacity to develop and technology to mature. There is no anticipation of procuring additional CNG buses.

Accomplishments to Date

Metro has embarked on the most extensive ZEB transition program outside of Asia. To date, Metro has made significant progress in transitioning to ZEB service:

- Metro's G (Orange) Line BRT initiated 100% ZE service at the start of 2021; 3 million revenue miles.
- 145 BEBs have been ordered, one of the most significant BEB procurements to date in CA and among the three largest in the country
- 50 BEBs have been delivered
- By the end of 2023, Metro will have the most BEBs in active service in U.S.
- In January 2023, the Metro Board authorized the solicitation of a Request For Proposal (RFP) of 260 additional BEBs and associated charging infrastructure.
- Secured to date $413.1 million in ZEB-related federal and state grant funding
- One of the largest Low-Emission/No-Emission grants in this federal program's history ($104.1 million awarded in 2022).
- Significant investments in workforce development.
- Developing a manufacturing careers policy and implementing advanced training for operators and maintainers specific to BEB technology.

Challenges

Despite the significant progress made to date, staff has found that the ZEB industry is still evolving and not sufficiently mature to allow for full implementation by 2030 without risk to service.

To date, ZEBs, whether BEBs or fuel cell electric buses (FCEBs), have not achieved parity with CNG buses, either in terms of performance or cost.

Key areas where issues arise include:

- ZEB Cost
- Utility Infrastructure
- ZEB Performance

ZEB Costs

- ZEBs are more expensive than CNG buses, and the new infrastructure required to support ZEBs requires a large initial capital investment.

Challenges

Utility Infrastructure Challenges

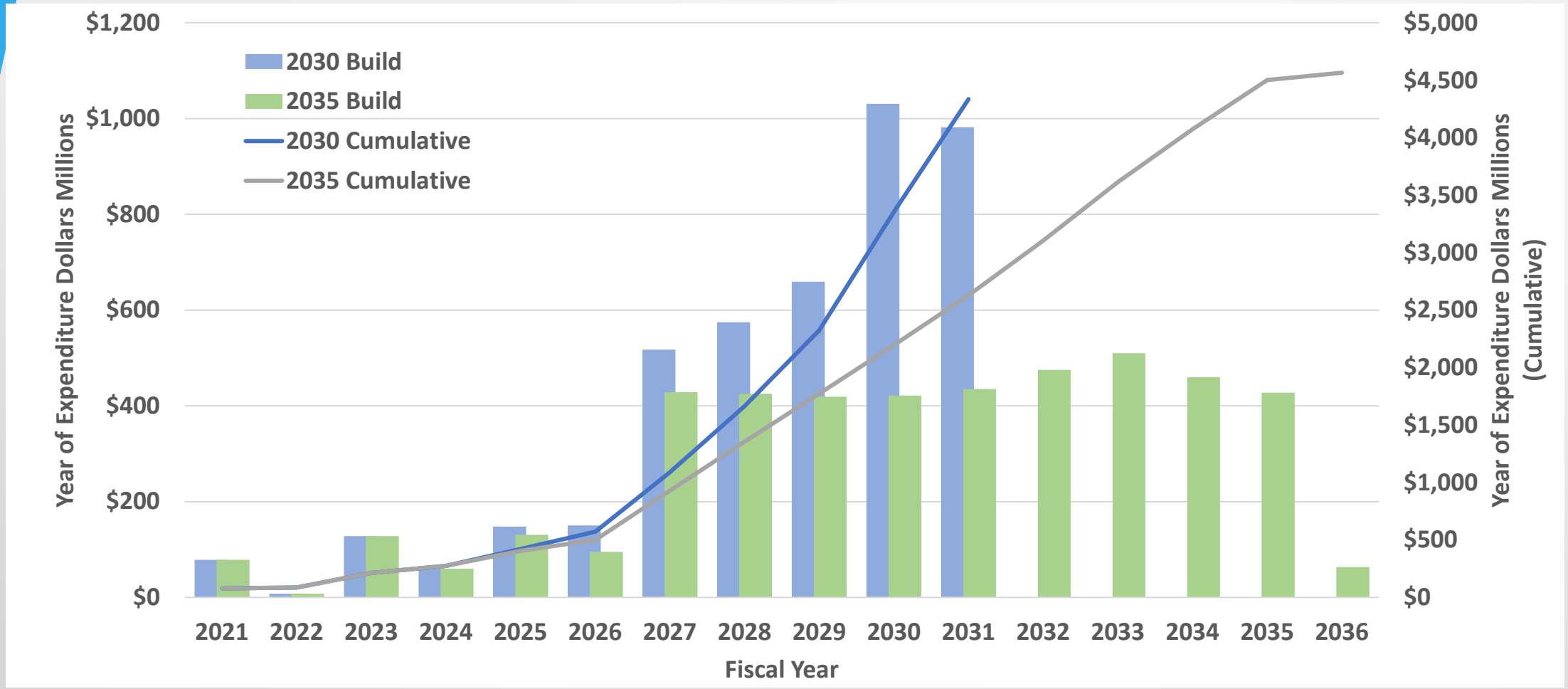
- **Grid capacity** - Studies have shown that the entirety of the California electrical grid is undersized and not ready to support a large-scale adoption of ZE vehicles.
- **Long lead times for grid upgrades** - Utilities anticipate five to seven years to complete upgrades.
- **Market availability** - Supply chain issues and constraints are currently impacting the timelines to deliver ZEBs and their supporting infrastructure.

ZEB Performance

- **Range** - Current BEBs have an operable range of 150-160 miles.
- **Reliability** - Metro continues to experience integration issues between new and existing battery systems and interfaces between the bus charging rails and pantographs, leading to premature failures of components, such as belt drives and bearings.
- **Maintainability** - Agencies rely on remote subject matter experts to investigate and mitigate failures, leading to longer out of service times.
- **Operability** - BEBs are not as user-friendly to operate as Metro's legacy fleet.

Obsolescence - As technology advances, parts, models, and other seemingly new equipment are rapidly becoming replaced - and in some cases, obsolete

2030 and 2035 – Programmatic Cost Impacts



(YOE millions)	2030 Goal	2035 Goal
Net Total Capital Costs	$4,336	$4,447
Average Annual Capital Costs	$542	$342

2035 reduces annual expenditure need by $200M per year with little overall program impact.

Summary

An additional five transition years:

- Gives utilities additional time to ensure Metro has needed grid capacity and reliability at divisions
- Results in lower average annual capital cost:
  - Reduces the annual expenditures by about $215M per year
- Better capitalizes on technological advancement and better range:
  - Potential cost savings due to a reduced need for infrastructure
  - Better capitalizes on lessons learned from earlier deployments (still learning from G and J Line deployments)
  - Savings could be as high as $119 million based on preliminary analysis
- Flattens out/evens out procurement of vehicles:
  - 2030 requires retiring buses earlier than 12 year FTA useful life
  - Spikes in procurement require significant increase in staffing to deliver on multiple projects at the same time
- Provides additional time to explore alternative options to CNG buses such as Hydrogen Electric Buses, installation of temporary charging infrastructure, and, if needed, extending the life of our CNG buses.

Questions?