

# ALAMEDA-CONTRA COSTA TRANSIT DISTRICT



## STAFF REPORT

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**MEETING DATE:** 1/25/2023

**Staff Report No.** 23-014

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**TO:** AC Transit Board of Directors  
**FROM:** Michael A. Hursh, General Manager/Chief Executive Officer  
**SUBJECT:** Zero Emission Transit Bus Technology Analysis

### BRIEFING ITEM

**AGENDA PLANNING REQUEST:** ☐

**RECOMMENDED ACTION(S):**

Consider receiving a report on AC Transit's Zero Emission Transit Bus Technology Analysis covering a performance period from January to July 2022.

Staff Contact:

Ramakrishna Pochiraju, Executive Director of Planning & Engineering  
Salvador Llamas, Chief Operating Officer

**STRATEGIC IMPORTANCE:**

Goal - Environmental Improvement  
Initiative - Zero Emission Programs

AC Transit's Zero Emission Transit Bus Technology Analysis (ZETBTA) guides the District's transition to 100% Zero Emission Bus (ZEB) fleet by 2040.

**BUDGETARY/FISCAL IMPACT:**

There are no budgetary or fiscal impacts directly related to this report.

**BACKGROUND/RATIONALE:**

AC Transit is committed to transition its bus fleet to 100% zero emissions by 2040. In order to effectively deliver on that goal, a thorough analysis of various commercially available ZEB technologies is needed to help assess which ZEB technology can best meet the operational requirements of the District while being financially efficient and sustainable. AC Transit has made significant investments by being a leader in the early adoption of ZEB technology, which created a distinct advantage for the District. As a result, AC Transit emerged as a vanguard in both testing and comparing the costs and results of various conventional and zero-emission fuel technologies in a public transit environment.

### **Zero Emission Transit Bus Technology Analysis Overview**

This report is the fourth volume of AC Transit's data gathering and research to meaningfully analyze the

various transit bus technologies that the District operates. The study includes results from the fuel-cell electric bus (FCEB), battery electric bus (BEB), diesel hybrid bus, and conventional diesel bus technologies. The analysis is the first ever true, side-by-side evaluation of ZEB technologies operated by the same agency, in the same service environment, with ZEBs from the same bus manufacturer, and compared to conventional fleets.

When selecting cost and performance data to include in this analysis, AC Transit carefully considered key performance indicators (KPI) that align with the Strategic Plan and ZEB Transition Plan. The study evaluates capital and operational costs, environmental benefits, suitability for various types of transit service, maintenance requirements, and reliability of the buses and associated fueling or charging infrastructure. The District integrated lessons learned, and best practices gleaned from deploying ZEB technologies, including developing innovative workforce training programs, data integration and management, and transit deployment viability.

To ensure transparency and quality of the data, analysis methodology, and performance statistics results, AC Transit continues its partnership with Stanford University's Precourt Institute for Energy to provide an independent third-party evaluation of the data and methodology used in the report.

#### **ZETBTA Volume 4 Performance Results (Jan to July 2022)**

Volume 4 of the Zero Emission Transit Bus Technology Analysis is an enhanced version from the previous publication. The additional results presented in this reporting period include the following that are key takeaways from the initial report:

1. The District updated its ZEB Transition Plan to meet requirements established in the Bipartisan Infrastructure Law (BIL) and type of technology replacement based on the ZETBTA cost/ performance data.
2. Workforce training has achieved over 25 thousand hours of instruction on ZEB technology and is moving forward with testing mixed reality systems (virtual and augmented reality) to engage workforce in the learning process.
3. Infrastructure upgrade at Oakland (Division 4) will create the capacity necessary to support our 2040 planned inventory.
4. Continued cost increases for the diesel, hydrogen, and electricity energy sources.
5. Summary comparison of the 4 volumes added to the appendix with a corrigendum on corrective action on data issues.

Performance of the bus fleet control group is summarized in Figure 1: 5X5 Vehicle Matrix on page 3 of the attached report, which highlights results of the 5x5 fleet and is supported by the additional data summaries throughout the report. The data concludes, during the review period, the diesel fleet generated the highest mileage and had the highest availability. The BEB fleet was the most reliable with one road call and had the lowest cost per mile. The Legacy FC fleet has the highest life-to-date miles of the control fleet which impacts its performance with reliability and cost per mile.

The report includes an appendix that compares the data summary figures from the previous versions. The corrigenda section outlines the improvements to the data integration and analytics models and processes since the start of the 5x5 study.

Staff recognizes there is a vast difference with technology maturity between the various fleets included in the study and acknowledges initial results may not reflect what develops over time. AC Transit will continue to deploy the ZETBTA control fleet and provide an annual report for the 2022 calendar year targeted for delivery in the summer of 2023. Future reports may also include data sets on other ZEB fleets outside of the control group.

#### **ADVANTAGES/DISADVANTAGES:**

The advantage of the Zero Emission Transit Bus Technology Analysis is that it provides a thorough evaluation of the financial and operational impacts of various ZEB technologies to help inform AC Transit decision making on how to deliver an effective ZEB Transition Plan.

There are no disadvantages to receiving this report.

#### **ALTERNATIVES ANALYSIS:**

Staff found no practical alternatives to the course of action recommended in this report.

#### **PRIOR RELEVANT BOARD ACTION/POLICIES:**

Staff Report 22-308: Zero Emission Transit Bus Technology Analysis Volume 3

#### **ATTACHMENTS:**

1. AC Transit Zero Emission Transit Bus Technology Analysis Volume 4

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#### **Approved/Reviewed by:**

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