

# ALAMEDA-CONTRA COSTA TRANSIT DISTRICT



## STAFF REPORT

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**MEETING DATE:** 6/22/2022

**Staff Report No.** 22-308

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

### BRIEFING ITEM

#### **RECOMMENDED ACTION(S):**

Consider receiving a report on AC Transit's Zero Emission Transit Bus Technology Analysis covering a performance period from July to December 2021.

#### **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 third 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 to provide an independent third-party evaluation of the data and methodology used in the report.

### **ZETBTA Volume 3 Performance Results (July to December 2021)**

Volume 3 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. Advancements in workforce development will explore new learning technologies in applying augmented reality systems to complex fuel cell maintenance tasks that will help determine the efficacy of on-the-job learning via live, instructor-guided virtual access to work tasks in real-time.
2. Information on the battery charging communication issues
3. Capacity increase from 65 to 85 buses per fueling window with the dual piston pump hardware for future hydrogen station investments
4. Expired Low Fuel Carbon Standard credits that offset the hydrogen fuel costs
5. Increased costs for the diesel, hydrogen, and electricity energy sources

Performance of the bus control fleet 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, was the most reliable, and available. The BEB fleet had the lowest cost per mile after including cost offset benefits from the Low Carbon Fuel Standards (LCFS) credits. The Legacy FC fleet had limited availability that lowered its deployment causing the highest cost per mile and the least reliable of the control fleet.

The report includes an appendix that compares the data summary figures from the previous versions. Staff looks to enhance the comparisons that will assist with examining the technology performance and cost trends as the District begins to expand the ZEB fleet and move towards achieving a 100% transition.

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 collect performance data to provide another report for the review period of January to June 2022.

### **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 Rollout 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 21-284a: Zero Emission Transit Bus Technology Analysis Volume 2

**ATTACHMENTS:**

1. AC Transit Zero Emission Transit Bus Technology Analysis Volume 3

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