ALAMEDA-CONTRA COSTA TRANSIT DISTRICT

STAFF REPORT

MEETING DATE: 12/8/2021 **Staff Report No.** 21-284a

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 January to June 2021.

STRATEGIC IMPORTANCE:

Goal - Environmental Improvement
Initiative - Zero Emission Programs

AC Transit's Zero Emission Transit Bus Technology Analysis will help inform the District decision process to 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's Board of Directors adopted a resolution in June of 2020 approving the AC Transit ZEB Rollout Plan which provides a path to transition the District's bus fleet to 100% zero emissions by 2040. In order to effectively deliver the ZEB Rollout Plan, 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, we have 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. This report is the second volume of AC Transit's data gathering and research.

Zero Emission Transit Bus Technology Analysis Overview

In June of 2021, staff presented the first version of the Zero Emission Transit Bus Technology Analysis (ZETBTA) designed to meaningfully analyze the various transit bus technologies that AC Transit operates. This report is the second edition of the study which includes results from the fuel-cell electric bus (FCEB), battery electric bus (BEB), diesel hybrid bus, and conventional diesel
bus technologies control fleet. 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 our Strategic Plan and ZEB Rollout
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. We integrated lessons learned and best practices gleaned from our extensive experience in 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.

Volume 2 of the Zero Emission Transit Bus Technology Analysis is an enhanced version from the first publication. The additional results presented in this reporting period include the
following that are key takeaways from the initial report:

1. The inclusion of performance and operating costs of the ZEB infrastructure
2. Appendix that displays performance and cost comparisons between the two publications
3. Reinventing ZEB workforce training

ZETBTA Volume 2 Performance Results (January to June 2021)
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 FCEB fleet had the lowest cost per mile that includes costs offset with the Low Carbon Fuel Standards (LCFS) credits. The Legacy FC fleet that had the highest cost per mile and was the least reliable. The BEB was the least available and generated lowest mileage of the control fleet.

Volume 2 includes Figure 3: Existing Facility Matrix on page 5, which is an overview of the facility infrastructure that supports the ZEB fleet and includes summary statistics for the reporting period. Included in the study are the operating and maintenance costs, availability, and reliability operating statistics. Facility information includes the technical specifications, capital costs, vehicle capacities, and charging or fueling times.

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 we begin to expand the ZEB fleet and move towards achieving a 100% transition.

As part of ongoing workforce development efforts, staff developed the newest evolution, an actual fuel cell training module complete with air and coolant kits, poster training aids, related tool, and diagnostic accessories. Moreover, we are exploring the possibilities of implementing virtual and augmented reality systems. Virtual reality is ideal in preparing a new workforce to engage more frequently with high voltage systems. Reducing fear of shock, arch flash and other hazards can be attained by engaging in a virtual world

first. AC Transit is reinventing how workforce training will be successful into the future and for generations to come.

To advance this ambitious initiative, AC Transit is seeking state and federal advocacy programs to secure funding in support of planning, design, construction, and operation of a training center. When completed, the reimagined Training and Education Center at AC Transit will provide zero-emission technological skills for operations and maintenance transit workers to serve as a career gateway and support a workforce development center for disadvantaged communities.

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 July to December 2021.

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 21-284: Zero Emission Transit Bus Technology Analysis

ATTACHMENTS:

1. AC Transit Zero Emission Transit Bus Technology Analysis Volume 2

Prepared by:
William Tonis, Director of Project Controls & Systems Analysis

In Collaboration with:
Michael Flocchini Training and Education Manager
Nichele Laynes, Acting Director of Marketing & Communications
Derik Calhoun, Director of Transportation
Manjit K. Sooch, Director of Systems and Software Development
Joe Callaway, Director of Capital Projects
Cecil Blandon, Director of Maintenance
Robert del Rosario, Director of Services Development and Planning

Approved/Reviewed by:

Beverly Greene, Executive Director of External Affairs, Marketing & Communications
Ahsan Baig, Chief Information Officer
Ramakrishna Pochiraju, Executive Director of Planning & Engineering
Salvador Llamas, Chief Operating Officer