

Transit Zero Emission Vehicle Roadmap

Executive Summary

December 2021



COLORADO
Department of Transportation

Photo Credit: CDOT

Introduction

The Transit Zero Emission Vehicle (ZEV) Roadmap is a comprehensive and adaptable guide for transit agencies, key stakeholders, and the State of Colorado to reduce transportation-related greenhouse gas (GHG) emissions and implement the zero emission transit strategies contained within the [Colorado Electric Vehicle Plan \(2020 EV Plan\)](#) to bring clean transit options to all Coloradans.

The 2020 EV Plan established a goal of transitioning 100 percent of transit vehicles in the state to ZEVs no later than 2050 and set an interim target of at least 1,000 transit ZEVs by 2030. In 2018, Colorado's transit fleet had over 3,200 revenue service vehicles in operation with just 38 battery electric buses (BEB). As of November 2021, Colorado's transit fleet has 60 BEBs, a 58 percent increase from 2018.

The State of Colorado recognizes that the transit sector faces unique challenges and opportunities in transitioning to ZEVs and installing/constructing the charging and fueling infrastructure necessary to support them. Transit agencies provide essential mobility services across a wide range of geographies, climates, and routes, so a one-size-fits-all approach will not be possible. The Transit ZEV Roadmap provides information about national trends and Colorado's ZEV environment, as well as a framework for financial modeling and actions to support the State's transit ZEV transition by 2050.

Comprehensive statewide transit service supports GHG emission benefits of lower per capita emissions by reducing single occupancy vehicle miles traveled. Transitioning transit service to zero emission options can enhance these existing emission reductions, enhance rider experience, expose a broader segment of Colorado's population to ZEVs, capitalize on cost saving opportunities, and provide an opportunity for the public sector to lead the ZEV transition.



National Transit ZEV Trends

Barriers to ZEV Fleet Adoption



Knowledge Barriers

There is a lack of understanding of the technical, planning, financial, and governance factors critical to successful ZEV implementation.



Technological Barriers

Currently, available ZEV transit models cannot meet the needs of all transit services due to battery limitations that impact range and vehicles' ability to operate at varying grades and temperatures.



Financial Barriers

Some Colorado transit agencies report that the cost of transit ZEVs can be as much as double that of internal combustion engine vehicles. Significant financial barriers arise when combined with costly infrastructure upgrades and transit agency training required to develop electric rates collaboratively with utility companies.



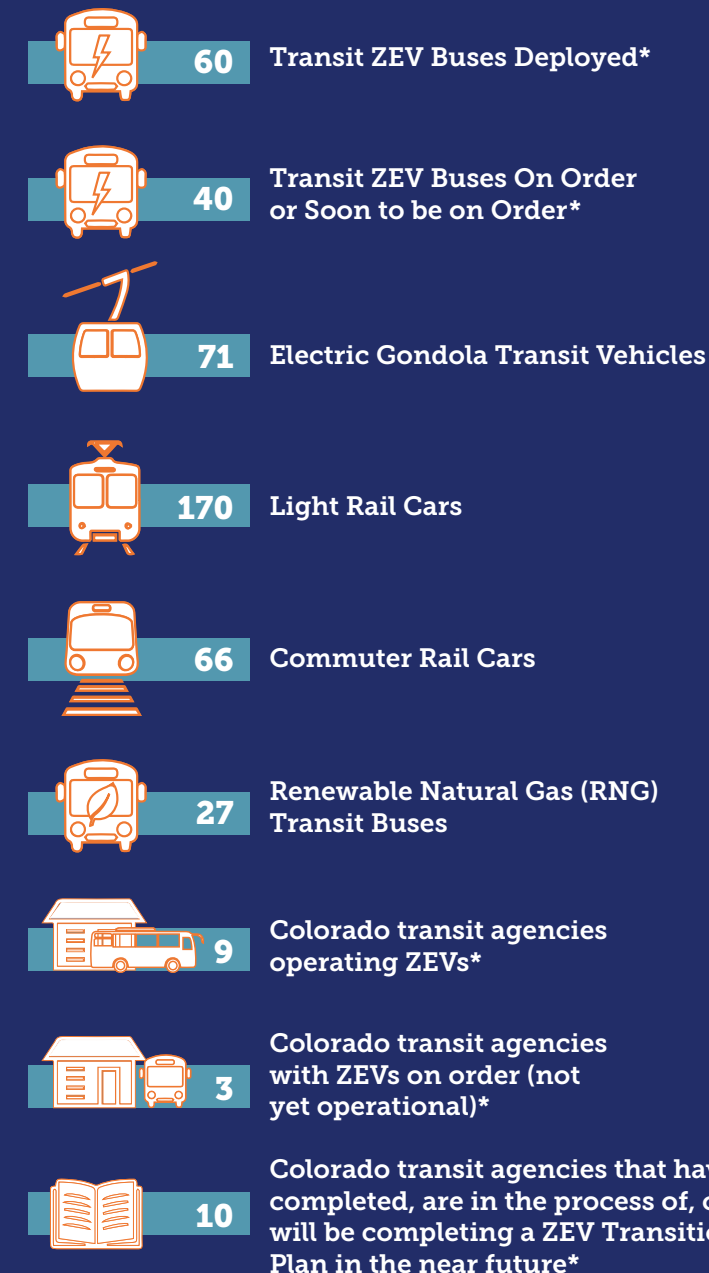
Institutional Barriers

Transit agency and utility service territories cover diverse and dynamic geographic areas. Colorado utilities and transit agencies have varying levels of experience and inconsistent processes for coordinating across jurisdictional boundaries to meet service planning and transmission/distribution planning needs.

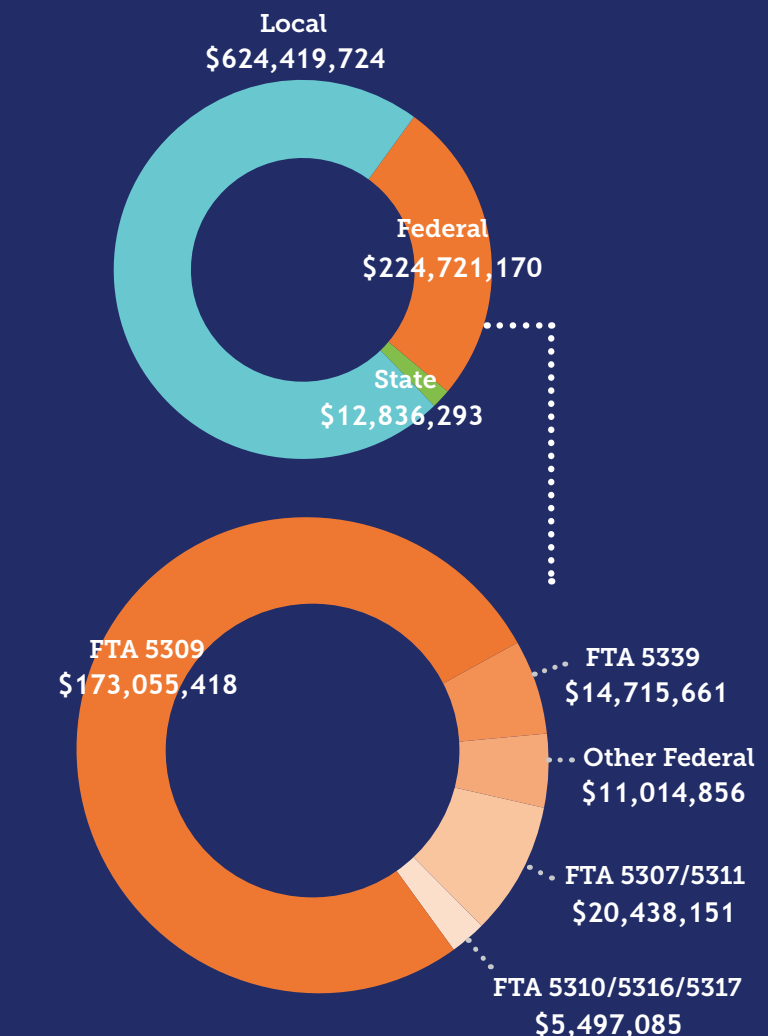
Fleet Electrification Readiness Opportunities

- Conduct a fleet-wide assessment to develop short- and long-term ZEV transition goals
- Leverage long-term planning goals to maximize use of available funding
- Develop phased plans to upgrade/retrofit maintenance facilities and bus depots
- Consult early and often with electric utilities
- Provide proactive training for operations and maintenance stage
- Involve diverse stakeholders early in the planning and transition process

Colorado ZEV Environment By the Numbers (2018)



Colorado's transit fleet is primarily funded with local dollars but also leverages state and federal formula and competitive grant funding.



*2021 data

The Role of Utilities in Transit Fleet Electrification

Electric utilities play an essential role in any successful ZEV planning and implementation process. Increased load associated with charging transit fleets could put significant strain on the existing electric infrastructure. Electric utilities are responsible for understanding the challenges and benefits of managing the increased demand associated with charging battery electric ZEVs and managing these loads in time and space to ensure reliable electric service for all customers.

Utility coordination can help reduce barriers to battery electric bus deployments, including:

- Fleet charging time/scheduling requirements
- Estimating operating costs associated with charging
- High upfront infrastructure costs

State and local governments can encourage utility investment in ZEVs by supporting infrastructure development.



ZEV Financial Modeling

Financial modeling was conducted to estimate the level of statewide investment that could support achieving the interim goal of 1,000 transit ZEVs by 2030 and 100 percent ZEVs by 2050.

Based on the financial analysis, it is technically possible to achieve both the 1,000 transit ZEVs by 2030 and 100 percent transit ZEVs by 2050, provided sufficient funding resources, policies, and vehicle model availability.



Transitioning the Colorado fleet to ZEVs is projected to cost \$230 to \$285 million more than the baseline scenario, equating to a 30 to 45 percent premium over maintaining the existing fleet.



Initial capital investment in EV chargers represents most of the incremental ZEV costs (\$225 million to \$230 million).



The incremental cost difference for vehicles (excluding associated charger costs) is \$45 to \$60 million, reflecting a 5 to 10 percent premium over the vehicle costs of replacing the existing non-ZEV fleet.



The near-term push to 1,000 ZEVs will cost an additional \$5 to \$10 million in transit ZEV replacement costs to meet the 2030 goal.

Achieving Colorado's Transit ZEV Goals

The Transit ZEV Roadmap Implementation Plan provides a framework to guide CDOT and partner transit agencies in the ZEV transition. All strategies have been identified for near-term (2021 - 2024), mid-term (2025 - 2027) or long-term (2028 - 2030) implementation.

The Transit ZEV Implementation Plan has five goal areas as listed below. Detailed implementation strategies to support these goals are included in the Transit ZEV Roadmap.



Policy

Identify policies to reduce barriers to ZEV transition and implementation.



Planning & Technical Support

Increase access to technical resources and expertise to support the planning, design, and implementation activities.



Information Sharing & Research

Define data collection, research, and analysis methods to facilitate statewide information sharing and support a successful transition to transit ZEVs in Colorado.



Funding

Prioritize funding and identify state funding types and methods to effectively support ZEV planning and implementation.



Education & Training

Provide training to promote workforce readiness and educational programs for riders and policy-makers.

