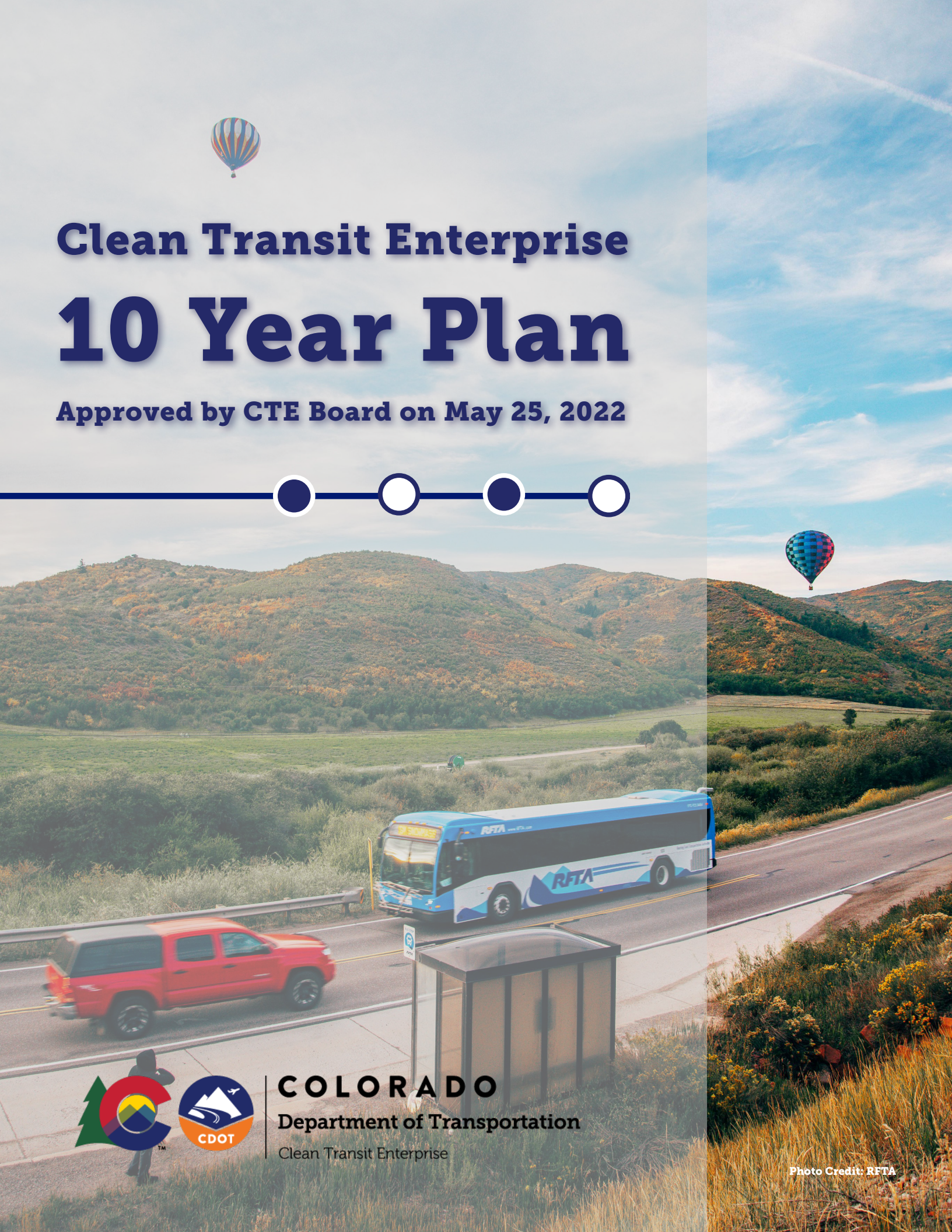




Clean Transit Enterprise 10 Year Plan

Approved by CTE Board on May 25, 2022



COLORADO
Department of Transportation
Clean Transit Enterprise

Photo Credit: RFTA

Table of Contents



Letter from the Board	3
Definitions	4
Introduction	6
Transit Electrification Background	8
National Transit ZEV Market	9
Colorado's Current Transit Fleet	12
Common Barriers to ZEV Fleet Transitions	14
Anticipated Timelines and Costs for Fleet Transition	16
Supporting Policies and Actions	19
Estimated Financial Resources and Expenditures	20
Clean Transit Retail Delivery Fee	20
Anticipated Fee Revenues for FY23-FY32	20
Anticipated Expenses for FY23-FY32	21
Potential Matching Funds and Supplemental Resources	27
CTE Funding Strategy	28
Funding Mechanisms	28
Funding Categories	29
Project Prioritization	30
Planning Requirements by Applicants	33
Match Requirements	34
Eligibility of CTE Funding as Match for Other Programs	34
Vehicle Scrapping Requirements	35
Vehicle Replacement Ratios	36
Vehicle-to-Charger/Vehicle-to-Fueling Station Ratios	36
Data Reporting Requirements	37
CTE Funding Programs	38
Planning Programs	38
Facility Modification Programs	39
Vehicle Acquisition Programs	40
Charging/Fueling Infrastructure Programs	41
10 Year Plan Implementation and Update Schedule	42
Coordination with CDOT Staff	42
Alignment with Existing CDOT Transit Grant Programs	42
Future 10 Year Plan Updates	42
Conclusion	43

Letter from the Board

Dear Neighbor,

As Chair of the Clean Transit Enterprise (CTE) Board of Directors, I am pleased to share the inaugural ten year plan describing how this Enterprise will reduce and mitigate the adverse environmental and health impacts of air pollution and greenhouse gas emissions produced by retail deliveries through enabling the widespread adoption of zero emission transit vehicles, including the requisite charging/fueling infrastructure, facility modifications and planning studies that will allow transit agencies to confidently make this transition. This plan is being delivered in accordance with SB21-260, C.R.S. § 43-4-1203.

The electrification of transportation is essential for clean air and our climate, and transit vehicles have an important role to play in helping Colorado achieve the greenhouse gas pollution reductions necessary to achieve the targets set out in HB19-1261. The Colorado Medium- and Heavy-Duty Vehicle Study recognized that the market for zero emission medium- and heavy-duty vehicles is nascent, but poised for growth, with transit buses on the leading edge of this market transition.

The availability of funding through the CTE will help large and small transit agencies across Colorado successfully integrate zero emission vehicles into their fleets, delivering air quality benefits to riders and residents alike, along with the added benefit of a much quieter bus! CTE's four program areas are positioned to assist transit agencies from planning through implementation while also providing transparency and accountability to the public.

This document reflects the vision and expertise of the CTE Board, along with valuable input from Colorado's transit agency partners, transit advocates, public stakeholders and staff from CDOT's Office of Innovative Mobility and Division of Transit and Rail. We look forward to continuing to refine this ten year plan through continued engagement with stakeholders, on-going evaluation of our program portfolio and careful monitoring of the rapidly evolving zero emission bus market.

The CTE board wants to hear from you. We invite you to contact us with your questions, comments and ideas by emailing us at cdot_cleantransitenterprise@state.co.us.

Sincerely,

Matt Frommer
CTE Board Chair

Battery Electric Vehicle (BEV)

A vehicle powered exclusively by a rechargeable battery pack that can be recharged by being plugged into an external source of electricity and that has no secondary source of propulsion.

Colorado Department of Transportation Division of Transit & Rail (DTR)

The division within the Colorado Department of Transportation responsible for planning, developing, operating and integrating transit and rail into the statewide transportation system.

Disproportionately Impacted (DI) Community

A community that is in a census block group, as determined in accordance with the most recent United States decennial census, where the proportion of households that are low income is greater than forty percent, the proportion of households that identify as minority is greater than forty percent or the proportion of households that are housing cost-burdened is greater than forty percent, as defined in C.R.S. 43-4-1202(5)

Electric Vehicle (EV)

A vehicle that uses a battery to store energy that powers the motor, including a battery electric motor vehicle, a hydrogen fuel cell motor vehicle and a plug-in hybrid electric motor vehicle.

Hydrogen Fuel Cell Electric Vehicle (FCEV)

A vehicle powered by electricity produced from a fuel cell that uses hydrogen gas as fuel.

Plug-in Hybrid Electric Vehicle (PHEV)

A motor vehicle that is powered by both a rechargeable battery pack that can be recharged by being plugged into an external source of electricity and a secondary source of propulsion such as an internal combustion engine.

Recovered Methane

Any of the following if the Colorado Department of Public Health and Environment's Air Pollution Control Division determines them to provide a net reduction in greenhouse gas emissions:

- (a) Biomethane;
- (b) Methane derived from:
 - (I) Municipal solid waste;
 - (II) Biomass pyrolysis or enzymatic biomass; or
 - (III) Wastewater treatment; and
- (c) Coal mine methane, as defined in section 40-2-124(1)(a)(II).

Retail Delivery

A retail sale of tangible personal property by a retailer for delivery by a motor vehicle owned or operated by the retailer or any other person to the purchaser at a location in the state, which sale includes at least one item of tangible personal property that is subject to taxation under Article 26 of Title 39. Each such retail sale is a single retail delivery regardless of the number of shipments necessary to deliver the items of Tangible Personal Property purchased.

Transit

A coordinated system of Transit modes providing transportation use by the general public, as defined in C.R.S. 43-1-102(4).

Transit Agency

An organization that provides Transit services to the general public or a segment of the public defined by age, disability or low income, as defined in 2 CCR 607-1.

Zero Emission Vehicle (ZEV)

A vehicle that produces zero or near-zero exhaust emission of any criteria pollutant (or precursor pollutant) or greenhouse gas under at least one operational mode. Eligible ZEVs include battery electric vehicles, plug-in hybrid electric vehicles and fuel cell electric vehicles.



Introduction

In 2021, the Clean Transit Enterprise (CTE) was established within the Colorado Department of Transportation (CDOT) to support public transit electrification planning efforts, facility upgrades, fleet vehicle replacements and the purchase and installation of electric vehicle (EV) charging and fueling infrastructure. Created by Colorado Senate Bill 21-260 (SB 21-260), the Enterprise imposes a Clean Transit Retail Delivery Fee to fund its operations and has the power to issue grants, loans and rebates to support the electrification of public transit in Colorado.

The primary business purpose of the CTE is to “reduce and mitigate the adverse environmental and health impacts of air pollution and greenhouse gas emissions produced by motor vehicles used to make retail deliveries by supporting the replacement of existing gasoline and diesel transit vehicles with electric motor vehicles, including motor vehicles that originally were powered exclusively by internal combustion engines but have been converted into electric motor vehicles, providing the associated charging infrastructure for electric transit fleet motor vehicles, supporting facility modifications that allow for the safe operation and maintenance of electric transit motor vehicles, and funding planning studies that enable transit agencies to plan for transit vehicle electrification” (CRS 43-4-1203).

The statute defines electric motor vehicles to include battery electric, plug-in hybrid electric and hydrogen fuel cell electric vehicles. It also allows for funding of compressed natural gas vehicles fueled by at least 90 percent recovered methane in circumstances where an electric vehicle is not practically available.

Public transit electrification projects funded by the CTE will help the state reach its targets of 1,000 zero-emission transit vehicles (ZEVs) on Colorado roads by 2030 and a 100 percent zero-emission transit fleet by 2050. These targets, which were established by the 2020 Colorado EV Plan and further elaborated in the 2021 Colorado Transit Zero-Emission Vehicle Roadmap, apply to rubber-tired, conventionally fueled transit buses, cutaways, vans, minivans and automobiles. They do not apply to commuter rail, light rail and gondola systems, as they are frequently powered by electricity.

No later than June 1, 2022, the CTE is required to publish a 10-Year Plan that details how the Enterprise will execute its business purpose during state fiscal years 2022-2023 through 2031-2032 and estimates the amount of funding necessary to do so.

As per statute, information regarding the implementation of the 10-Year Plan will be maintained and regularly updated in a public accountability dashboard that can be accessed via the CTE website. It is anticipated that this plan, once finalized, will act as a living document with regular future updates and refinements necessary to adjust to changing conditions in Colorado and across the broader transportation electrification landscape.

Public transit electrification projects funded by the CTE will help the state reach its targets of **1,000 zero-emission transit vehicles (ZEVs) on Colorado roads by 2030** and a **100 percent zero-emission transit fleet by 2050**.

Transit Electrification Background

Converting transit fleets to ZEVs is complex, expensive and poses many challenges. It is a process that will take years to accomplish, during which time the technology, industry best practices and market conditions are likely to evolve significantly.

A number of challenges and barriers to implementation exist, including limitations concerning technology, infrastructure, existing transit facilities and technical capacity. The benefits to the state, however, are also significant. These include improved air quality, reduced greenhouse gas (GHG) emissions, greater access to public transit service and improved public health outcomes.

Over the course of 2021, the CDOT Division of Transit & Rail (DTR) partnered with the Office of Innovative Mobility (OIM) to develop the state's first [Colorado Transit Zero-Emission Vehicle Roadmap](#). The final Roadmap document was the product of many months of literature review, data collection, stakeholder engagement, financial analysis and strategy development intended to define a holistic path forward for Colorado to achieve its zero-emission transit goals of 1,000 ZEVs on the road by 2030 and a 100 percent zero-emission transit fleet by 2050.

Given its comprehensive nature and recent completion, the Roadmap served as a strong foundation for the Board and staff of the CTE to build upon in developing this 10 Year Plan. In addition to providing an up-to-date picture of the current transit landscape in Colorado and identifying state and national market trends, the Roadmap also included a number of emerging industry best practices and explored common barriers encountered by transit agencies in planning, implementing and scaling their fleet transitions.

Finally, the financial modeling tool developed as a part of the Roadmap effort has been (and will continue to be) used to forecast potential timelines and costs for ZEV fleet transitions at both the statewide and individual transit agencies levels.

The establishment of the CTE represents an important new tool to help the State and local transit agencies overcome the barriers and realize the benefits of converting their transit fleets to ZEVs.

Enterprise funds will allow the state of Colorado to make this necessary transition more quickly, broadly and equitably. Key findings from the Colorado Transit ZEV Roadmap are summarized below.



National Transit ZEV Market

Vehicle Variety

Full sized electric buses have been commercially available for over a decade and their use has continued to increase since introduction to the market. At the start of 2020, approximately 180 transit agencies were operating over 850 electric transit buses throughout the United States, with an additional 1,000 vehicles on order for delivery by 2022.

Decreasing battery and electricity costs have contributed to the growth of the battery electric ZEV market, with half a dozen major OEMs already active in the space. Some are recent start-up companies that focus exclusively on development and production of battery electric and fuel cell electric vehicles, while others are legacy transit vehicle manufacturers that have more recently entered the ZEV market.

A third group of manufacturers has emerged that specializes in converting traditional internal combustion engine vehicles to zero-emission powertrains, thereby allowing for a greater number and variety of transit vehicle types (beyond large buses) to go zero-emission in the near future.

Additionally, some manufacturers that initially focused on full-size electric transit buses are pivoting to integrate medium- and small-size cutaway vehicles into their vehicle portfolios to meet the growing demand for vehicle offerings in this market segment.

Given the various needs and service delivery models across Colorado, additional vehicle types will support faster adoption of ZEVs since cutaway

vehicles make up approximately 25 percent of the state's existing transit fleet. ZEV deployment should occur as proven vehicle models are available to meet current and future transit needs. In Colorado, this means vehicles must be able to operate with extended range to serve rural areas, and in areas with cold climates and mountainous terrain.

Vehicle Range

The range of electric transit vehicles depends on many variables, most significantly battery capacity, battery age and environmental factors such as outside temperature or roadway grade. Standard methods of range measurement have not yet been established in the industry, and with so many route variables, advertised ranges can be misleading or confusing.

The advertised range of buses new to the market is increasing at a steady pace. For example, the maximum range of a recently unveiled 40-foot bus is advertised at 329 miles. How this bus performs in various climates, and whether transit agencies experience a similar range to that advertised, is yet to be seen.

The range of electric cutaway buses commonly ranges between 100 and 160 miles. The range for electric minivans varies more - some models can run for just over 100 miles on a single charge, whereas newer models could offer a range of up to 350 miles. Charge time is a factor of battery size and charging capability. With Level 2 charging, electric buses can reach a full charge in around six to eight hours. With DC fast charging, they can be charged in under three hours.



Vehicle Costs

Although electric buses are generally more expensive to purchase than conventionally fueled buses, they often achieve cost savings over time due to lower operating costs and reduced spending on fuel.

For example, one vehicle manufacturer estimates that over the lifetime of their electric bus, more than \$400,000 in fuel savings and \$125,000 in averted maintenance costs are achieved. Electric buses have fewer parts and require less maintenance than diesel buses. Electric buses do not have an exhaust system, the braking system lasts longer, and no oil changes are required.

Additionally, government incentives and grant opportunities can significantly reduce the upfront costs of electric vehicle purchases, thereby accelerating the timeline in which operational cost savings deliver an overall return on investment by the operating agency.

Besides the lower total cost of ownership, electric buses have substantial societal benefits. Electric buses produce less nitrogen oxides (NOx) and GHG emissions than new and existing diesel buses, creating community benefits in the form of cleaner air and better health, since higher rates of cancer and mortality are linked to exposure to diesel and ground-level ozone created by diesel exhaust. Transitioning to electric buses can help reduce hospital visits and other negative health and environmental externalities caused by diesel exhaust.

Vehicle Performance

Over the past decade, zero emission buses have performed well in dozens of pilot projects as well as many broader, long-term deployments in a variety of cities, states, and countries around the world. Battery electric buses have been noted for their quiet operations, instant torque and superior handling in snowy conditions, among other features. Additionally, zero-emission buses tend to require less maintenance and repair and can be more pleasant for drivers and passengers alike.

Of course, some ZEV implementations have also encountered technological hurdles. Electric bus performance can be hindered by several factors, including driver behavior, number of stops, weather conditions and topography. In the Colorado context, weather and topography are of particular concern. All transit buses, regardless of fuel source, experience some loss of range in extreme weather.

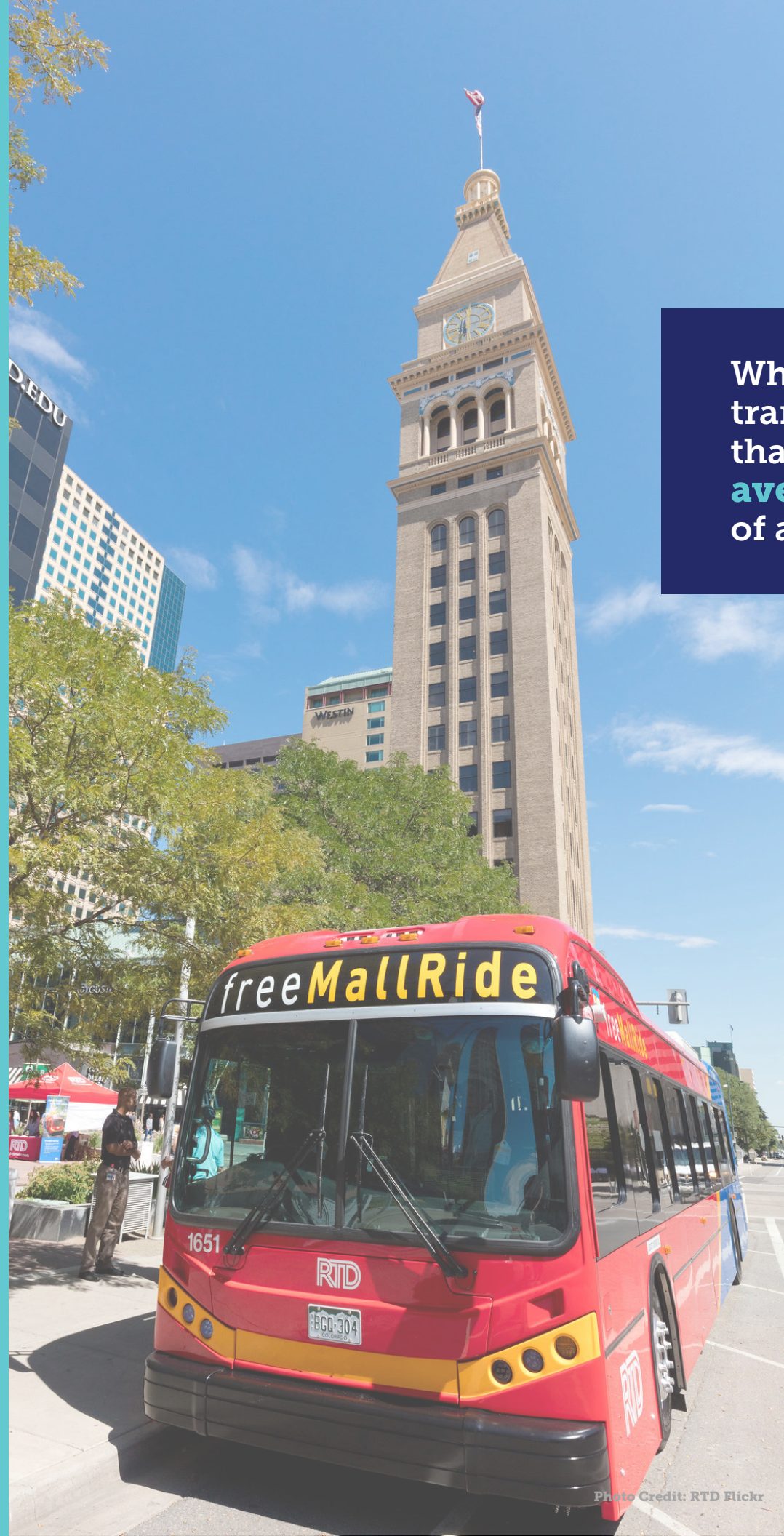


Photo Credit: RTD Flickr

While generally more expensive to purchase, transit operators can expect to save more than **\$400,000 in fuel costs** and **\$125,000 in averted maintenance costs** over the lifetime of an electric bus.

However, these issues can sometimes be significant in electric buses. In a recent study by the Center for Transportation and the Environment, for temperature drops from 50-60° to 22-32° Fahrenheit, battery electric buses lost around 32.1 percent efficiency, while fuel cell electric buses dropped 28.6 percent.

As a result, it is important for transit agencies to account for daily and seasonal variability in vehicle performance when considering a given route or service block for electrification in order to guarantee that the reliability of the service is not negatively impacted by the transition to a ZEV.

Additional Considerations

Although electric buses have several technological barriers to overcome, the technology is constantly improving, and there are several things transit agencies can do to ensure their buses are performing as highly as possible. Because driver behavior can impact bus performance, drivers should be trained on how to maximize efficiency of the bus with driving technique. Transit agencies should also ensure that contracts with bus manufacturers include provisions to guarantee protections in case vehicles delivered do not perform as promised. Additionally, being realistic about the capabilities of electric buses for particular routes and conditions, and studying route modeling data to determine the appropriate type of bus for the route, can help performance.

Colorado's Current Transit Fleet

Colorado is home to a variety of transit options operated by public, private and non-profit agencies. Transit service across the state includes bus service (local, regional, interregional, intercity), passenger rail service (light rail, commuter rail) and human services transportation. Colorado transit fleet vehicles are largely owned outright by a public agency; however, approximately 12 percent are owned by a private entity. The entire statewide fleet is open and accessible to the general public.

The transit vehicle inventory below summarizes 2018 data. At that time, ZEVs represented only 1.2 percent of the entire vehicle fleet, not including tramways, light rail or commuter rail. While the number of transit ZEVs operating in Colorado has increased to 62 (as of May 2022), they remain a small percentage of the overall fleet and are limited to only around a dozen agencies at this point.

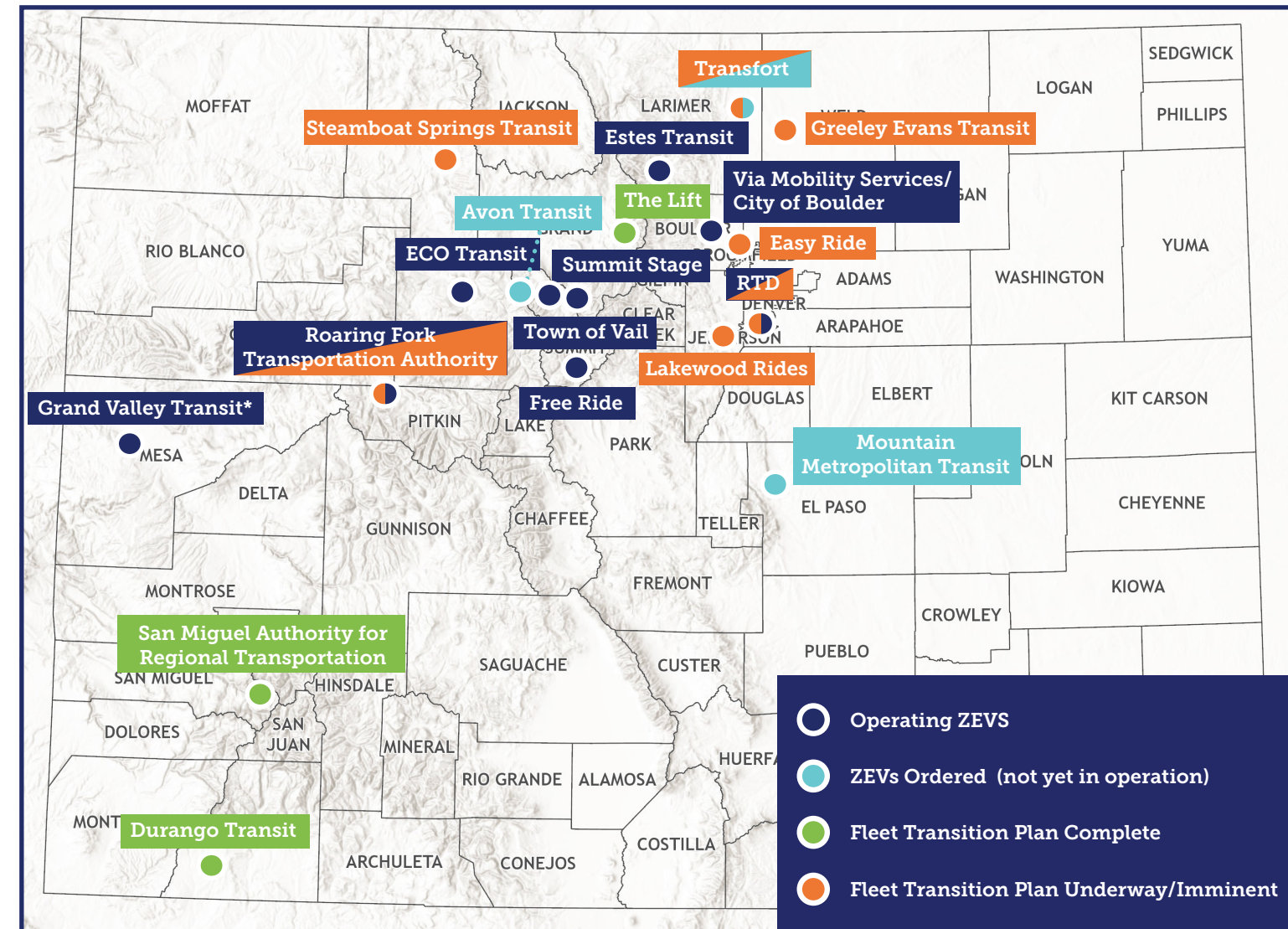
FIGURE 1: 2018 COLORADO TRANSIT FLEET BY VEHICLE & FUEL TYPE

		Compressed Natural Gas	Diesel Fuel	Gasoline	Hybrid Diesel	Hybrid Gasoline	Electric Propulsion Power	Electric Battery	Dual Fuel	Total
Revenue Vehicles	Aerial Tramway						71			71
	Articulated Bus	8	117							125
	Automobile			96	14		1	3		114
	Over-the-Road Bus	10	187							197
	Bus	79	1,123	12	39	4		37	2	1,296
	Cutaway	22	50	777	1	1				851
	Light Rail Vehicle						172			172
	Minivan	9		112					1	122
	Commuter Rail Self-Propelled Passenger Car						66			66
	Sports Utility Vehicle			4						4
Service Vehicles*	Automobile			44	5					49
	Truck and Other Rubber Tire Vehicle		5	64	1					70
Total		135	1,482	1,225	40	25	309	38*	10	3,264

Note: Vehicle totals in the table sum the number of vehicles that meet the dual variables. Data entries missing information in either variable are excluded from table totals, resulting in variations in table totals. NTD data reported in the following table has been verified and updated to address reporting errors and inconsistencies.

* The Colorado EV Plan defines transit vehicles as vehicles operated by transit agencies that carry passengers or public riders. The Colorado transit fleet overview summarizes all vehicles included in the CDOT inventory. Accordingly, 2030 and 2050 goal attainment has been evaluated based on revenue vehicles only.

FIGURE 2: STATE OF TRANSIT AGENCY ZEV TRANSITION IN COLORADO (AS OF SUMMER 2021)



*Grand Valley Transit uses Renewable Natural Gas (RNG) for 50% of its operations; the remaining 50% uses Xcel Energy natural gas.

In addition to the early-adopter agencies responsible for current ZEV deployments across the state, there are a number of other transit agencies that have begun the planning process necessary to begin their fleet transitions in the next few years. The map above illustrates the geographic dispersion of these fleets and indicates their stage in the transition process as of 2021.

To date, there has been a clear pattern of early adoption and planning by larger and better resourced agencies in the Front Range metro areas and along the I-70 mountain corridor. In order for the State of Colorado to achieve its transit ZEV targets and ensure the widespread and equitable access to the benefits of zero-emission transportation, it will be necessary for a greater number and variety of transit agencies statewide to begin this shift over the course of the CTE's first ten years.

Common Barriers to ZEV Fleet Transitions

The transition from traditional, internal combustion engine vehicles to ZEVs can be challenging for a number of reasons and every transit agency is unique in this regard. However, there are a number of common challenges that agencies across the state and country can expect to encounter that the CTE's programs may be well-suited to minimize or overcome. Below is a brief summary of some of these barriers:



Technology Limitations

Advancements in battery technology and decreases in the cost per kilowatt hour have made ZEVs more competitive relative to their internal-combustion-engine peers. Nonetheless, it is true that currently available transit ZEV models cannot always meet all of the needs of transit providers in varied operating environments.

As a result, the transit ZEVs on the market may not always be able to replace conventionally fueled vehicles at a 1:1 ratio due to range and performance limitations. While the range of vehicle types and models is constantly expanding, not all vehicle types are readily available as transit ZEVs.

Even in spite of rapid advances in battery technology, the range of battery-electric transit vehicles is often less than that of diesel-powered buses. This range can be further reduced when operating in cold or hot temperatures, or when operating on steep mountain grades. Driver behavior can also have a significant impact on vehicle range, which is not as significant a concern for diesel or gasoline vehicles. For battery-electric buses, vehicle charging takes more time than re-fueling a conventionally fueled bus. While vehicle charging technology is rapidly advancing, this extra time adds logistical complexity and requires buses to be "out of service" longer.

The CTE has limited ability to advance battery and electric vehicle technology. It does, however, provide a source of funds for transit providers to purchase ZEVs and transition their fleets over time. This will allow transit providers to overcome some of the technological barriers of ZEVs by making it financially feasible to replace a conventionally-fueled fleet with ZEVs, even if this replacement is not on a 1:1 ratio. Furthermore, a wider adoption of ZEVs across the country and the state will continue to drive down the cost of battery technology and, by extension, the cost of ZEVs.



Infrastructure Limitations

There are several barriers associated with existing power and transportation infrastructure that can hinder large-scale ZEV adoption. The electrical grid, in particular, will need to evolve to accommodate a higher volume of charging for transit and personal ZEVs alike.

Some of the challenges of upgrading electrical infrastructure to accommodate vehicle charging include grid instability, lack of standards and regulation on charging infrastructure, large capital expenses, lack of land and space to install new infrastructure, and limited planning for the long-term impacts to the electric grid.

Hydrogen-fueled vehicles also face challenges, primarily from the lack of fueling infrastructure currently in Colorado. This could change in the future, as Colorado signed a Memorandum of Understanding with New Mexico, Wyoming and Utah in February 2022 to pursue federal funding to help establish a hydrogen hub in the region. Increased production and usage of hydrogen,

whether via a federally-funded hub or smaller-scale targeted investments, will open up new possibilities for transit agencies in Colorado to transition to ZEVs.

The CTE will help alleviate some of these infrastructure limitations by funding the purchase and installation of vehicle charging infrastructure and potential hydrogen fueling systems. By continuing to support the expansion of the charging and fueling network in Colorado, more local transit providers will be able to accommodate ZEVs without sacrificing reliable access to fuel.



Facility Limitations

As vehicle technology continues to evolve, associated facilities such as those used for transit operations and maintenance needs will have to be planned accordingly. Many transit facilities will need upgrades in order to accommodate charging for transit ZEVs.

Depot charging, which refers to electric bus charging infrastructure located at the facility at which off-duty buses are stored, is often preferred for smaller scale deployments. This is because the infrastructure is less expensive than for on-route charging; however, large agencies that operate in space-constrained urban environments may run into obstacles when siting all charging equipment in the depot or planning for future fleet growth. As such, facility modifications including space requirements, site infrastructure and expansion in electrical grid capacity on-site will require significant investment. The enterprise funding will fill this gap in providing resources for agencies in need to install and expand its charging, maintenance and operation facilities.



Planning/Knowledge Limitations

In general, transit agencies lack the information needed to make informed decisions regarding ZEV transitions. Electric transit operation requires substantial planning as it needs to address issues around vehicle performance, charging technologies, route optimization in alignment with charging needs and procurement processes. As electrification is a niche market for many transit agencies, there is a knowledge gap when it comes to understanding the electric transition of transit fleets.

Planners will need to understand the changes to operational characteristics and maintenance requirements of ZEVs, including training for drivers, technicians and other staff. A successful cost-effective deployment of electric buses will require an implementation plan with concrete strategies in addressing the technology, infrastructure and facility modification barriers as well as a refined procurement process. There is also an unprecedented need to coordinate with utilities, charging providers and other stakeholders to ensure route services and electrical grid distribution are equitably met. To bridge the knowledge gap, local agencies will be able to access CTE funds to assist in their fleet electrification planning efforts including knowledge capacity building, conducting feasibility studies and the development of a Zero Emission Fleet Transition Plan.

Anticipated Timelines and Costs for Fleet Transition

Replacement Cycle Assumptions

As part of the Transit ZEV Roadmap development, it was important to understand how many existing transit vehicles in the state were likely to reach retirement age over the course of the 2030 and 2050 target years. To this end, staff used the existing Transit Asset Inventory Master Database, which automatically populates Revenue Vehicle Service Years for existing fleet vehicles and uses this data to identify remaining service life, including which vehicles should be prioritized for replacement. Because the data used to develop the initial transit vehicle inventory was from 2018, it was necessary to adjust vehicles ages forward to 2022. The results of this process are shown in the table below:

The majority of vehicles in the statewide fleet will reach their anticipated replacement age within **ten years**.

FIGURE 3: 2022-ADJUSTED COLORADO TRANSIT FLEET - YEARS OF REMAINING SERVICE LIFE BY FUEL TYPE

	Compressed Natural Gas	Diesel Fuel	Gasoline	Liquid Petroleum Gas	Hybrid Diesel	Hybrid Gasoline	Electric Propulsion Power	Electric Battery	Dual Fuel	Total
Exceeded	14	446	319	1	8	11	9	1	5	814
0-5 Years	68	225	834	0	18	7	0	0	5	1157
6-10 Years	51	729	45	0	4	0	1	36	0	866
11-15 Years	0	42	0	0	14	0	0	1	0	57
TOTAL	133	1,442	1,198	1	44	18	0	38	10	2,884

Note: While the vehicle ages of 2018 have been adjusted forward to 2022, this table does not account for new or retired vehicles since 2018.

The Transit ZEV Roadmap identified approximately 800 vehicles that had already exceeded their anticipated service life and another 1,100 that would do so in the next five years. The great majority of the remaining vehicles in the statewide fleet will reach their anticipated replacement age within ten years. Since the state's target is to put at least 1,000 transit ZEVs on the road by 2030, this indicates that there are more than enough replaceable vehicles that could be converted - assuming that the funding, planning and institutional buy-in are established ahead of time.

Vehicle Price Parity Assumptions

Currently, transit ZEVs can be significantly more expensive than their gasoline or diesel equivalents, but purchase prices have tended to decline from year-to-year. This pattern is expected to continue as ZEV technology advances, even in spite of current inflationary and supply chain challenges. While it is difficult to predict exactly when ZEVs will achieve price parity with internal combustion engine vehicles, common forecasts place this tipping point within the 2024 to 2030 timeframe.

In the central scenario developed as a part of the Transit ZEV Roadmap, price parity was assumed to occur in 2027. Whether or not this comes to pass in that specific year, price parity between new transit ZEVs and conventional replacements is important because it represents the point at which a transit agency will stand to achieve operational savings in both the short- and long-term periods, rather than having to bear an upfront cost burden and wait several years to recoup it via operational savings. This is likely to make a ZEV transition more accessible and attractive to transit agencies with fewer financial resources that are unable to wait several years for their return on investment. Until the point that price parity is achieved, continued financial support by CDOT, FTA and new entities such as the CTE will remain a critical means of overcoming the vehicle cost barrier.

Common forecasts predict that ZEVs will achieve **price parity** with internal combustion engine vehicles sometime within the **2024-2030 timeframe**.



Total Incremental Cost of Transition

One goal of the Transit ZEV Roadmap was to identify a realistic timeline and level of financial support necessary to achieve Colorado’s 2030 and 2050 transit fleet transition goals. To this end, a financial modeling tool was created and a series of statewide cost and timing assumptions were used as inputs. The resulting forecast found that, in the central scenario, Colorado could deploy 1,150 transit ZEVs at a total incremental cost of \$235 million.

FIGURE 4: ZEV FLEET TRANSITION FINANCIAL MODELING TOOL ASSUMPTIONS

Revenue Vehicle Type	# of Vehicles in Fleet	ZEV Cost	Non-ZEV Cost	ZEV Replacement Year	Year Parity is Reached	Annual Reduction to Parity
Articulated Bus	124	\$1,200,000	\$672,000	2027	2029	8%
Standard Bus (35-45 ft)	1044	\$950,000	\$500,000	2027	2030	8%
Small Bus (35 ft or less)	198	\$580,000	\$350,000	2027	2029	8%
Large Cutaway	50	\$360,000	\$200,000	2027	2030	8%
Standard Cutaway	779	\$170,000	\$88,000	2027	2030	8%
Passenger Van	250	\$100,000	\$55,000	2027	2030	8%
Automobile	104	\$60,000	\$30,000	2027	2031	8%
Minivan	103	\$60,000	\$33,500	2027	2029	8%
Sports Utility Vehicle	4	\$60,000	\$35,500	2027	2029	8%
Over-the-Road Bus/Motorcoach	228	\$1,100,000	\$630,000	2027	2029	8%
Total Number of Vehicles in Fleet	2,884					
Vehicle Replacement Schedule:	NTD ULB					

Because any or all of the cost and timeline assumptions used in this financial modeling exercise could be debated, CDOT created the tool in a manner that allows for variable inputs and also has made it available to individual transit agencies to use and revise themselves. It is hoped that this flexibility will allow CDOT and its transit agency partners to continue updating and refining these forecasts to better understand the resources and schedules necessary for success.

The funding support that the CTE will provide to transit agencies for vehicle acquisition, charging and fueling infrastructure, and facility modifications will play a critical role in reducing the burden on local transit agencies and lead to a faster and more equitable ZEV transition across the state.

Supporting Policies and Actions

The Transit ZEV Roadmap identified 37 action items, organized into five goal areas, to serve as the framework for the successful transition to zero emission transit statewide. The five goal areas include policy, planning and technical support, education and training, information sharing and research, and funding. Individual actions within each goal area have been identified for near-term, mid-term or long-term implementation.

Below is a brief summary of each goal area:



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.



EDUCATION & TRAINING

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



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.

While the creation of the CTE and its resulting grant, loan, and rebate programs will most directly support the funding goal identified in the Transit ZEV Roadmap, it will also have a role to play in the other four implementation areas by fostering greater statewide ZEV planning and implementation across the state. It will be important for the CTE Board to maintain alignment with the supporting policies and actions undertaken by the State of Colorado in the coming years to ensure that their efforts are mutually supportive of the transit agencies undertaking this challenging transition.

Estimated Financial Resources & Expenditures

Funding from the CTE will be a key enabler for assisting transit agencies with ZEV transition. Fee revenues collected will support planning and facility modification efforts and capital equipment purchases for transit ZEVs and charging infrastructure, along with administrative and operating expenses for the Enterprise.

Clean Transit Retail Delivery Fee

SB 21-260 established several new fees on the delivery of items that are subject to the state sales tax. The rates for these fees will be increased in future years to account for inflation. The CTE is funded by a retail delivery fee initially set at a rate of \$0.03 per delivery. This is the maximum amount established by SB 21-260, although the fee may be adjusted for inflation in future years. The CTE Board will work with staff of CDOT, the Colorado Department of Revenue (DOR) and other subject matter experts on how and when to adjust the retail delivery fee to account for inflation over time.

The CTE Board initiated the rulemaking process on February 22, 2022 to set the Clean Transit Retail Delivery Fee. In accordance with administrative procedures, the proposed rule was filed with the Secretary of State on February 25 and a public comment period was open from March 10 through April 7. A public hearing was held on April 12, 2022 and the Board adopted 2 CCR 607-1, Rules Governing Clean Transit Enterprise Processes and Fees on the same day. The final rule can be found online [here](#).

Anticipated Fee Revenues for FY23-FY32

To forecast the revenue from the retail delivery fees, CDOT used the outputs from the SB 19-239 Emerging Mobility Impact Study to estimate the number of deliveries that would be subject to this fee. The study's initial outputs were revised to reflect updated traffic volume inputs and revised ZEV fleet penetration assumptions. Updated forecasts for this revenue will be included in CDOT's future quarterly revenue forecasts.

The fees established in SB21-260 are on-going revenue streams and CDOT staff have estimated revenue amounts for the next ten years.

The projections anticipate that the Clean Transit Retail Delivery Fee will result in \$8.2 million in revenue in the first full year of implementation, growing to \$20.6 million by 2032. Anticipated fee revenue amounts for 2033 and beyond will be calculated in the future.

FIGURE 5: CLEAN TRANSIT RETAIL DELIVERY FEE, FY 2022-23 TO FY 2031-32

Fiscal Year	Estimated Rate Per Trip	Total
FY 2021-22	\$0.000	\$0
FY 2022-23	\$0.030	\$8,280,329
FY 2023-24	\$0.031	\$9,132,872
FY 2024-25	\$0.031	\$9,834,347
FY 2025-26	\$0.032	\$11,134,125
FY 2026-27	\$0.033	\$12,308,104
FY 2027-28	\$0.034	\$13,617,560
FY 2028-29	\$0.034	\$14,712,367
FY 2029-30	\$0.036	\$16,716,268
FY 2030-31	\$0.037	\$18,549,225
FY 2031-32	\$0.037	\$20,606,029
10-Year Total		\$134,891,225

The projections anticipate that the Clean Transit Retail Delivery Fee will result in **\$8.2 million** in revenue in the first full year of implementation, growing to **\$20.6 million** by 2032.

Anticipated Expenses for FY23-FY32

The CTE Board will establish an annual budget, which will include anticipated expenses for the Board to execute its business purpose. Elements of the annual budget include Administrative and Agency Operations to support day-to-day operations of the enterprise, Contingency Reserve to handle unexpected expenses that are outside the range of the usual budget, and Programmed Funds that will be made available in the form of grants, loans, rebates and revenue bonds to transit agencies to support zero emission vehicle transition.

Administrative and Agency Operations

Administrative and Agency Operations includes staff time, professional services and other board expenses.

The CTE does not anticipate having dedicated staff members, but will be leveraging existing CDOT staff with the necessary expertise to support Enterprise work. Staff from OIM, DTR, Division of Accounting and Finance (DAF), and Office of Policy and Government Relations (OPGR) will be identified to support the enterprise and will charge any time spent working on CTE efforts directly to the Enterprise. In addition, CTE will leverage resources from the Colorado Attorney General's Office for legal expertise and from the Office of State Audit for an annual independent financial audit.

Also included in this budget category are board expenses related to holding board meetings and supporting board member travel to in-person meetings, language translation services to ensure accessibility and professional services to assist with development of the CTE's required public accountability dashboard and other program evaluation efforts.

In fiscal year 2023, the Administrative and Agency Operations budget line item will also include repayment of the start-up loan agreement from the CDOT Transportation Commission, including accumulated interest, per the terms of the loan agreement.

FIGURE 6: CLEAN TRANSIT ENTERPRISE PROPOSED SPENDING PLAN

LINE ITEM	YEAR 1 FY 2022-23	YEAR 2 FY 2023-24	YEAR 3 FY 2024-25	YEAR 4 FY 2025-26	YEAR 5 FY 2026-27	YEAR 6 FY 2027-28	YEAR 7 FY 2028-29	YEAR 8 FY 2029-30	YEAR 10 FY 2030-31	YEAR 10 FY 2031-32
1 TOTAL REVENUES	\$8,280,329	\$9,132,872	\$9,834,347	\$11,134,125	\$12,308,104	\$13,617,560	\$14,712,268	\$16,716,268	\$18,549,225	\$20,606,029
2 Clean Transit Retail Delivery Fee	\$8,280,329	\$9,132,872	\$9,834,347	\$11,134,125	\$12,308,104	\$13,617,560	\$14,712,268	\$16,716,268	\$18,549,225	\$20,606,029
CLEAN TRANSIT ENTERPRISE - REVENUE ALLOCATION										
3 Administration & Agency Operations	\$626,628	\$560,917	\$575,838	\$591,281	\$607,265	\$623,808	\$640,930	\$658,652	\$676,994	\$695,977
4 Staff Salaries	\$411,900	\$426,317	\$441,238	\$456,681	\$472,665	\$489,208	\$506,330	\$524,052	\$542,394	\$561,377
5 Program Administrator	\$15,000	\$15,525	\$16,068	\$16,631	\$17,213	\$17,815	\$18,439	\$19,084	\$19,752	\$20,443
6 Board Secretary	\$5,500	\$5,693	\$5,892	\$6,098	\$6,311	\$6,532	\$6,761	\$6,998	\$7,242	\$7,496
7 DTR Director	\$6,500	\$6,728	\$6,963	\$7,207	\$7,459	\$7,720	\$7,990	\$8,270	\$8,559	\$8,859
8 DTR Staff	\$300,000	\$310,500	\$321,368	\$332,615	\$344,257	\$356,306	\$368,777	\$381,684	\$395,043	\$408,869
9 OIM Staff	\$37,500	\$38,813	\$40,171	\$41,577	\$43,032	\$44,538	\$46,097	\$47,710	\$49,380	\$51,109
10 Enterprise Controller/Accountant	\$15,000	\$15,525	\$16,068	\$16,631	\$17,213	\$17,815	\$18,439	\$19,084	\$19,752	\$20,443
11 DAF Budget Analyst	\$10,000	\$10,350	\$10,712	\$11,087	\$11,475	\$11,877	\$12,293	\$12,723	\$13,168	\$13,629
12 DAF Procurement Staff	\$20,000	\$20,700	\$21,425	\$22,174	\$22,950	\$23,754	\$24,585	\$25,446	\$26,336	\$27,258
13 OPRG Rule Coordinator	\$2,400	\$2,484	\$2,571	\$2,661	\$2,754	\$2,850	\$2,950	\$3,053	\$3,160	\$3,271
14 Attorney General's Office Fees	\$5,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
15 Office of State Audit - Annual Financial Audit	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000
16 Professional Services	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000
17 Language Translation Services	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000
18 Administrative Expenses	\$6,600	\$6,600	\$6,600	\$6,600	\$6,600	\$6,600	\$6,600	\$6,600	\$6,600	\$6,600
19 Board/Staff Travel	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000
20 Board Meeting Expenses	\$600	\$600	\$600	\$600	\$600	\$600	\$600	\$600	\$600	\$600
21 Miscellaneous	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
22 Loan Payments	\$76,128	-	-	-	-	-	-	-	-	-
23 Contingency Reserve	\$828,033	\$913,287	\$983,435	\$1,113,413	\$1,230,810	\$1,361,756	\$1,471,237	\$1,671,627	\$1,854,923	\$2,060,603
24 Board Reserve Fund (10.00%)	\$828,033	\$913,287	\$983,435	\$1,113,413	\$1,230,810	\$1,361,756	\$1,471,237	\$1,671,627	\$1,854,923	\$2,060,603
25 Programmed Funds	\$6,825,668	\$7,658,668	\$8,275,075	\$9,429,432	\$10,470,029	\$11,631,996	\$12,600,200	\$14,385,989	\$16,017,309	\$17,849,449
26 Programmed Funds	\$6,825,668	\$7,658,668	\$8,275,075	\$9,429,432	\$10,470,029	\$11,631,996	\$12,600,200	\$14,385,989	\$16,017,309	\$17,849,449
27 TOTAL - CTE	\$8,280,329	\$9,132,872	\$9,834,347	\$11,134,125	\$12,308,104	\$13,617,560	\$14,712,367	\$16,716,268	\$18,549,225	\$20,606,029

Contingency Reserve

Contingency Reserve is established within the annual budget to handle unexpected expenses and includes a Board Reserve fund in the amount of 10 percent of total revenue.

Board Reserve will be used as a contingency for project cost increases and other unexpected expenses. For example, if a transit agency is awarded funding for a project and there are cost increases during project execution due to supply chain issues or unforeseen material cost escalations, the agency would be able to request supplemental funding from the Board Reserve.

If the Board Reserve is not needed in a given year, this funding will be rolled into programmed funds for the next year. The CTE anticipates reviewing and assessing the need for the 10 percent level of Contingency Reserve on an annual basis as more experience is gained with the Clean Transit Retail Delivery Fee revenue stream.

Programmed Funds

Programmed Funds are dedicated to assisting transit agencies with their transition to zero emission buses and include project funding categories to support zero emission planning studies, facility modifications, vehicle replacements and installation of charging/fueling infrastructure.

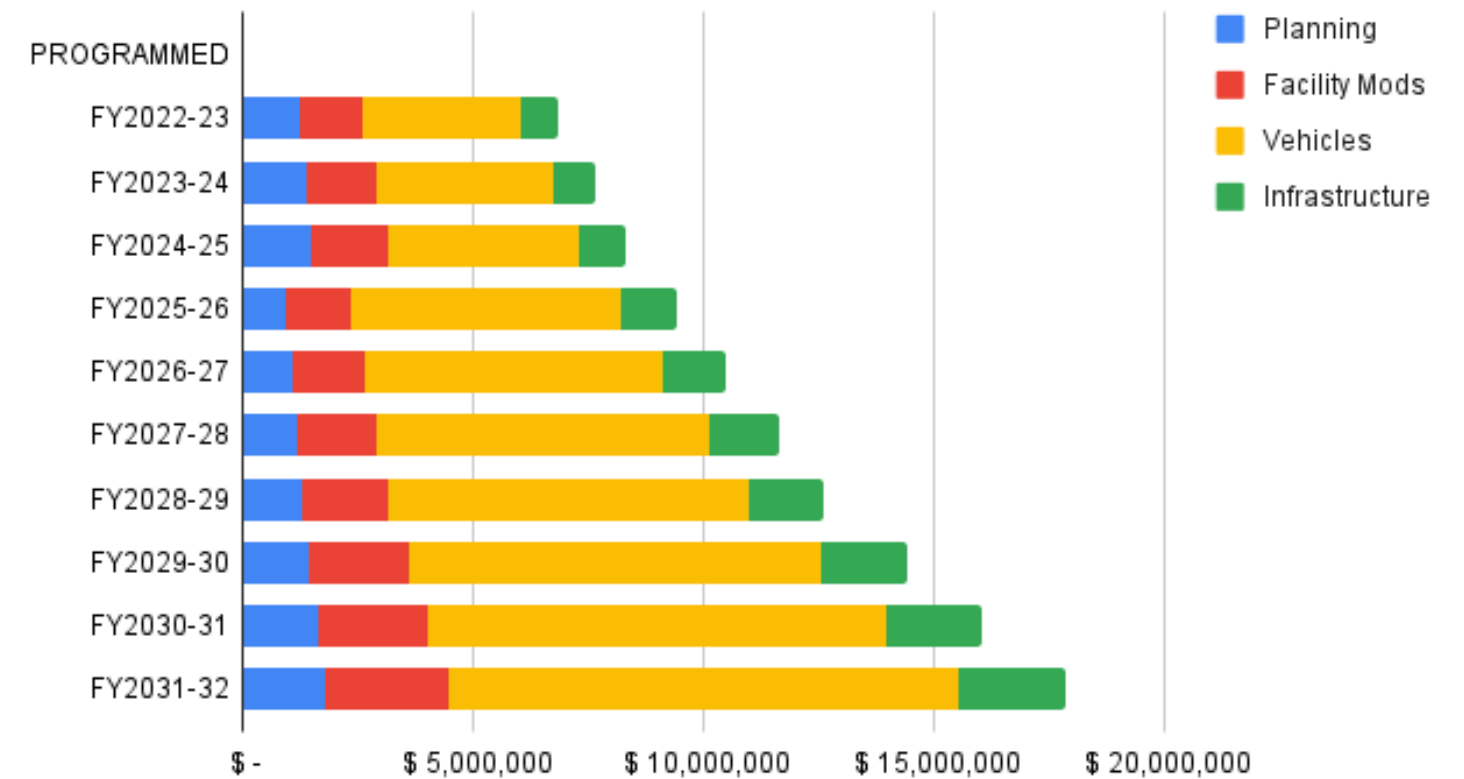
Transit agencies will apply to CTE for programmed funds during regular calls for project applications. Applications will be evaluated based upon pre-established evaluation criteria and proposed project awards will be approved by the CTE Board.

It is the desire of the CTE Board to avoid strict funding caps by project category (planning, facility modifications, vehicles and infrastructure), but it is generally expected that the CTE will see more applications for planning and facility modification projects in the early years. This reflects the need for transit agencies to complete these types of readiness efforts prior to pursuing capital equipment purchases for vehicles and charging infrastructure.

The Programmed Funds estimates by project category are for illustrative purposes and reflect the general cost differences for projects in each category, with planning projects being the least expensive and vehicle purchases being the most expensive, along with assumptions about which types of funding transit agencies will require in the short- and long-term in order to successfully transition to ZEVs.

The CTE Board will strive for a mix of different project types in each round of funding, but ultimately the project mix will be determined by the number of applications received for each project type and the total amount of funding available in the Programmed Funds category in any given year.

FIGURE 7: CTE PROGRAMMED FUNDS ESTIMATE BY PROJECT CATEGORY



PLANNING PROJECTS are intended to support transit agencies in developing zero emission transition plans.

These plans typically include a long-term fleet transition timeline, individual route and schedule feasibility analyses, assessment of current and potential funding resources, identification of facility and workforce capacity, among other topics, and are a documented best practice to ensure successful deployment of ZEVs into a transit fleet. The cost of ZEV transition plans can range from \$25,000 - \$100,000 depending on the size of the agency and scope of the effort. Prior experience with existing ZEV Planning Grants in Colorado suggests that \$50,000 per award is a reasonable estimate for budgeting purposes.

It is the stated desire of the CTE Board to ensure that every transit agency in Colorado has the opportunity to develop a ZEV Plan in the early years of the Enterprise. To achieve this, CTE will need to dedicate approximately 18 percent of Programmed Funds in years 1-3. In future years, it is assumed that all agencies will at least have an initial plan, but that some agencies may still require planning funds to enable on-going updates to existing plans or development of new plans for additional routes. The anticipated lower demand for planning in the out years compared to the initial years suggests that CTE will adjust planning projects to 10 percent of Programmed Funds in the out years.



FACILITY MODIFICATIONS PROJECTS are intended to support the safe operation and maintenance of ZEVs.

Transit maintenance facilities have historically been equipped to service gasoline and diesel vehicles and facility modifications may be necessary to ensure that transit agencies can service and maintain any ZEVs in their fleet, as well. It is anticipated that transit agencies will pursue maintenance facility modification projects prior to procuring vehicles to ensure that their facilities are equipped to handle this new technology; therefore, 20 percent of Programmed Funds in years 1-3 are dedicated to Facility Modification projects. This drops to 15 percent of Programmed Funds in the out years of the plan.



VEHICLE ACQUISITION PROJECTS are intended to support the purchase of zero emission transit vehicles per the guidelines outlined in SB21-260.

Per the definition in statute, zero emission vehicles include battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs) and hydrogen fuel cell electric vehicles (FCEVs). Funding is also allowable in some limited circumstances for compressed natural gas vehicles fueled with at least 90 percent recovered methane, if no electric option is practically available. SB21-260 also allows for the funding of non-electric vehicles that are converted or repowered to make them ZEVs, which is sometimes more cost-effective for transit agencies.

Transit ZEV purchases are estimated to range from \$100,000 for a van to \$1,200,000 for an articulated bus according to the Transit ZEV Roadmap, making them the largest line item in the Programmed Funds category. Fifty percent of Programmed Funds will be dedicated to vehicle projects in years 1-3. This will increase to 63 percent of Programmed Funds in the out years of the plan in anticipation of more transit agencies having completed the necessary planning to acquire ZEVs and the anticipated cost decrease for these vehicles in the market as production volumes increase.



CHARGING/FUELING INFRASTRUCTURE PROJECTS are intended to support installation of recharging or refueling equipment necessary for transit ZEV purchases.

The Transit ZEV Roadmap suggests that charging infrastructure ranges in cost from \$50,000 to \$110,000 per charger (including both purchase and installation), though these costs can vary significantly by charger type and project location. Hydrogen fueling is also eligible but costs are harder to estimate based on a lack of existing projects in Colorado.

By dedicating 12 percent of Programmed Funds to Infrastructure projects in years 1-3, the CTE is estimated to be able to fund approximately one charger per vehicle (assuming a standard 80/20 cost share). As more agencies complete ZEV transition plans in the early years of the Enterprise and shift toward capital purchases for vehicles and infrastructure, the funding projection of Infrastructure projects remains at 12 percent of Programmed Funds in the out years of the plan reflecting the lower cost of charging infrastructure relative to vehicle purchases, but still sufficient funding to support approximately one charger per vehicle.

Potential Matching Funds and Supplemental Resources

A number of additional funding sources exist with the goal of facilitating the transition of transit fleets to ZEVs. These funding sources include federal, state and local programs, as well as private sources such as financial incentives from utility providers.

Local match requirements for CTE-funded projects are discussed in more detail later in this plan, but it is important to note that many of these federal, state and local funding sources can be leveraged with CTE funding. The CTE Board encourages applicants to pair awards with outside funding sources where possible, and within the guidelines of each specific funding program, in order to enable and accelerate their ZEV transition. A list of potential federal and state funding sources can be found in the Transit Zero Emission Vehicle Roadmap. CDOT is the designated entity for most of the transportation-related federal and state funding, and CDOT staff can provide assistance to transit agencies in pursuing funding opportunities.



Photo Credit: Grand Valley Transit

CTE Funding Strategy

While SB21-260 clearly defines the business purpose, eligible project categories and planning and reporting deadlines of the CTE, many questions related to the funding strategy, program prioritization and individual applicant requirements were left for the CTE Board and supporting staff to define as part of this 10 Year Plan.

Over the course of the spring of 2022, these groups held multiple discussions and solicited survey feedback from a number of transit agency and broader community stakeholders that helped to inform the Board's decisions on the topic areas below.

Many of these areas will require ongoing research, stakeholder engagement and policy development following the completion of this plan and are likely to inspire future revisions and refinements as the CTE moves into the program implementation phase of its work.

Funding Mechanisms

After multiple stakeholder discussions and consultation with the CTE Board, CTE funding will consist of grants, rebates and loans. Grants are the most familiar to both agencies and DTR staff and will be ready for CTE to implement quickly. Other funding sources including rebates and loans are of interest to the Board, but will require more time to develop.

- **GRANTS:** Grants have historically been the primary source of CDOT and FTA support for transit agencies in their activities, including transit electrification. Consensus from the Board and agency stakeholders strongly favors this option. The selection of grants will be on a competitive basis, and the CTE Board will leverage CDOT DTR staff to help oversee the administrative grant management process and requirements, with DTR staff charging their time to the Enterprise for all time spent working on CTE efforts. Grant requirements will be updated periodically based on the annual budget and anticipated programmed funds available each year.
- **REBATES:** A rebate is a reimbursement after certain eligible purchases of pre-approved standardized equipment that is vetted in advance rather than through a more labor-intensive application review process. The drawback of this option is that it requires the applicant to pay full price at the time of purchase, where lower resourced agencies may not be able to cover these initial costs.
- **LOANS:** A loan is an arrangement that provides capital for costs in the present to be paid back over a future period, often with a low interest rate, and enables agencies to make cost-effective investments. Loans have not been commonly used by CDOT in the past but could be a beneficial option for transit agencies in some cases.

In consultation with the CTE Board, grants will be the primary initial source of funding for transit agencies. Rebate and loan options will be further investigated and developed in a later stage as the CTE Board considers effective use cases that do not conflict with state laws and regulations. The Board will evaluate all funding programs periodically and will leave a degree of flexibility in adjusting funding mechanisms as the program matures.

Funding Categories

The Enterprise was created to serve the primary business purpose of reducing and mitigating the adverse environmental and health impacts of air pollution and greenhouse gas emissions produced by retail deliveries. To meet this purpose, the following types of projects were identified as eligible for enterprise funding:

- **PLANNING:** Funding planning studies that enable transit agencies to plan for transit vehicle electrification
- **FACILITY MODIFICATIONS:** Supporting facility modifications that allow for the safe operation and maintenance of electric transit motor vehicles
- **VEHICLE ACQUISITION:** Supporting the replacement of existing gasoline and diesel public transit vehicles with zero-emission motor vehicles (including conversions and repowers)
- **CHARGING/FUELING INFRASTRUCTURE:** Providing the associated recharging and refueling infrastructure for zero-emission transit fleet motor vehicles

The Board recognizes that different agencies are in different stages of their transit electrification efforts, and agencies will have different priorities depending on their development stage, so a degree of flexibility in funding eligibility will be maintained.

As mentioned previously, the CTE Board has decided not to establish specific dollar or percentage caps by funding category in order to maintain a high level of flexibility in relation to shifting agency needs and market conditions. However, for the purposes of long-term financial planning and year-to-year budgeting, it is necessary to assume certain dollar amounts in each category that can be adjusted and refined in future years based on demonstrated applicant demand for each.

In addition, tracking and measuring agency performance against any ZEV plans developed via CTE funding, along with periodic program evaluation efforts, can help the CTE Board and staff to make informed future decisions on funding adjustments and project prioritization updates.



Photo Credit: CDOT

Project Prioritization

Among the four eligible project types, individual applications will need to be prioritized in the context of limited funding. The CTE Board will prioritize projects that address emissions reduction, service to disproportionately impacted communities, and agency and project readiness as top priorities.

Additional factors of influence include match level and geographic distribution. A weighted, multi-factor formula for scoring the projects will be developed by the CTE Board, CDOT staff and transit agency stakeholders prior to the first funding awards being made.

Primary Factors

1 EMISSIONS REDUCTION: Given that the business purpose of the CTE is to mitigate the negative impacts of air pollution and greenhouse gas emissions, it is the desire of the CTE Board for anticipated emission reductions to be one of the primary factors considered in scoring individual funding requests.

While it is relatively easy to make a direct emissions profile comparison between an existing gasoline or diesel vehicle and its zero-emission replacement, there are other elements that need to be considered for a full accounting of emissions benefits. These include, but are not limited to, total vehicle mileage, overall ridership, frequency of service, estimated displacement of automobile trips, carbon intensity of the electricity or fuel used, scrapping of existing vehicles and more. It is also important that these potential inputs be calculated consistently across applicant agencies in order to allow for an apples-to-apples comparison by scoring committee members.

The CTE will work with CDOT staff and transit agency stakeholders to develop a consistent and transparent methodology for calculating the anticipated emissions benefits of different proposed projects. This will serve as one of multiple inputs into the overall weighted, multi-factor scoring formula used to guide application review and selection. The emissions reduction methodology and overall scoring formula will be reviewed and adjusted in future years to ensure that it continues to support the business purpose of the CTE.



Photo Credit: Summit Stage

2 SERVICE TO DI COMMUNITIES: Electrifying transit fleets offers an opportunity to advance equity given the air quality, health and resiliency benefits that may be amplified in traditionally marginalized communities where residents face higher levels of pollution and are more susceptible to climate change impacts.

There is a crucial need for agencies to continue to enhance their efforts in prioritizing projects that will directly benefit disproportionately impacted (DI) communities.

Per SB 21-260, “disproportionately impacted community” means a community that is in a census block group, determined in accordance with the most recent census, where the portion of households that are low income is greater than 40 percent, the portion of households that identify as minority is greater than 40 percent, or the proportion of households that are housing cost-burdened is greater than 40 percent. The Colorado Energy Office is currently conducting an EV Equity Study to map out the state’s DI communities, identify strategies for supporting greater access to the benefits of ZEVs in those communities, and provide tools for agencies to utilize in planning and developing programs for equitable access.

3 AGENCY AND PROJECT READINESS: Investment in transit electrification is key to reducing emissions, and funding is essential in overcoming cost barriers. However, the successful roll-out of electric buses is much more complex than simply purchasing buses. Having a comprehensive implementation plan is crucial to ensure widespread adoption and success.

As such, the CTE Board will assess the applicant’s ability or readiness to successfully implement the project as a priority for competitive funding. Applicants should be able to address various aspects of the project including procurement, charging, technical requirements and an operational and maintenance plan. Other key factors in assessing the project’s success include stakeholder engagement and the level of existing utility coordination. It is recommended that agencies consult with their local utility provider to discuss cost implications and to address grid capacity in order to plan service routes and infrastructure upgrades efficiently.



Photo Credit: Transfort

Secondary Factors

4

MATCH LEVEL: Local match by awardees is a common element of many grant programs because it helps to demonstrate a commitment to success by the implementing agency and also serves to spread limited funds further across more projects.

Therefore, an applicant’s ability to financially contribute beyond the required minimum match of the award will be considered as an additional benefit in the scoring process. However, this will be treated as a secondary factor given that many transit agencies lack the financial resources to over-match and should not be penalized as a result.

5

GEOGRAPHIC DISTRIBUTION: All transit agencies in the state will have access to funding support. Selected projects should represent agencies geographically dispersed across the State with an emphasis on balancing funding between urban and rural agencies.

Ozone nonattainment areas produce high emissions and should be prioritized; however, rural communities usually lack the resources that urban areas have access to. As balancing regional needs is a critical aspect in distributing equitable funds, a selection criterion for prioritization based on geographic distribution will be determined by the Board.

Planning Requirements by Applicants

The successful implementation of transit electrification projects, including initial pilots, requires extensive planning in order to understand current technologies, identify and mitigate potential risks, and adapt to unexpected obstacles. It is in the interest of the CTE Board and grantee transit agencies to ensure that the leadership and staff of organizations using CTE funding are positioned for success.

Therefore, the Board will work with staff to develop specific minimum planning requirements that applicants must meet in order to be awarded funding for Facility Modifications, Vehicle Acquisition and/or Charging or Fueling Infrastructure funding. Applications for Planning awards will be exempted from this requirement since it would present a barrier to entry for new transit agencies to access CTE resources.

As the CTE Board and staff develop applicant planning requirements, they will strive to align these as closely as possible with applicant planning requirements issued by the FTA to minimize redundancy and ensure that any plans developed by transit agencies confer eligibility for both state and federal funding programs. However, the CTE will also attempt to include additional or “stretch” planning elements that agencies are encouraged but not required to develop and document.

Applicant planning requirements will be reviewed and updated regularly to ensure continued alignment with those of the FTA, and CDOT staff will continue to develop, refine and share planning support resources with transit agencies in order to facilitate their compliance.



Match Requirements

While local agency match is a common element in many transportation grant programs and considered a best practice, match requirements can also present a barrier to entry for agencies with fewer financial resources, leading to an inequitable deployment of ZEVs and inconsistent access to their benefits by riders, employees and communities across Colorado. It is therefore important for the CTE to establish a match structure that balances these two competing priorities in order to maximize resources while maintaining accessibility.

The CTE Board and CDOT staff will collaborate with stakeholders to develop tiered match percentage requirements that account for the differing ability of transit agencies to contribute financially to projects that support zero-emission fleet transitions. One potential model for this is the approach used by the CDOT Multimodal & Mitigation Options Fund (MMOF), which uses factors such as Median Household Income, Median Home Value and Percentage of Population Above Poverty (among others) to establish variable match percentage requirements for local governments. A similar formula, paired with a process for applicants to request approval of a full match waiver by the CTE Board, could balance the need for match predictability on the part of applicants with a mechanism to allow for exceptions when circumstances dictate.

Apart from the overall match requirement structure above, the CTE Board and staff will also explore the option of establishing distinct match levels by the category of project being funded. For instance, past Planning grant programs in Colorado have required lower match requirements as a means of encouraging more agencies to participate, while the potentially high cost of projects in the Facility Modifications category could lead the CTE to require a higher award-ee match to prevent an imbalance in the overall division of funds across the entire CTE portfolio.

Eligibility of CTE Funding as Match for Other Programs

The business purpose of the CTE will be advanced by any successful effort to bring additional funding resources into Colorado that support transit ZEV transition. Therefore, to the extent that transit agencies are able to leverage awarded or anticipated CTE funding to increase their competitiveness for discretionary federal (or other) funding, the Clean Transit Enterprise will encourage this strategy by allowing the mixing of CTE and other funds on a given project.



Vehicle Scrapping Requirements

In managing a fleet transition from diesel and gasoline vehicles to zero-emission battery and fuel cell options, transit agencies stand to generate significant air quality benefits for their riders, employees, and surrounding communities.

However, if the diesel or gasoline vehicle displaced by the ZEV is simply moved to another route or sold to a different operator, then its negative emissions impacts may simply be moved to a different part of the state or to another state or country rather than fully eliminated.

Scrapping (the permanent destruction or disabling) of vehicles is one way to address this issue, but it can also create unintended waste by taking a transit vehicle off of the road prior to the end of its useful life when there could be other transit agencies in need of used vehicles to replace even older vehicles with higher emissions profiles. In addition, scrappage requirements can unintentionally prevent transit agencies without a vehicle to scrap from even applying for ZEV replacements.

The CTE will encourage the scrapping of the oldest and dirtiest in-service transit vehicles as a feature of all programs that involve the acquisition of new transit ZEVs. Some potential mechanisms that could be applied include a bonus factor in applications which include scrapping of an existing vehicle or vehicles, a match requirement reduction for such proposals, and CDOT or partner organization staff support to help awardee transit agencies transfer their emitting but still usable vehicle(s) to another non-awardee agency in exchange for scrapping of an older, dirtier vehicle in a “hand-me-down” system.

The CTE Board and staff will regularly monitor and assess the level of vehicle scrapping occurring as a result of CTE programs and adjust accordingly to maximize the overall benefits of the programs.

Vehicle Replacement Ratios

Zero-emission transit vehicles offer many benefits to riders, transit agency staff and surrounding communities, but also have technical limitations, at least at present. One common challenge is that currently available vehicles may have a lower overall range per charge than their traditional equivalents, which impacts the ability of transit agencies to maintain existing routes and schedules while replacing existing vehicles in a one-to-one ratio. As a result, there may be situations in which each traditional vehicle is most effectively replaced by more than one ZEV.

As a result, the CTE will not require a specific vehicle replacement ratio but rather allow applicant agencies to make their own determination as to the right fleet balance needed to maintain efficient and reliable operations as they transition to new zero-emission options across their diverse and ever-evolving service areas and customer needs. The CTE Board and CDOT staff will encourage agencies to prioritize routes able to be served by a single vehicle, but will assess individual funding requests on a case-by-case basis to consider when and where higher vehicle replacement ratios are merited.

Over time, it is anticipated that ZEV technologies will continue improving to the point that a more traditional one-to-one vehicle replacement ratio becomes possible across all vehicle and service types in Colorado. The CTE Board and CDOT staff will monitor these trends and consider future adjustments to this policy as changing technology and the needs of the Colorado transit network allows, while continuing to prioritize operational flexibility for applicant agencies.

Vehicle-to-Charger/Vehicle-to-Fueling Station Ratios

As with vehicle replacement ratios, the appropriate ratio of zero-emission vehicles to chargers or fueling stations depends on a number of variables, including:

- Existing and anticipated service schedules
- Existing and anticipated route distances
- Location, size and age of vehicle storage facilities
- Power levels of chargers (Level 2, DC Fast Charger, etc.)
- Depot versus on-route charging mix
- Use of hydrogen fuel versus battery electric charging

Accordingly, the CTE will not require a specific vehicle-to-charger or vehicle-to-fueling station ratio from applicants for funding, but will allow transit agencies to make their own determination as to the most appropriate strategy for charging or fueling infrastructure needed to efficiently and reliably support their transit services. The CTE Board and CDOT staff will develop resources to help agencies determine an appropriate

charging or fueling ratio and will assess individual funding requests on a case-by-case basis to consider whether or not the vehicle-to-charger/fueling station ratio proposed by a given applicant is justified.

While the CTE Board encourages agency flexibility and an individualized approach to appropriate charging strategies by transit providers, the CTE will not fund charging or fueling infrastructure that lacks a clear procurement and deployment plan for accompanying vehicles. CDOT staff will explore options to develop a rebate program that will facilitate a scaled build-out of additional charging units and/or fueling locations for agencies that have previously been approved for a Charging/Fueling Infrastructure, Vehicle Acquisition or Facility Modification awards.

Data Reporting Requirements

The collection, sharing and analysis of data is a critical element of any transportation project and particularly vital for those involving new and emerging technologies such as ZEVs and infrastructure. It is a standard practice for CDOT and other state agencies to require regular reporting of data for projects that are funded with grants, and zero-emission transit vehicles have the capability to produce a wide range of data on vehicle performance, battery capacity, charging behavior, temperature and terrain impacts, and other relevant points that can be analyzed and used to inform operational adjustments, routing and scheduling improvements, and future vehicle procurement and deployment strategies.

The insights gained from this data collection and analysis can prove valuable not just to the operating agency, but to other transit agencies across Colorado as well. Therefore, the CTE Board has an interest in ensuring that transit ZEV operational data is collected, analyzed and shared in a consistent and accessible manner to support the development of statewide best practices, improve the effectiveness of funded projects and help to inform future CTE program and policy adjustments. Once developed, these data reporting requirements will be clearly articulated to potential applicants and awardees in advance so that they are understood and agreed upon as a condition of CTE funding.

While data reporting requirements have some clear benefits, they can also potentially impose additional burdens on transit agency and CDOT staff, so the CTE Board will work with stakeholders to develop awardee data reporting requirements that align as closely as possible with existing National Transit Database (NTD) requirements and that have a clear connection to the interests of the CTE in improving future programs and policies.

CTE data reporting requirements will also be developed in a manner that can be easily input into the Transit Emissions Dashboard and GHG Transportation Planning Standard mitigation policies currently under development at CDOT in order to efficiently and consistently quantify and communicate the air quality and GHG benefits of the transition to zero-emission transit fleets in Colorado. The CTE Board and CDOT staff will also explore methodologies for employing reported data to quantify and communicate the potential equity benefits and disbenefits of zero-emission transit to DI communities in Colorado.

CTE Funding Programs

CTE will offer four categories of funding programs to fulfill its business purpose - Planning, Facility Modifications, Vehicle Acquisition and Charging/Fueling Infrastructure programs - each with a distinct role in addressing identified barriers for transit agencies to transition to ZEVs and helping Colorado achieve its goal of a 100 percent ZEV transit fleet by 2050.



Planning Programs

- **AGENCY-SPECIFIC GRANTS:** The CTE will offer a grant program to support ZEV-related planning activities that will prepare for, facilitate and refine individual agencies' fleet transition processes. The predominant focus of initial awards will be to support the development of comprehensive, agency-wide fleet transition plans for those transit agencies that don't currently have one. In the future, awards may also be considered for more focused ZEV planning efforts, including but not limited to individual route or facility analyses, vehicle performance assessments, project benefit-cost analyses, workforce transition plans or updated service plans. In such cases, applicant agencies will be required to identify a clear nexus to the ZEV transition process rather than a general agency need.

In all cases, applicant transit agencies will have the flexibility to identify the appropriate scope and timeline for the scoring committee to assess using a predetermined multi-factor scoring metric to be developed in partnership with the CTE Board, staff and stakeholders. Agencies will be strongly encouraged to align their planning efforts with national best practices, CDOT-developed planning templates and the planning requirements established by the FTA for their own ZEV grant programs. Awardee agencies will also be strongly encouraged to procure consultant support in the development of their plans and analyses, though scoring committee staff will consider support for agency staff-only planning efforts on a case-by-case basis.

Match requirements for awardees will be determined via a formula intended to assess a given agency's ability to financially contribute, including a mechanism for Board-approved match relief. The CTE Board will also consider a category-wide match reduction to encourage a greater focus on plan development in the early years of the CTE's implementation period.

- **ON-CALL PLANNING SUPPORT:** In addition to agency-specific, awardee-managed planning projects, the CTE Board will also investigate the option to award statewide or multi-agency on-call planning support projects that will offer individual agencies an opportunity to get specific, short-term planning support without the need for a fully-scoped, multi-month planning process. Once established, individual planning support requests will be reviewed and approved by CDOT staff based on predetermined criteria and processes approved by the CTE Board.
- **FUTURE OPTIONS:** The CTE Board and staff will consider additional grant, loan and rebate program options to support ZEV-related transit agency planning activities in the future based on emerging best practices and stakeholder feedback.



CTE will offer **four categories** of funding programs - each with a distinct role in helping Colorado achieve its goal of a **100 percent ZEV transit fleet by 2050.**



Facility Modification Programs

- **GRANTS:** The CTE will offer grants to fund facility modifications necessary to support the safe, efficient and scalable transition to ZEV fleets across the state. Applicant transit agencies will have the flexibility to identify necessary facility modifications and upgrades for the scoring committee to assess using a predetermined multi-factor scoring metric to be developed in partnership with the CTE Board, staff and stakeholders.

Potential facility elements identified for funding include but are not limited to hazard detection and fire prevention systems, electrical grid connection upgrades, modernized maintenance and repair bays to accommodate ZEV technology, and power generation, storage, and backup systems, among others. Applicants will be encouraged to partner with local electric utilities to offset any costs related to power supply to new or existing facilities. Proposals may be limited to a specific area or system of an existing transit facility or encompass a more extensive rebuild or construction project, though the CTE Board and staff will identify an appropriate grant cap to prevent a small number of large projects from absorbing limited CTE funds in a given year.

Match requirements for awardees will be determined via a formula intended to assess a given agency's ability to financially contribute, including a mechanism for Board-approved match relief. The CTE Board will also consider a higher category-wide match level to stretch limited funding further and ensure a firm agency commitment on potentially expensive and long-term projects.

- **FUTURE OPTIONS:** The CTE Board and staff will consider additional funding mechanisms, specifically loan offerings, to support a greater number and variety of agencies in preparing for and beginning their fleet transitions.



Charging/Fueling Infrastructure Programs

- **GRANTS:** The CTE will offer a grant program to support the purchase and installation of charging and/or fueling infrastructure to support current and future ZEV deployments. Grants may be coupled with a specific vehicle award or facilities modification award or may in certain circumstances be stand-alone. Applicant transit agencies will have the flexibility to identify appropriate charging/fueling equipment, siting and installation timelines for the scoring committee to assess using a predetermined multi-factor scoring metric to be developed in partnership with the CTE Board, staff and stakeholders. Wired, inductive, on-route and other charging mechanisms will likewise be considered based on the agency's proposed approach. Installation of charging or fueling infrastructure without a clear path to vehicle acquisition and deployment will be avoided, but projects that incorporate a "future-proofing" approach that allows for cost-effective scaling in a later phase will be encouraged.

Match requirements for awardees will be determined via a formula intended to assess a given agency's ability to financially contribute, including a mechanism for Board-approved match relief. Applicants will be required to coordinate closely with their local electric utility and pursue any cost-sharing opportunities to reduce the overall funding need for a given project. Grants will function on a reimbursement basis, with CTE committing funding prior to the equipment purchase and making the awardee agency whole once the project has been completed.

- **FUTURE OPTIONS:** The CTE Board and staff will consider additional grant, loan and rebate options to support charging or fueling infrastructure projects in the future based on changing technologies, markets, emerging industry best practices and the input and feedback of transit stakeholders across the state. In particular, the CTE will explore options for establishing a charger rebate system that can be used by transit agencies to quickly scale up existing deployments without requiring a full grant application process, and will also investigate options for loan programs to support the acquisition and installation of charging and fueling infrastructure in accordance with the restrictions imposed by TABOR and other federal, state and local regulations.

- **HYDROGEN FUELING:** FCEVs powered by hydrogen are a well-established option for transit fleets to consider in their transition to ZEVs, but fueling infrastructure in Colorado is nearly non-existent as of 2022. While hydrogen fueling infrastructure is currently an eligible use of CTE funds, the CTE Board, staff and stakeholders will continue to monitor the hydrogen market in Colorado and explore options to develop a more targeted hydrogen fueling grant program to fund public or private "behind the fence" hydrogen fueling systems that support accompanying FCEV deployments by one or more transit agencies. Program elements will be based on existing best practices from states with more established hydrogen production and use, and will need to be adapted over time as the market develops and new barriers and opportunities are identified in Colorado.



Vehicle Acquisition Programs

- **GRANTS:** The CTE will offer a grant program to support the acquisition of zero-emission transit vehicles that is based on offsetting the incremental cost difference between a ZEV and its equivalent internal combustion vehicle option. Applicant transit agencies will have the flexibility to identify the appropriate vehicle type, vehicle replacement ratio and approach to disposal of the existing vehicle (as appropriate) for the scoring committee to assess using a predetermined multi-factor scoring metric to be developed in partnership with the CTE Board, staff and stakeholders.

Match requirements for awardees will be determined via a formula intended to assess a given agency's ability to financially contribute, including a mechanism for Board-approved match relief. Grants will function on a reimbursement basis, with CTE committing funding prior to the vehicle purchase and making the awardee agency whole once the vehicle has been delivered.

- **FUTURE OPTIONS:** The CTE will explore future options for establishing Loan or Rebate programs to support the acquisition of ZEVs in accordance with the restrictions imposed by the Colorado Taxpayers Bill of Rights (TABOR) and other federal, state and local regulations. One particular area of exploration may be the potential use of loans to support leasing of ZEVs or individual ZEV components such as batteries. The Board, staff and stakeholders of the CTE will identify opportunities and develop proposals for such programs for CTE Board approval in future years to ensure that the CTE continues to meet the funding needs of transit agencies engaged in a ZEV transition.



Zero Emission Vehicle (ZEV) Defined:

Per the definition in statute, zero emission vehicles (ZEV) include:

- Battery electric vehicles (BEVs)
- Plug-in hybrid electric vehicles (PHEVs)
- Hydrogen fuel cell electric vehicles (FCEVs)

Statute allows for the above vehicles to be purchased directly from a manufacturer or, when appropriate, repowered or converted by an intermediary from a non-ZEV to a ZEV

In circumstances where no electric motor vehicle option is practically available, funding is also allowable for:

- Compressed natural gas vehicles fueled with at least 90% recovered methane

10 Year Plan Implementation & Update Schedule



Coordination with CDOT Staff

The CTE does not have dedicated, permanent staff but rather contracts with CDOT to manage its operations. This has been an important element in the initial establishment of the Board, bylaw development and rulemaking activities of the Enterprise, along with the development and approval of this 10 Year Plan. It will become even more critical as the CTE moves into an implementation phase by collecting fee revenues, developing specific grant offerings, accepting and reviewing funding applications, and selecting, contracting, monitoring and reimbursing individual awards across the state. To the extent possible, the CTE Board will strive to ensure continued alignment between the goals and activities of the CTE and those of CDOT to avoid duplication of efforts and support an efficient statewide transition to zero-emission transit over the next decade and beyond.

Alignment with Existing CDOT Transit Grant Programs

Per the Process Rules adopted by the CTE on April 12, 2022, the CTE will coordinate with staff of CDOT DTR to align the notice of funding availability, application deadline and committee review timelines of the CTE call for funding with that of CDOT's regular grantmaking process. This will serve to minimize the administrative burden both on CDOT staff responsible for managing the grantmaking process and the transit agency staff managing applications for multiple funding sources at once. While application timelines, processes and points of contacts will be held consistent to the degree possible, the distinct award criteria, program requirements, data reporting and reimbursement tracking elements of the two funding streams will be maintained separately in accordance with the independent status of the CTE with staff charging their time to the Enterprise for all time spent on CTE work.

Future 10 Year Plan Updates

The CTE Board intends for this 10 Year Plan to function as a living document which will be updated and refined over time to account for changes in ZEV technologies, developing vehicle markets, emerging industry best practices and the specific feedback and input of transit stakeholders - most importantly, the implementing transit agencies themselves. To this end, the CTE Board intends to review this plan at least every 2 years following its adoption in order to evaluate the need for updates. The CTE Board may adjust the regular review schedule in future years as more in-state experience and overall market predictability is gained.



Photo Credit: Summit Stage

Conclusion

The statewide transition to zero-emission transit vehicles will be a long and challenging process requiring commitment, partnership and resources from stakeholders across Colorado.

The CTE was established to play a central role in this effort by helping to provide the funding support to transit agencies that was previously insufficient to achieve the state's goal of 1,000 transit ZEVs by 2030 and 100 percent transit ZEVs by 2050.

As the Board, staff and stakeholders of the CTE move from creation and planning to implementation and scaling, it will be critical for this close partnership to be maintained and strengthened, and for more voices and partners to be added to the conversation. While the path will not be easy, success in this effort will lead to cleaner, healthier and more efficient mobility for Coloradans in the years to come.



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