



# Electric School Buses in Colorado

*January 27, 2022*



**COLORADO**  
Department of Transportation



**COLORADO**  
Energy Office



**COLORADO**  
Department of Public  
Health & Environment





# AGENDA

**Colorado Medium- & Heavy-Duty Vehicle Study**

**Kay Kelly, CDOT**

**Electric School Bus Programs & Planning**

**Steve McCannon, CDPHE**

**Colorado Infrastructure Grant Programs**

**Christian Williss, CEO**

**Q&A**

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# Colorado Medium and Heavy-Duty Vehicle Analysis Study



# What Types of Vehicles are Medium/Heavy Duty?

## Class 2b: 8,501 to 10,000 lbs.



## Class Three: 10,001 to 14,000 lbs.



## Class Four: 14,001 to 16,000 lbs.



## Class Five: 16,001 to 19,500 lbs.



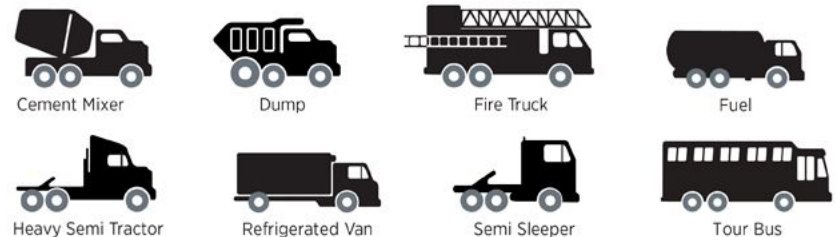
## Class Six: 19,501 to 26,000 lbs.



## Class Seven: 26,001 to 33,000 lbs.



## Class Eight: 33,001 lbs. & over



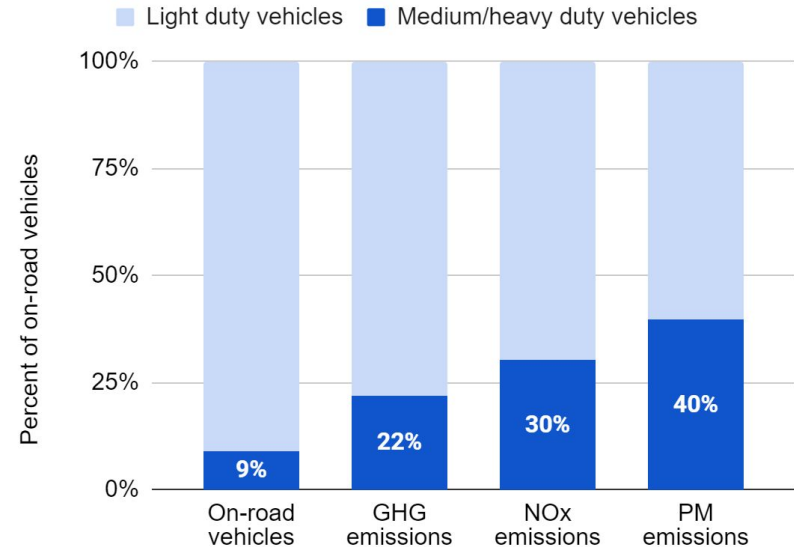
Source: <https://afdc.energy.gov/data/10381>



# M/HD Vehicles and Emissions

- M/HD vehicles contribute nearly a quarter of on-road GHG emissions, despite comprising less than 10% of Colorado on-road vehicles due to lower fuel economy and more vehicle miles traveled.
- M/HD vehicles are also a significant contributor to ozone precursor emissions (NO<sub>x</sub> and PM) that have serious impacts on air quality and human health.

## M/HD as a percent of total on-road vehicles



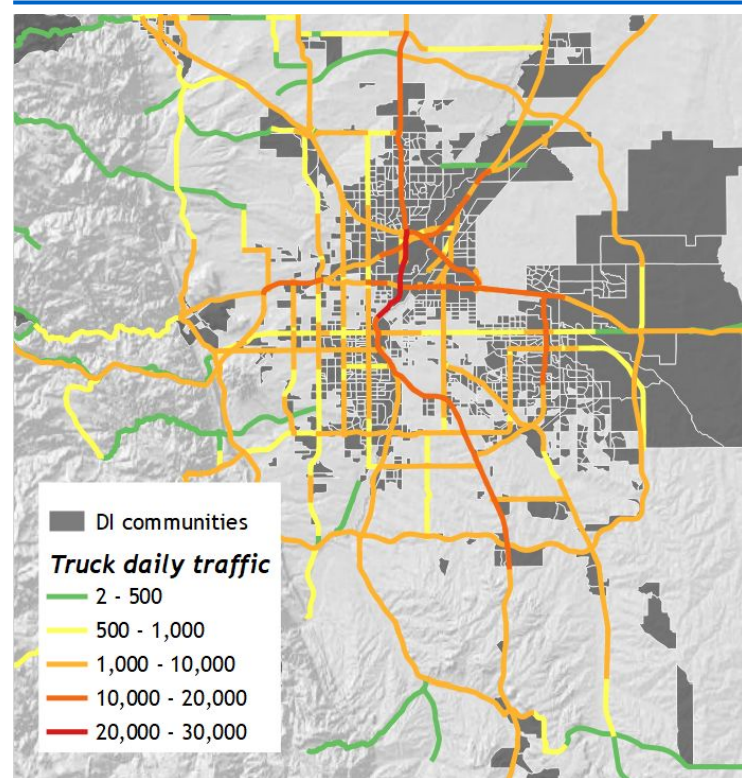
Sources: FHWA, vehicle registration data, CO GHG Roadmap, and 2017 National Emissions Inventory



# M/HDV and Disproportionately Impacted Communities

- Disproportionately impacted communities are more likely to live in close proximity to major freight routes, like I-70, I-270, and I-25, where they experience greater exposure to NO<sub>x</sub> and PM emissions that have significant impacts on human health.

Daily truck traffic and DI communities



# Near Term Transportation Actions in CO GHG Roadmap

Reduce pollution ~12.7 million tons by 2030

6 MMT  
reduction

Low & Zero Emission Vehicle rules

2 MMT  
reduction


Utility and public investment in fleet turnover and infrastructure for light-duty zero emission vehicles (SB19-077, electrification investments from SB21-260)

1.5 MMT  
reduction

GHG Transportation Planning Standard

Collectively, the other strategies will target remaining 3.2 million tons

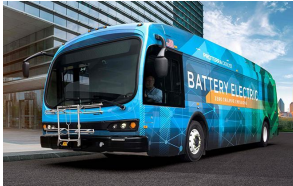
~3.2 MMT  
reduction

Incentivize land use to increase housing near jobs and reduce VMT and pollution	HB 21-1271, HB 21-1117; CDOT stakeholder process; affordable housing committee; Strong Communities
Clean trucking strategy - infrastructure, fleet incentives, consider regulatory tools such as advanced clean trucks and fleet rules 	Study released October 2021 Stakeholder Engagement - Fall 2021/Winter 2022
Participate in developing post 2025 vehicle standards (state and federal)	Federal and CARB processes
AQCC evaluation of indirect source rules	RAQC has convened committee to start developing proposals
Expansion of public transit, including setting the stage for Front Range Rail	In progress - SB21-238, SB 21-260, Main Streets investments, on-going multimodal emphasis

# M/HD Zero Emission Vehicle Phase-In

Some vehicle types are more ready to transition to zero emission vehicles in the near term, while others are more challenging and will require more time and support.

## Wave 1: Transit



*Multiple vehicles available and actively operating in many regions*

## Wave 2: Delivery + School Bus



*Some vehicles available, pilot deployments and limited fleet usage underway*

## Wave 3: Medium Freight & Service



*Pilots, demonstration projects, and announcements of future models*

## Wave 4: Heavy Regional Freight



*Demos and announcements, but require more infrastructure to scale up*

## Wave 5: Corridor Long-Haul



*Aspirational, requiring major infrastructure investments nationwide*

2020

?

?

2050



# *Bus Markets are the Furthest Along in ZEV Offerings*

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- 5x more electric transit buses deployed nationally compared to electric trucks
- ~13% of the country's transit agencies currently have electric buses in their fleet or have them on order,
- 1/3 of transit agencies in the U.S. have committed to convert to zero-emission vehicles by 2045
- Every North American manufacturer of diesel buses also sells electric buses
- The electric school bus market is progressing rapidly, with electric models available from several major manufacturers
- School buses outnumber transit buses roughly 2:1 in CO



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# Electric School Bus Programs & Planning



# *Electric School Bus Efforts in Colorado*

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- RAQC ALT Fuels Program
  - 41 electric buses in urban, suburban, rural, and mountainous operational environments
- Xcel Program offering \$275,000 per bus
- CDPHE funding opportunity for up to 20 eBuses
- Clean Fleet Enterprise \$289M over 10 years
- Governor Polis' \$150M Budget Request
  - Our goal is to engage on incentives, planning, resources, and disproportionately impacted community funding
- Infrastructure Investment and Jobs Act



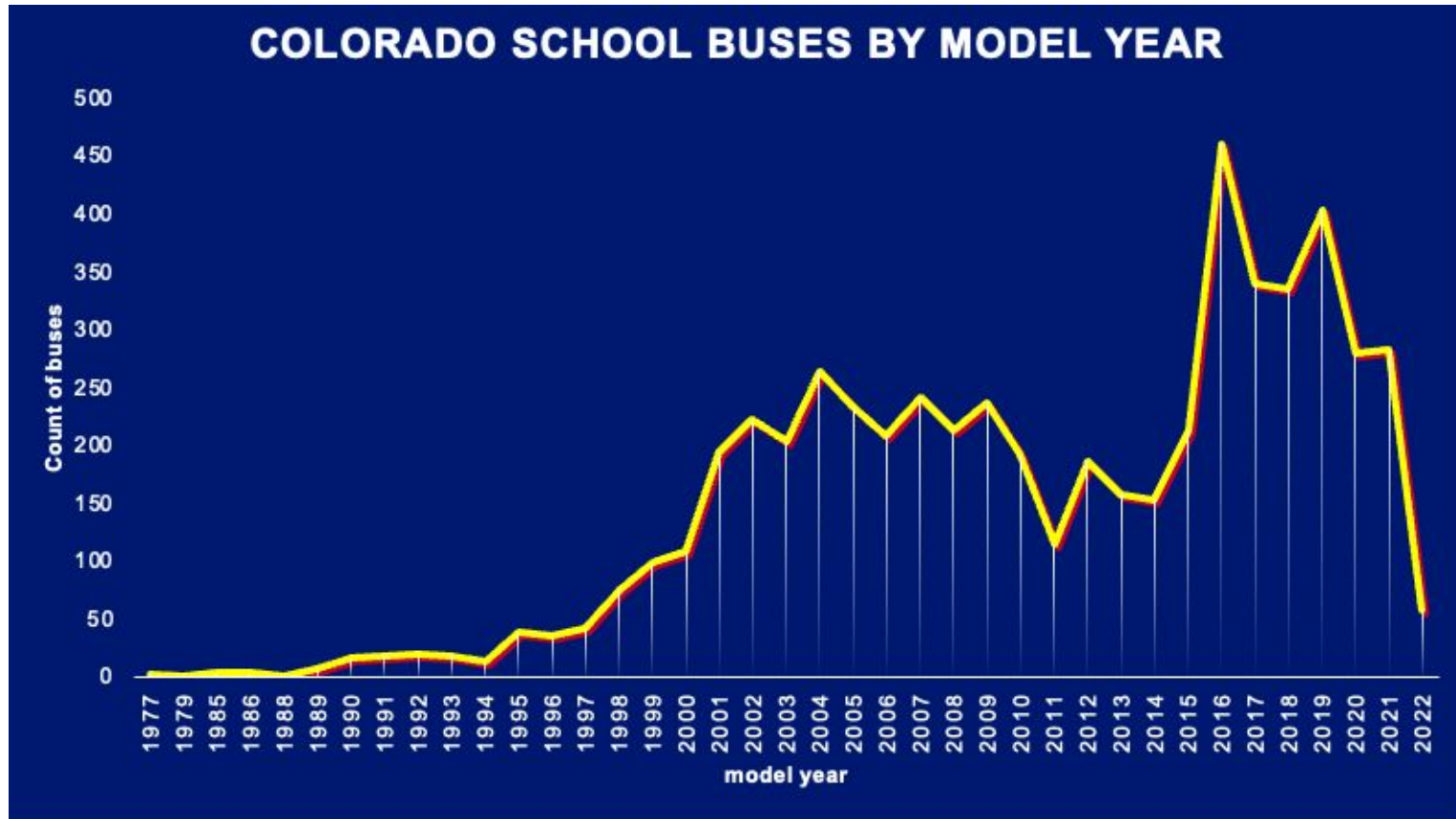
# Costs & benefits

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- Diesel bus cost \$100,000 - \$140,000
- Estimated eBus costs between \$320,000 - \$420,000
- Need to include infrastructure costs, could be a mix of Level 2 and DC Fast Chargers
- Cost savings \$9,000 per bus annually
- A large electric school bus program could reduce emissions by 11 tpd NO<sub>x</sub>, 0.8 tpd VOCs, 0.08 tpd PM<sub>10</sub> and PM<sub>2.5</sub>, 10,000 tpd GHG across Colorado
  - Significantly reduce in cab emissions



# School Bus Demographics



# Guideposts

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- Every district can do something now
- You could be investigating, planning, developing demonstration projects, going to scale from 2 - 50 buses
- Every district has a different use case
- Multi-year implementation for our State efforts
- No one-size-fits-all planning
- There are many resources out there to assist your efforts



# *Vehicle and infrastructure assistance*

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- [Clean Fleet Enterprise](#)
- [Community Access Enterprise](#)
- [Xcel Energy Resources](#)
- [ReCharge Colorado](#)



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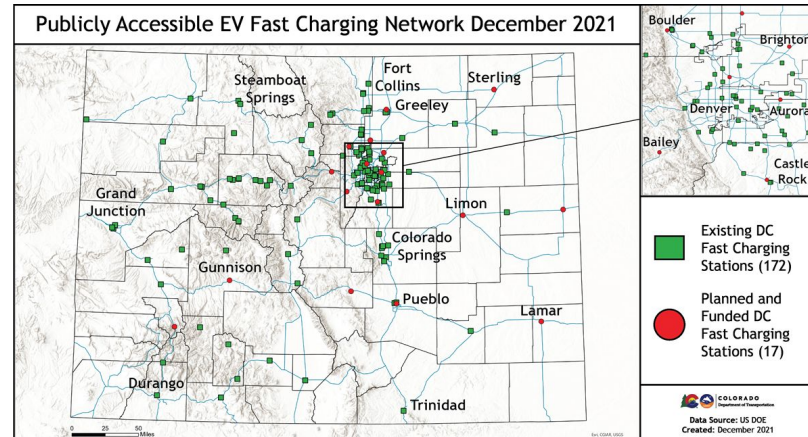
# Colorado Infrastructure Grant Programs





# Colorado Infrastructure Grant Programs

- Charge Ahead Colorado: Community-based Level 2 and DC Fast-Charging (DCFC) stations
- DCFC Corridors: High-speed charging stations along Colorado's major transportation corridors
- DCFC Plazas: High-speed charging stations for public users and high-mileage fleets
- New programs planned for later this year



# Funding for EV Charging Infrastructure

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- Community Access Enterprise is anticipated to bring in \$310 million over 10 years
  - Eligible activities include EV charging for light and medium/heavy duty vehicles, hydrogen fueling, and eBikes and EVs for low and moderate income Coloradans
  - Ten-Year Plan to be developed by June 1
- Infrastructure Investment and Jobs Act includes \$7.5 billion in funding for EV Charging Infrastructure - mix of formula and competitive grants
  - Approximately \$57 million in formula grants to Colorado
  - Guidance on how funds can be used will be issued in February



# Infrastructure Considerations

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- Electric school bus charging results in a (fairly) consistent load profile
- Ability to charge off-peak when it's less expensive and there are often more renewables on the system
- Potential for very favorable charging rates and reduced fuel costs
- Eligible for State grants and various utility programs
- Eligible to use State price agreements to purchase charging stations and related services



# Infrastructure Considerations

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- Engage your utility early - assistance with incentives, rates, charging optimization, and even technical support
- Right-size your charging infrastructure - mix of charging speeds that support operational needs while limiting capital and operational costs
- Future-proof sites - upsize transformers, pre-wire additional sites, allow for expansion





Thank you!



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