Electric School Buses in Colorado
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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
Colorado Medium and Heavy-Duty Vehicle Analysis Study
### What Types of Vehicles are Medium/Heavy Duty?

<table>
<thead>
<tr>
<th>Class 2b: 8,501 to 10,000 lbs.</th>
<th>Class Six: 19,501 to 26,000 lbs.</th>
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</thead>
<tbody>
<tr>
<td>Full Size Pickup</td>
<td>Beverage</td>
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<tr>
<td>Mini Bus</td>
<td>Rack</td>
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<tr>
<td>Step Van</td>
<td>School Bus</td>
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<tr>
<td>Utility Van</td>
<td>Single Axle Van</td>
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<tr>
<td>Stake Body</td>
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<thead>
<tr>
<th>Class Three: 10,001 to 14,000 lbs.</th>
<th>Class Seven: 26,001 to 33,000 lbs.</th>
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<tbody>
<tr>
<td>City Delivery</td>
<td>City Transit Bus</td>
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<tr>
<td>Mini Bus</td>
<td>Furniture</td>
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<tr>
<td>Walk In</td>
<td>High Profile Semi</td>
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<td>Home Fuel</td>
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<tr>
<th>Class Four: 14,001 to 16,000 lbs.</th>
<th>Class Eight: 33,001 lbs. &amp; over</th>
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<tbody>
<tr>
<td>City Delivery</td>
<td>Cement Mixer</td>
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<tr>
<td>Conventional Van</td>
<td>Dump</td>
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<tr>
<td>Landscape Utility</td>
<td>Fire Truck</td>
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<tr>
<td>Large Walk In</td>
<td>Fuel</td>
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<tr>
<td></td>
<td>Heavy Semi Tractor</td>
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<tr>
<td></td>
<td>Refrigerated Van</td>
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<tr>
<td></td>
<td>Semi Sleeper</td>
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<td></td>
<td>Tour Bus</td>
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</tbody>
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Source: [https://afdc.energy.gov/data/10381](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 (NOx and PM) that have serious impacts on air quality and human health.

Sources: FHWA, vehicle registration data, CO GHG Roadmap, and 2017 National Emissions Inventory
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 NOx and PM emissions that have significant impacts on human health.

Sources: CDOT, CDPHE
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

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

Reduce pollution ~12.7 million tons by 2030
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

Source: Modified from CALSTART
Bus Markets are the Furthest Along in ZEV Offerings

➔ 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
Electric School Bus Programs & Planning
Electric School Bus Efforts in Colorado

- 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

- 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 NOx, 0.8 tpd VOCs, 0.08 tpd PM10 and PM2.5, 10,000 tpd GHG across Colorado
  - Significantly reduce in cab emissions
School Bus Demographics

COLORADO SCHOOL BUSES BY MODEL YEAR

Count of buses

model year

Guideposts

- 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

- Clean Fleet Enterprise
- Community Access Enterprise
- Xcel Energy Resources
- ReCharge Colorado
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

● 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

- 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

- 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!