

APPENDIX I.

REPORTS OF THE SUBCOMMITTEES

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**Incentivizing
Zero-Emission Vehicles
Subcommittee**

SB19-239 Incentivizing Zero-Emission Vehicles Subcommittee Technical Memo

Introduction

At the start of the SB19-239 Stakeholder Working Group process, the Incentivizing ZEVs Subcommittee was established to identify and explore a number of questions related to the interplay between the emerging mobility sector and the ongoing transition from internal combustion engine vehicles (ICEVs) to zero-emission vehicles (ZEVs) that is taking place across Colorado and the world. Some of the key questions identified at the outset included:

- What types of policies and incentives can help motivate the replacement of ICEVs with ZEVs in the emerging mobility sector?
- How can fee revenues be utilized to help ensure continued support for the expansion of ZEV infrastructure?
- How can the increased adoption of ZEVs help ameliorate the negative environmental impacts of the emerging mobility sector in Colorado?

Between July and November of 2019, the Incentivizing ZEVs Subcommittee held 7 meetings to develop a workplan, review state of the practice research and data on ZEVs in the emerging mobility sector, discuss potential barriers to ZEV adoption and strategies to overcome them, and develop consensus recommendations to submit to the SB19-239 Stakeholder Working Group for their consideration. The following is a summary of the Subcommittee's findings, including its recommendations on a potential fee structure, identification of existing and additional tools to employ, and topics for further research and consideration by the Stakeholder Working Group and Legislature.

Benefits of ZEVs in the Emerging Mobility Sector

ZEVs offer a number of benefits in comparison with ICEVs, most notably their lack of tailpipe emissions. Given that the transportation sector is the leading source of emissions in the United States and soon will be in Colorado¹ and that the Denver / North Front Range Ozone Non-Attainment Area is anticipated to be upgraded to "Serious" status in the future, the increased adoption of ZEVs in Colorado will support improved air quality at both the local and statewide scale. In fact, according to the US Department of Energy's Alternative Fuels Data Center, an electric vehicle in Colorado will produce on average 52% of the annual carbon emissions of an ICEV.² Better still, that margin will improve over time as the state's electric grid continues to decarbonize. A 2017 study by the Denver Department of Public Health &

¹ <https://www.colorado.gov/pacific/cdphe/colorado-greenhouse-gas-reports>

² https://afdc.energy.gov/vehicles/electric_emissions.html

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Environment found that in terms of GHG emissions, an EV charging on the Xcel Energy grid in 2017 is equivalent to an ICEV with 52 mpg and by 2026 will be equivalent to one with 105 mpg.³ Meanwhile an ICEV with 34 mpg in 2017 will *at best* maintain this efficiency over the same ten year period.

In addition to the environmental benefits, ZEVs are cheaper to maintain and operate over the vehicle lifetime, in part because the cost of electricity is less volatile than that of gasoline or diesel fuel. Widespread vehicle electrification can also put downward pressure on overall utility rates by flattening demand curves. A 2017 assessment by MJ Bradley and Associates estimated a cumulative net savings of \$43 billion to Coloradans by 2050 as a result of large-scale transportation electrification⁴. In the future a growing number of ZEVs could also serve as distributed energy storage for the electrical grid, increasing overall resiliency.

Moreover, ZEVs offer increased consumer choice for Coloradans, allowing travelers to select the vehicle that best meets their needs in terms of lifestyle, performance, and environmental sustainability. This should only increase as automakers continue to produce more ZEV makes and models and as the recently-established ZEV Program encourages manufacturers to make more of them available to consumers in Colorado.

In addition to ZEVs' benefits in the broader transportation sector, they also offer particular advantages in the context of the six Transportation Providers identified for study in SB19-239. For instance, a 2019 study by UC Davis of real-world TNC trips in Los Angeles, San Francisco, and San Diego concluded that "in California, the emissions benefits of electrifying a vehicle in a TNC fleet are nearly three times greater than the benefits from electrifying a privately-owned vehicle."⁵ This is in large part due to the relatively high mileage of vehicles used for commercial purposes in comparison to those that are personally driven. While there are not yet such definitive studies of electrification benefits for the other five Transportation Providers being examined, it stands to reason that their high mileage and relatively quick fleet turnover rates would produce similar results to those seen for TNCs.

Finally, it is important to note that while currently TNC, taxi, car share, rental car, and delivery vehicles represent a small number and percentage of vehicles, VMT, and emissions in Colorado, it is also true that these emerging Transportation Providers represent a rapidly growing portion of the transportation sector. It is therefore important to focus on mitigating their impacts and establishing beneficial incentives today as a means of establishing a sustainable, positive trend for the future.

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https://www.denvergov.org/content/dam/denvergov/Portals/771/documents/EQ/EV/FinalUpdated_EVEmis_sionsAnalysis.pdf

⁴ https://mjbradley.com/sites/default/files/CO_PEV_CB_Analysis_FINAL_13apr17.pdf

⁵ <https://escholarship.org/uc/item/15s1h1kn>

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Subcommittee Fee Structure Recommendations

Because the SB19-239 Stakeholder Working Group was charged with addressing the question of how a fee structure could be used to support electrification, the Incentivizing ZEVs Subcommittee examined this topic and came to the following core recommendations regarding a potential fee structure.

Waived Fee for ZEVs: To accelerate the adoption of zero-emission vehicles (ZEVs) in Colorado, any proposed fee for commercial vehicle trips should be waived for trips completed in a ZEV. ZEVs provide significant air quality and climate benefits, and for this reason, the deployment of ZEVs in commercial fleets should be promoted instead of discouraged.

- Approach to Hybrid Electric Vehicles (HEVs): There was a debate among the Subcommittee participants as to whether the fee should also be waived or discounted for HEVs and other low-emission vehicles. While the group was unable to come to a consensus, a summary of the arguments pro and con are included below in the Pending Questions & Future Research section of the document.

Periodic Reassessment: Assuming that the fee is waived or reduced for ZEV trips, the policy should include an appropriate cap, sunset date, or periodic reassessment to address the long-term revenue impacts of commercial fleet electrification.

Fare Transparency: Transportation providers should provide clear transportation cost estimates to riders at all times. Fare estimates should show the price difference between the cost of a trip in an ICEV vehicle versus a ZEV to allow the user to make an informed decision.

Barriers to ZEV Adoption in the Emerging Mobility Sector

Over the course of the Incentivizing ZEVs Subcommittee's discussions, a number of barriers to greater ZEV adoption were identified. While some of these barriers apply broadly to all ZEVs, others are more potent or intractable for the six commercial vehicle types identified by SB19-239. It is important to note that this is a rapidly evolving transportation element and that current barriers may change over time.

High Capital Cost of EVs:

- ZEVs are currently more expensive than ICEVs, but the significance of this incremental cost depends on which entity owns or leases the vehicles.
- For mobility services where the company owns or leases the vehicles (Car Rental, Carshare, some TNC and delivery, etc.), the fuel cost savings of a ZEV are collected by the drivers, which might create a split incentive.

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- For mobility services where the company does not own or lease the vehicles (TNCs, Peer Carshare, Taxis), the drivers tend to have lower access to capital and are therefore less likely to purchase a ZEV, even if the total cost of ownership is lower over time.
- As the transportation sector continues to change and new forms of vehicle ownership and access (such as subscription services) develop in the future, the impact of this high initial vehicle cost may become more or less significant of a barrier.

Limited EV Model Availability and Vehicle Range:

- There is a limited selection of vehicle types and features, particularly for the crossovers, SUVs, and pickup trucks that are more popular among Colorado car buyers⁶.
- Lack of ZEV inventory and sales training at Colorado dealerships creates a barrier even for those who want to purchase an EV.
- Many of the ZEVs currently on the market have relatively short ranges compared to ICEVs, which can limit service and revenue potential for mobility services providers (whether in reality or in perception).
- Lack of medium-duty ZEV delivery truck models with sufficient range to accommodate the typical routes of residential delivery services.

Limited Access to EV Charging Stations:

- Limited access to home-charging at multi-unit dwellings may preclude many TNC drivers from switching to a ZEV, and most building owners have little incentive to provide the costly infrastructure that would make such a transition possible.
- The low number of public DC Fast-charging stations may limit potential areas of operation and add unnecessary VMT, congestion, and emissions as ZEVs travel long distances to recharge.
- Public charging stations are shared with non-commercial vehicles and may get crowded as the ZEV market continues to grow in the future, creating an opportunity cost as commercial EV users wait for an available plug.
- Existing DCFC locations are more highway-oriented and may have limited utility for drivers operating at a community level, which is more typical for these emerging commercial sectors.
- Residential delivery companies prefer dedicated behind-the-fence charging facilities, but limited grant funding exists for such infrastructure unless there is public access. Making these facilities open to the public would create substantial liability and security concerns, so in effect companies are unable to access resources designed to ease the high-cost transition to ZEVs.

High Cost of Fast Charging:

- The relatively high cost of construction, ongoing development of charging protocols, and rapid advancement of new charging technologies can all slow the development of a robust fast-charging network.

⁶ <https://autoalliance.org/in-your-state/CO/>

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- High demand charges and/or critical peak pricing can increase the cost of electricity at fast charging stations and negate the potential fuel cost savings of switching from an ICEV to a ZEV.
- Limited range and longer charging times of 45-60 minutes can create an opportunity cost in which charging downtime cuts into driver revenue.
- Larger fleets may require additional staff to manage charging operations and coordinate routes and operations to ensure that individual vehicles are ready for their next duty cycle.

Lack of EV Education and Awareness:

- Limited public understanding of available ZEV models and features, charging costs and locations, and economic and air quality benefits may combine to limit the number of individuals and companies actively considering electrification as an option.

Existing Tools & Strategies to Incentivize ZEV Adoption in Colorado

State Incentives and Programs:

Colorado EV Tax Credit

Description: In addition to the up to \$7,500 maximum federal EV tax credit (depending on the manufacturer), EVs purchased, leased, or converted and registered in Colorado are eligible for a state EV tax credit. The state tax credit for a light-duty EV is \$5,000 and begins to phase out starting in 2020 and ending on January 1, 2026. EVs leased for TNC services through long-term contracts of at least 2 years are eligible for the full purchase value of the tax credit⁷.

Barriers Addressed: High Capital Cost of EVs

Challenges: Low and middle-income drivers have lower access to capital, and therefore, are more likely to buy used vehicles, which are not eligible for the Colorado EV tax credit. A large portion of new mobility contractors may fall into this category.

Colorado Zero-Emission Vehicle (ZEV) Standard

Description: The standard would require each automaker to sell a certain number of ZEVs as a percentage of their total vehicle sales in Colorado starting in 2023.

Barriers Addressed: Limited EV Model Availability and Vehicle Range

Challenges: While the Colorado ZEV standards do include options for early action and proportional ZEV credits from California ZEV sales, the Colorado requirements do not officially kick-in until 2023, which leaves a near-term gap in ZEV model availability at Colorado dealerships.

⁷ <https://afdc.energy.gov/laws/11702>

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[Alt Fuels Colorado EV Fast Charging Corridors & Electrify America Fast Charging Network](#)

Description: The Colorado Energy Office (CEO) is funding the buildout of a network of public fast charging stations at 33 sites across six transportation corridors comprised of Interstate, State, and U.S. Highways. In addition, Electrify America is in the process of building 14 public fast charging sites across Colorado.

Barriers Addressed: Limited Access to EV Charging Stations, High Cost of Fast Charging

Challenges: Much of the funding for the public fast charging network is from the Volkswagen Settlement and is therefore limited. The charging stations are sited to provide statewide connectivity, but may still be insufficient for commercial EV operations on a more local level.

[Charge Ahead Colorado](#)

Description: The Regional Air Quality Council (RAQC) and CEO partner to provide financial support for EVs and EV charging stations. The program will cover 80% of the cost of an EV charging station up to \$9,000 for a Level 2 dual-port station and \$30,000 for a DC Fast Charging station. Funding has been awarded to local governments, school districts, state agencies, non-profits, multi-unit dwellings, and businesses for the deployment of more than 800 charging locations statewide.

Barriers Addressed: Limited Access to EV Charging Stations, High Cost of Fast Charging

Challenges: Funding is limited and the program is responsive to application submittals, unable to dictate station locations or who applies for funding.

[Colorado Electric Vehicle Plan & Colorado Electric Vehicle Coalition \(CEVC\)](#)

Description: The Colorado Electric Vehicle Coalition (CEVC), a statewide group of EV stakeholders committed to accelerating EV adoption, was created in 2015. This coalition is chaired by the CEO and works to improve statewide coordination, disseminate information about stakeholder activities, and promote EV adoption. The Coalition consists of thought leaders, educators, automobile dealers and manufacturers, state agencies, local governments, nonprofit organizations, utilities, and other stakeholders. In coordination with the CEVC, CEO published the Colorado Electric Vehicle Plan in January 2018, which outlines a series of actions and strategies the State can implement to accelerate EV adoption. The Plan is a living document and will be updated in 2020 to reflect the evolving policy landscape and EV market challenges.

Barriers Addressed: Lack of EV Education and Awareness, Limited Access to EV Charging Stations, High Capital Cost of EVs, Limited EV Model Availability and Vehicle Range, High Cost of Fast Charging

Challenge: The CEVC is a volunteer coalition and therefore does not have the funding to implement many of the outreach and EV education strategies that have been identified as beneficial.

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Utility Incentives and Programs:

EV Charging Rates

Description: Electric utilities across the state have introduced optional time-of-use (TOU) electricity rates with differential pricing for peak and off-peak demand periods. TOU rates give EV drivers the ability to minimize their energy costs by scheduling their EV charging during off-peak periods when rates are the lowest. In addition, Xcel Energy recently created an EV-specific rate for commercial fleets, which was designed to address the high cost of demand charges and improve the business case for EV fast charging.

Barriers Addressed: High Cost of Fast Charging

Challenges: Electricity rates may vary across utility service territory, making charging significantly more expensive at certain charging stations in different parts of the state. Xcel Energy's new commercial EV rate was designed with fleet operators like cities and transit agencies in mind, and may not apply as well in applications where charging schedules are less predictable, like commercial EV fast charging. In the case of TNCs, drivers may be able to minimize their energy costs by charging their vehicles during off-peak periods between 9pm and noon, and by avoiding critical peak periods, but this hasn't been tested.

Utility EV Infrastructure Investments

Description: Electric utilities across Colorado are investing in EV charging infrastructure to increase access to EVs and lower the cost of installing charging stations. Xcel Energy recently filed their first EV pilot, which includes a \$1 million investment in fast charging infrastructure for rideshare vehicles. SB19-77 requires the state's regulated utilities to propose larger 'Transportation Electrification Plans' by May 2020.

Barriers Addressed: Limited Access to EV Charging Stations, High Cost of Fast Charging

Challenges: Xcel Energy is one of 53 electric utilities across the state, so the impact of its investments will be limited to its service area. Holy Cross Energy, a rural electric cooperative in Western Colorado, has developed their own EV charger program for their customers, and other electricity providers around the state have shown interest in creating similar programs.

Private Sector Incentives and Programs:

TNC Weekly Rental Programs

Description: TNCs like Uber and Lyft have partnered with traditional rental car companies to offer weekly rentals to their drivers. These offerings, like the Lyft 'Express Drive' program, give drivers the

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opportunity to test drive an EV without committing to the full cost of ownership. By connecting their drivers with vehicles, TNCs have greater control over the composition of their vehicle fleets.

Barriers Addressed: High Capital Cost of EVs, Lack of EV Education and Awareness, Limited EV Model Availability and Vehicle Range

Challenges: In the case of Lyft’s ‘Express Drive’ program, the EV selection is determined by a third-party rental car company and may be limited or non-existent. TNCs can overcome this limitation by leasing vehicles directly from the automakers. Second, while EVs do provide operating cost savings and a lower multi-year total cost of ownership, the upfront cost of an EV is higher than a conventional gas or hybrid vehicle and therefore, may be the less attractive option for renters. Lastly, in the company fleet model, TNCs cover the higher upfront cost of an EV and the fuel cost savings are collected by the drivers, which may create a split incentive.

Recommended Additional Tools & Strategies

Expanded Fast Charging Network

Description: A robust network of fast charging stations would help to alleviate EV range anxiety and address geographic limitations. New fast charging hubs should be located at popular destinations, natural break locations, and pick-up/drop-off spots for TNCs, and siting should be coordinated with local governments and utilities to minimize infrastructure costs. A percentage of charging ports should be reserved for fleet charging to minimize wait times for drivers. Charging operators may coordinate with mobility service providers to institute a ‘charger reservation system’ to ensure that charging ports are available at certain times of the day for commercial vehicle use. Fast charging stations should deliver a minimum of 50kW of electricity, and the electrical infrastructure should be future-proofed to deliver 350kW or more of electricity to accommodate future improvements in charging technologies.

Barriers Addressed: Limited Access to EV Charging Stations, Limited EV Model Availability and Vehicle Range, High Cost of Fast Charging

Challenges: A typical DC Fast Charging station costs \$50,000-\$100,000 and installation requires coordination between utilities, site owners, EV charging providers, and the users. In addition, dedicating a portion of EV charging stations for fleet drivers may limit charging services for non-fleet vehicles.

Does this strategy apply to all six Transportation Providers?

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	Yes	Yes

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Home-Charger Incentives and Installation Services

Description: Home-charging is the most convenient and low-cost option for recharging an EV. A home-charger incentive program might include rebates to cover the cost of installing a charging station, as well as services to help drivers navigate the charger installation process. Access to home-charging reduces the reliance on public fast charging, which is more expensive and may result in a higher opportunity cost from the downtime spent charging instead of providing mobility services. Home-charger installations are less complicated for drivers living in single-family homes with a dedicated off-street parking space, and more challenging for drivers who are renters or residents of multi-unit dwellings. The home-charger incentive program should coordinate with utilities to address the financial and logistical challenges of installing charging stations at multi-unit dwellings, where many TNC and taxi drivers live. Owner of long-range battery-electric vehicles (BEVs) with higher daily VMT should be advised to install a Level 2 home-charger, and owners of lower-range plug-in hybrid electric vehicles (PHEVs) may only need a Level 1 charging station.

Barriers Addressed: Limited Access to EV Charging Stations, High Cost of Fast Charging

Challenges: Many drivers live in multi-unit dwellings where home-charging is limited and installations are costly and logistically challenging. A large percentage of TNC drivers are part-time temporary contractors. To the extent possible, incentives should be directed toward long-term contractors to maximize the benefits of the home-charger incentive program. Transportation providers should collaborate with utilities and homeowner associations to develop a standard process for home-charger installations at multi-unit dwellings.

Does this strategy apply to all six Transportation Providers?

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	Yes	No	Yes	No	No

Community Charging Hubs

Description: The Community Charging Hub model provides shared EV charging spaces for commercial fleet vehicles. Community charging hubs should be conveniently located in multi-family neighborhoods where there is a high concentration of commercial drivers. Community charging hubs have the potential to increase charger utilization by offering greater operational flexibility across a variety of use cases. Since the majority of commercial EVs will recharge overnight, it may be possible for commercial EV drivers to share charging stations with day-time parking facilities such as office, retail, and mixed-use parking, and alternate charging sessions with those vehicles on a 24-hour cycle. By installing the charging stations in the public domain instead of residences, the program can reduce the risk of stranded assets.

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Barriers Addressed: Limited Access to EV Charging Stations, High Cost of Fast Charging

Challenges: Community charging hubs are complex because they require coordination between a number of different stakeholders. In addition, the community charging hub model requires drivers to commute to the charger location, which adds an opportunity cost, and potentially, additional VMT to the system.

Example: [Xcel Energy Minnesota “community charging hub” pilot program.](#)

Does this strategy apply to all six Transportation Providers?

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	No	No

Free or Discounted Fast Charging

Description: The cost of fast charging is typically much higher than that of home-charging, and these higher rates can negate the economic benefits of driving an EV. The average TNC or taxi vehicle drives significantly more miles per year than a personally-owned vehicle and as a result, the fuel costs are a more important factor in the vehicle selection process. By guaranteeing free or low-cost electricity for fleet drivers, the program can make EVs the more attractive vehicle option, particularly in the context of the short-term rental program. Charging discounts or rebates might be designed to cover the full energy costs or the incremental cost of charging an EV at a fast charging station versus a home-charging station.

Barriers Addressed: High Cost of Fast Charging

Challenges: Communicating the total cost of ownership for EV vs ICEV to commercial drivers and mitigating potentially long-dwell times by drivers.

Examples: Lyft partnership with EVgo on the Express Drive program.

Does this strategy apply to all six Transportation Providers?

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	Yes	Yes

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Rebates for EV Drivers

Description: To offset the incremental cost of purchasing or leasing an EV, a program could provide a rebate for EV drivers. In the case of the TNC weekly rental programs, the value of the rebate should be incorporated into the weekly rate so that EVs are the lowest cost option. A rebate could also be performance-based, applied per electric vehicle-mile-traveled.

Barriers Addressed: High Capital Cost of EVs

Challenges: The incremental cost of purchasing or leasing an EV instead of an ICEV will decrease over time as the price of lithium-ion batteries continues to decline. Experts predict that compact EVs will achieve price parity with ICEVs between 2023 and 2026 depending on the vehicle size and range⁸. Any rebate should be periodically reassessed and adjusted to reflect these changes.

Examples:

- [Uber 'EV Champions Initiative' \(2018\)](#)

Does this strategy apply to all six Transportation Providers?

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	Yes	Yes

EV Cash-for-Clunkers Program

Description: An EV Cash for Clunkers Program would offer drivers an opportunity to trade in their used ICEV in exchange for a voucher that must be used to purchase or rent an EV for commercial use.

Barriers Addressed: High Capital Cost of EVs

Challenges: The environmental impacts of an EV Cash for Clunkers program are difficult to quantify and there is potential to distort the used car market. For TNCs and Peer Carshare services, the companies do not procure the vehicles, and therefore, have limited influence on vehicle choice outside of the rental program.

Examples: The Clear the Air Foundation has an existing program and has taken 4,300 vehicles off the road (average age 19.3 years).

⁸ https://theicct.org/sites/default/files/publications/EV_cost_2020_2030_20190401.pdf

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Does this strategy apply to all six Transportation Providers?

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	Yes	Yes

EV Education and Awareness Campaign

Description: An EV awareness campaign should be designed to educate commercial drivers on the economic benefits of EVs by providing a simple total cost of ownership comparison between EVs, conventional gas, and hybrid vehicles. The campaign would also include basic information about available EV models and features, charging costs and locations, available incentives, and the emissions benefits of electric transportation. EV drivers would be prepared and encouraged to promote these benefits to customers who express interest in learning more about EVs.

Barriers Addressed: Lack of EV Education and Awareness

Challenges: The dispersed and informal nature of these businesses may make it difficult to identify and target drivers for education. Those drivers encouraged to promote EV awareness with passengers would be hard to monitor or assess, and might inadvertently misrepresent the facts.

Examples: [Uber's "EV Ambassador" campaign in Portland](#)

Does this strategy apply to all six Transportation Providers?

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	Yes	Yes

EV Bulk Procurement for Commercial Fleets

Description: New mobility providers should leverage their buying power and offer drivers access to a greater selection of EV models than those currently available at Colorado dealerships, in partnership with dealers and auto manufacturers.

Barriers Addressed: Limited EV Model Availability and Vehicle Range

Challenges: Companies may be hesitant to make a large fleet commitment without more extensive data and experience with operating ZEVs.

Examples: EV Group Buy programs, [Climate Mayors EV Purchasing Collaborative](#)

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Does this strategy apply to all six Transportation Providers?

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	No	Yes	Yes	Yes	Yes

Investments in Electric Micromobility Infrastructure and Education

Description: Electric micromobility options like shared electric bikes and scooters offer significant emissions and congestion benefits compared to both gas-powered and electric vehicle trips. As a result, funds might be used to better incorporate these new mobility options into the transportation system by building micromobility infrastructure like travel ways and parking spaces, and by creating a public education and outreach campaign to improve safety and system efficiency.

Barriers Addressed: Lack of EV Education and Awareness

Challenges: The micromobility space is quickly evolving and best practices are still emerging in cities across the country. In addition, shared and dockless micromobility devices are only allowed in a handful of cities across Colorado.

EV Perks: Prioritizing Queuing at Airport and High-Volume Locations

Description: Cities might consider managing curbside access and rideshare lines at high-traffic venues such as Denver International Airport to provide a competitive advantage for EV drivers. TNCs and taxi companies might also create such prioritization in their apps.

Barriers Addressed: High Cost of Fast Charging, High Capital Cost of EVs

Challenges: This strategy requires coordination across a broad group of stakeholders.

Does this strategy apply to all six Transportation Providers?

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	No	No	Yes	No	No

Traveler Support Services for EVs

Description: CDOT should integrate EV-specific equipment, materials, and training to its existing Courtesy Patrol and Traffic Incident Management (TIM) programs to ensure the safety and confidence of

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drivers, passengers, CDOT personnel, and first responders when dealing with roadside assistance and incidents involving EVs.

Barriers Addressed: Lack of EV Education and Awareness, Limited EV Model Availability and Vehicle Range

Challenges: There are technical and cultural challenges to providing a similar level of roadside service to EVs and ICEVs at present.

Examples: AAA Colorado now offers emergency roadside EV charging.

Does this strategy apply to all six Transportation Providers?

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	Yes	Yes

Pending Questions & Future Research

While there was a great degree of consensus achieved by the members of the Incentivizing ZEVs Subcommittee over the course of this effort, the group also identified several issues that could not easily be resolved and are flagged for further consideration and additional analysis.

- The Stakeholder Working Group and the Legislature should consider the place of (non-plug-in) hybrid electric vehicles (HEVs) and other low-emission vehicles in any potential fee structure:
 - Pro: Some Subcommittee participants feel that HEVs offer measurable air quality benefits in the short-term and should be encouraged through a waived or reduced fee. This could potentially form a “bridge” to greater BEV and PHEV adoption in the emerging commercial vehicle market in the future and also allow more drivers to participate in the short-term, given the lower incremental cost of HEVs (compared to BEVs) and the more robust market for used vehicles. The greater presence of HEVs among commercial TNC fleets may also allow those companies to offer their hybrid/EV specific in-app marketing features (Uber Green, Green Mode, etc.) sooner in Colorado. Adding “Green Mode” is a powerful way to increase exposure and incentivization of clean vehicles and could lead to faster clean vehicle deployment and higher ridership.
 - Con: Other Subcommittee participants believe that because HEVs already present a positive, short-term cost-benefit proposition for commercial vehicle drivers, they do not require public incentives, which would be better applied to PHEVs and BEVs. More fuel-

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efficient gas-powered vehicles, like HEVs, save drivers money on fuel. This savings opportunity is even greater for a commercial vehicle because they drive more miles each year than a personally-owned vehicle. These Subcommittee participants also point out that the lifetime emissions benefits of an HEV are not as substantial as those of a BEV, and they are concerned that incentivizing HEVs as a “bridge” may ultimately delay the advent of true ZEVs in the commercial vehicle fleet. Unlike HEVs, BEVs have zero-tailpipe emissions and offer a potential pathway toward 100% carbon-free transportation. Lastly, some members of the group have argued that HEVs do not face the same new technology barriers as ZEVs, particularly when it comes to refueling infrastructure, and they believe that the policy should be focused on targeted investments to accelerate the transition to a clean transportation system.

- Another consideration is whether Residential Delivery companies merit additional consideration in a potential fee structure, given the current lack of medium-duty ZEV models available on the market. Arguably a fee structure that incentivizes ZEVs would not produce meaningful results for this type of business if there are no viable vehicles for them to adopt. It may be prudent to revisit this question in future years as the market for medium-duty ZEVs expands and makes such a transition more feasible.

Conclusion

ZEVs offer a number of significant benefits for Coloradans in terms of air quality, cost savings, and consumer choice, and therefore, their greater adoption should be encouraged. The six Transportation Providers identified for study by SB19-239 face unique challenges and opportunities in making this transition, and as a result strong partnerships between state agencies, utilities, private companies, and the general public will be needed to achieve success. There are a number of potential tools and incentives that decision-makers can provide to support the greater adoption of ZEVs among emerging commercial transportation providers, and foremost among them is to waive or greatly reduce any future fee structure for those companies utilizing ZEVs.

Additional Resources & Further Reading

Jenn, Alan (2019). Emissions Benefits of Electric Vehicles in Uber and Lyft Services. *UC Davis Research Reports*, <https://escholarship.org/uc/item/15s1h1kn>.

Slowik, Peter, Nikita Pavlenko, and Nic Lutsey (2019). Emerging policy approaches to electrify ride-hailing in the United States. *The International Council on Clean Transportation*, <https://theicct.org/publications/policy-briefing-electrify-ridehailing>.

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Slowik, Peter, Sandra Wappelhorst, and Nic Lutsey (2019). How Can Taxes and Fees on Ride-Hailing Fleets Steer Them to Electrify? *The International Council on Clean Transportation*, https://theicct.org/sites/default/files/publications/EV_TNC_ridehailing_wp_20190919.pdf.

APPENDIX I
REPORTS OF THE SUBCOMMITTEES

**Natural Environment
Impact and Emissions
Analysis Subcommittee**

To: Stakeholder Working Group for Senate Bill 19-239
From: Sub-committee on Natural Environment Impact and Emissions Analysis
Date: October 10, 2019
Subject: Findings on Changing Emissions and Recommendations to Mitigate Negative Impacts

Subcommittee Purpose

At the start of the SB 19-239 Stakeholder Working Group process, the Natural Environment Impact and Emissions Analysis Subcommittee was established to identify the current and future environment impacts of the emerging mobility sector, and to identify policies to mitigate any negative impacts, while promoting positive influences on the state's emissions and air quality targets . Some of the key questions identified at the outset included:

- What are the emissions that will be generated in the future by commercial transportation providers?
- If fees on commercial transportation providers are implemented, how will the VMT and subsequent emissions change?
- If fleets are converted to electric vehicles, in what way will VMT and emissions change?

Subcommittee Members

- **Stakeholder Working Group Lead:** Travis Madsen (SWEEP)
- **CDOT Technical Support:** Rose Waldman, Lily Lizarraga
- Tracy Sakaguchi (CMCA); John Hennelly (Teamsters Local 445); Tyler Pritchard (Chris Hansen Fellow); Jon Walker (Lyft); Sophie Shulman (CDOT); Jenny Adler (DOR/DMV); George Twigg (Boulder County); Scott McCarey (Boulder County); Jordan Sanchez (Brandberry McKenna); Julie McKenna (Brandberry McKenna); Megan Wagner (Brandberry McKenna); Jennifer Brandberry (Brandberry McKenna); Totsy Rees (Enterprise); Tim Stewart (E-470); Kevin Kuhn (DoR); Justin Wilson (ChargePoint); Jeynce Houg (Houg Transportation & Resources); Chris Votoupal (Votoupal Government Affairs); Jessica Ferko (RAQC); Amanda Brimmer (RAQC); Kelly Grubbs (RAQC); Phil von Hake (CDPHE); Alana Wilson (NREL); Celeste Stragand (Ford); Carla Perez (HDR); Jeannie Vanderburg (The Capstone Group); Lisa Streisfeld (CDOT); Matt Zerega (S-Curve Strategies); Michael King (CDOT); Michelle Scheuerman (CDOT)

Meeting Timeline

Between July and October of 2019, the Sub-committee met six times (July 24, August 14, August 30, September 10 , October 9, and October 16) to develop a workplan, review research, data, and modeling results, discuss potential barriers and some strategies to overcome them, and develop recommendations and questions for the Stakeholder Working Group.

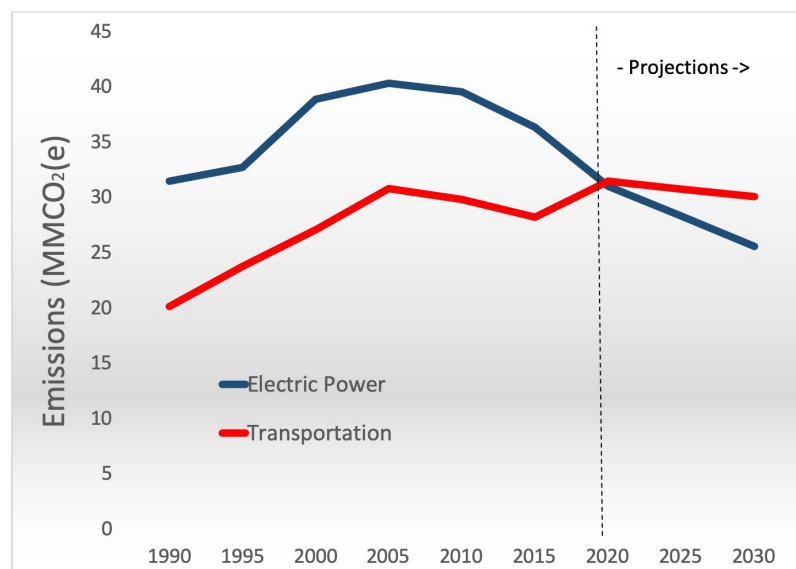
Sub-committee on Natural Environment Impact and Emissions Analysis Findings on Changing Emissions and Recommendations to Mitigate Negative Impacts

Key Findings:

Transportation in Colorado now generates about as much climate-changing carbon pollution as electricity generation.

- Climate change is having serious impacts on Colorado, including declining snowpack, more severe periods of drought, more extreme heat, elevated wildfire risk, widespread beetle infestation in forests, and more frequent and severe precipitation and flooding.¹
- Transportation is passing electricity generation to become the leading source of climate-changing pollution in Colorado, according to the most recent draft state emissions inventory.² (See Figure 1.) The state estimates that transportation is responsible for about one-quarter of climate-changing pollution statewide (largely carbon dioxide pollution from fuel combustion).

Figure 1: Transportation has surpassed electricity generation as Colorado's leading source of climate-changing pollution³



*Note that projections presented in this inventory do not capture recent Colorado state efforts to cut pollution; nor do they anticipate future policy actions that could reduce emissions.

¹ For example, see: <https://insideclimatenews.org/news/07102019/mountain-climate-change-disruption-glaciers-water-ecosystems-agriculture-plants-food> and <https://nca2018.globalchange.gov/chapter/25/>

² Sarah Heald, CDPHE, *Draft Colorado Greenhouse Gas Emissions Inventory 2019*, 5 July 2019. (Available at <https://www.colorado.gov/pacific/cdphe/colorado-greenhouse-gas-reports>)

³ Sarah Heald, CDPHE, *Draft Colorado Greenhouse Gas Emissions Inventory 2019*, 5 July 2019. (Available at <https://www.colorado.gov/pacific/cdphe/colorado-greenhouse-gas-reports>).

Sub-committee on Natural Environment Impact and Emissions Analysis Findings on Changing Emissions and Recommendations to Mitigate Negative Impacts

- Pollution from driving in the Denver Metro area has increased more than 100 percent since 1990 -- even faster than population growth. Per-capita emissions went up 16 percent, despite increases in vehicle efficiency.⁴
- Vehicles are also a major source of pollution that harms public health, especially near busy roadways. Types of pollution include particulate matter, ground-level ozone and a variety of toxic air contaminants.⁵ Efforts to reduce climate-changing pollution from transportation will likely have additional benefits for public health.

Preventing future damage from climate change will require major efforts to reduce transportation carbon pollution.

- Colorado enacted House Bill 1261 in 2019, setting required targets for statewide reductions in climate-changing pollution at 26 percent below 2005 levels by 2025, 50 percent by 2030, and 90 percent by 2090.⁶
- Reaching these goals will require major efforts to reduce pollution from the transportation sector. Consider:
 - Reducing emissions from electricity generation 80 percent below 2005 levels by 2030, as required for certain utilities under SB19-236, would get the state about one-third of the way to the target.⁷
 - If all additional sectors of the economy contributed equally, (transportation, fuel use in buildings, oil and gas operations, agriculture, coal mining, industrial processes and waste management), each would have to cut emissions by at least 35 percent below 2005 levels by 2030.⁸
- Colorado can reduce transportation emissions both by reducing vehicle travel demand, and by shifting the vehicle fleet towards zero emissions performance.
 - A recent scenario for achieving climate targets suggest that we must reduce urban vehicle miles traveled (and associated fuel consumption and pollution) on the order of 18 percent by 2030, and shift all new vehicle sales to zero emission technology: for passenger cars by 2035, and for medium- and heavy-duty trucks no later than 2040.⁹

⁴ Nadja Popovich and Denise Lu, "The Most Detailed Map of Auto Emissions In America," *New York Times*, Oct. 10, 2019. <https://www.nytimes.com/interactive/2019/10/10/climate/driving-emissions-map.html>

⁵ For example, see: <https://www.sciencedirect.com/science/article/pii/S2214140516301992>; <https://academic.oup.com/circovasres/advance-article/doi/10.1093/cvr/cvz228/5579822>; <https://www.who.int/air-pollution/news-and-events/how-air-pollution-is-destroying-our-health>

⁶ https://leg.colorado.gov/sites/default/files/2019a_1261_signed.pdf

⁷ Estimate by authors based on: Sarah Heald, CDPHE, *Draft Colorado Greenhouse Gas Emissions Inventory 2019*, 5 July 2019.

⁸ Ibid.

⁹ See for example: John Podesta, Christy Goldfuss et al., Center for American Progress, *A 100 Percent Clean Future*, 10 October 2019; available at <https://www.americanprogress.org/issues/green/reports/2019/10/10/475605/100-percent-clean-future/>

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New mobility services are currently a small part of the overall transportation system and associated emissions in Colorado.

- New mobility services (as defined in SB19-239) are a relatively small part of Colorado's transportation system today. These vehicles currently make up about 4.1 percent of non-freight vehicle miles traveled in Colorado, and about the same proportion of transportation carbon pollution.
- When addressing the natural environment, we urge policy-makers to think about the impacts of the transportation system as a whole, and to consider the impacts of new mobility services within the larger context.

New mobility services have the potential to become a much more significant part of Colorado's overall transportation system.

- Venture capitalists are investing billions of dollars in more than a dozen new mobility companies, anticipating growth and opportunity.¹⁰
- In particular, the introduction of autonomous vehicle technology could significantly disrupt the current system of private vehicle ownership and catapult new mobility services into the mainstream.¹¹ One of the more dramatic forecasts predicts that regulatory approval of autonomous vehicles would shift 95 percent of passenger miles traveled in the United States away from private vehicles to commercial fleets within 10 years.¹²
- It is unclear how soon autonomous vehicles might become widespread. However, for an indication of how far companies have developed the technology, Google's Waymo division announced in October 2019 that it plans to begin offering driverless rides to the general public in suburban Phoenix, with no safety attendant.¹³

New mobility services could help cut pollution from the transportation system.

- New mobility services could significantly reduce pollution, if the vehicles are shared (in ways that increase vehicle utilization and reduce overall VMT), if they operate with zero-emissions technology, and especially if they are both shared and electric.¹⁴ The overall

¹⁰ Goldman Sachs, *Ride-hailing and new businesses to fuel \$7tn+ global mobility market*, 4 June 2019.

¹¹ For example, see: Frances Sprei, "Disrupting mobility," *Energy Research & Social Science* 37, 238–242, 2018.

¹² James Arbib, Tony Seba, RethinkX, *Rethinking Transportation 2020–2030: The Disruption of Transportation and the Collapse of the Internal-Combustion Vehicle and Oil Industries*, 2017.

¹³ Kirsten Korosec, "Waymo to Customers: Completely Driverless Cars Are On the Way," *TechCrunch*, 9 October 2019. <https://techcrunch.com/2019/10/09/waymo-to-customers-completely-driverless-waymo-cars-are-on-the-way/>

¹⁴ For more exploration of this topic, see Lew Fulton, Jacob Mason and Dominique Meroux, ITDP; ITS UC Davis, *Three Revolutions in Urban Transportation: How To Achieve the Full Potential of Vehicle*

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potential is a function of how effectively the services unlock opportunities to improve the efficiency of the overall transportation system, replacing inefficient trips currently taken in private vehicles fueled by petroleum.

- In the near-term, electrifying a new-mobility vehicle can make a larger difference than electrifying a private car, because private cars tend to sit idle as much as 95 percent of the time.¹⁵ Electrifying a vehicle in a ride-hailing fleet has nearly three times greater emissions benefit compared to a privately-owned vehicle, based on a study of EV ride-hailing vehicles in California.¹⁶ Each full-time ride-hailing EV in the study cut carbon pollution by nearly 40 kilograms per car, per day, compared to a gasoline-powered ride-hail vehicle.¹⁷ These benefits will increase as the power grid gets cleaner over time.
- UC Davis researchers, in their “Three Revolutions” analysis, found that shifting the full global transportation system fleet to autonomous, electric vehicles (while decarbonizing the electricity system) would cut transportation carbon pollution about two-thirds by mid-century.¹⁸ In this scenario, the vehicles could be privately owned, much like vehicles are today.
- The researchers found that squeezing more pollution out of the system would require pooling and sharing of vehicles, dramatically increasing the utilization of each vehicle to maximize energy, material and space efficiency. In the Three Revolutions study, maximizing pooled electric vehicle trips and vehicle sharing would reduce overall vehicle travel by 50 percent, reduce the number of vehicles necessary by nearly 75 percent, free up road space for other modes of transportation (like walking and biking), and cut overall transportation carbon pollution by about 80 percent.¹⁹

However, new mobility services could fail to reduce pollution.

- New mobility services could fail to reduce pollution if they continue to operate on petroleum fuel, if they increase VMT by failing to capture opportunities for efficiency, or if they replace trips that otherwise would have happened through more efficient, less polluting modes.

Electrification, Automation, and Shared Mobility in Urban Transportation Systems Around the World by 2050, 2017

¹⁵ Angie Schmitt, “It’s True: The Typical Car Is Parked 95 Percent of the Time,” *Streetsblog USA*, 10 March 2016; <https://usa.streetsblog.org/2016/03/10/its-true-the-typical-car-is-parked-95-percent-of-the-time/>

¹⁶ Jenn, A. (2019). Emissions Benefits of Electric Vehicles in Uber and Lyft Services. *UC Davis: National Center for Sustainable Transportation*. <http://dx.doi.org/10.7922/G23R0R38> Retrieved from <https://escholarship.org/uc/item/15s1h1kn>

¹⁷ Alan Jenn, UC Davis: National Center for Sustainable Transportation, *Emissions Benefits of Electric Vehicles in Uber and Lyft Services*, August 2019, <http://dx.doi.org/10.7922/G23R0R38>; Retrieved from <https://escholarship.org/uc/item/15s1h1kn>

¹⁸ See: ITS Davis, *Three Revolutions in Urban Transportation*, 3 May 2017, <https://www.itdp.org/2017/05/03/3rs-in-urban-transport/>

¹⁹ See: ITS Davis, *Three Revolutions in Urban Transportation*, 3 May 2017, <https://www.itdp.org/2017/05/03/3rs-in-urban-transport/>

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- Initial studies of ride-hailing conclude that the services are currently a net source of pollution, rather than helping to reduce it, although the magnitude of the effect likely varies by location. For example:
 - A UC Davis review found that “the available research as of 2017 suggests that ride-hailing, as currently used in U.S. cities, is contributing to a net increase in VMT and associated GHG emissions; however, the total magnitude of that increase is uncertain.”²⁰ The review found that causes included generating trips that otherwise would not have happened, from commuting to dense areas and additional travel between fares (i.e. network travel), and from substituting ride-hailing for trips that otherwise would have happened via walking, cycling or transit.
 - The Boston Metropolitan Area Planning Council estimated that 60 percent of ride-hailing trips replaced journeys that would have been taken by transit, walking, or biking, or would not have happened at all. The agency estimated that increased net pollution in the state by at least 96,000 metric tons of carbon dioxide (the figure does not include pollution caused outside of revenue-generating trips (i.e. deadheading or commuting). That represents a 0.6 percent increase in Massachusetts passenger vehicle pollution.²¹
 - One survey in Denver found that 22 percent of ride-hailing trips otherwise would have happened via transit. The author of that study, who temporarily worked as a driver, also found that 40 percent of VMT had no passenger (excluding commuting to and from his start location).²² The study concluded that ride-hailing in its current form is less efficient than all modes, except for taxis and getting a ride from a friend. It did not attempt to estimate what effect ride-hailing is having on net vehicle emissions, although it implies a net increase.
 - As part of the development of its “Clean Mile Standard,” the California Air Resources Board concluded that ride-hail fleets produce 75 percent more pollution per passenger-mile traveled than the overall private vehicle fleet.²³ Lower occupancy and higher deadhead miles more than offset the fact that TNC vehicles tend to be newer and slightly more efficient than the regular fleet.
- The evolution of new mobility technologies into a net-negative pollution tool is not guaranteed. For example, UC Davis researchers estimate that widespread deployment of autonomous vehicles would increase travel demand on the order of 15 to 20 percent, largely due to underserved populations (like the elderly) gaining access to mobility services (a social benefit). If those vehicles are fueled by petroleum, the additional miles traveled could wipe out any potential benefit from future increases in fuel efficiency.

²⁰ Caroline Rodier, Institute of Transportation Studies, University of California, Davis, *The Effects of Ride Hailing Services on Travel and Associated Greenhouse Gas Emissions*, April 2018.

²¹ <http://www.mapc.org/wp-content/uploads/2019/07/Growing-Carbon-Footprint-of-Ride-hailing-in-MA.pdf>

²² Henao, Alejandro. "Impacts of Ridesourcing-Lyft and Uber-on Transportation Including VMT, Mode Replacement, Parking, and Travel Behavior." PhD diss., University of Colorado at Denver, 2017.

²³ California Air Resources Board, *Clean Miles Standard Workshop 2018 Base Year Emissions Inventory*, Presentation on 25 September 2019, Slide 40, available at: https://ww2.arb.ca.gov/sites/default/files/2019-09/Clean_Miles_Standard_Workshop_Slides.pdf

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Moreover, if those vehicles remain privately owned, they could operate much more inefficiently. For example owners could have them drive without any passengers inside, perhaps circling to avoid parking fees, or perhaps running errands for the owner without the owner inside -- driving up VMT and emissions.²⁴

Home delivery services offer similar potential to reduce pollution -- or to increase it.

- Home delivery, when companies are able to load up vehicles and link many delivery stops, is more efficient and less polluting than when individuals take trips to the store in a private vehicle.
 - For example, Dr. Miguel Jaller, the co-director of the Sustainable Freight Research Center at the Institute of Transportation Studies at UC Davis, estimated the difference between online shopping and delivery compared with individuals driving to stores in Dallas and San Francisco. He found that online shopping could reduce carbon pollution by 40 to 75 percent, dependent on the efficiency of delivery service and distance traveled.²⁵
 - Similarly, a 2013 study of grocery delivery in Seattle found that delivery trucks could reduce carbon dioxide by 20 to 75 percent per customer on average when compared to individual vehicle trips, but only if the store could optimize delivery routes and schedules.²⁶
- However, rush deliveries reduce efficiency and could increase pollution. Services like Amazon Prime or UberEats are moving toward increasingly rapid delivery times -- as little as minutes or hours -- reducing opportunities to consolidate deliveries. Anne Goodchild, director of the University of Washington's Supply Chain Transportation and Logistics Center, calls these "paid butler services."²⁷
 - Dr. Jaller found that home delivery became more polluting than travel in individual vehicles when delivery vans made less than about six stops per trip.²⁸
 - Similarly, in the Seattle grocery study, allowing customers to choose delivery times, rather than allowing the delivery service to optimize, tripled the amount of

²⁴ For more exploration of this topic, see Lew Fulton, Jacob Mason and Dominique Meroux, ITDP; ITS UC Davis, *Three Revolutions in Urban Transportation: How To Achieve the Full Potential of Vehicle Electrification, Automation, and Shared Mobility in Urban Transportation Systems Around the World by 2050*, 2017

²⁵ <https://sfreight.ucdavis.edu/evaluating-environmental-impacts-online-shopping-behavioral-and-transportation-approach-0>

²⁶ Michelle Ma, "Grocery delivery service is greener than driving to the store," *UW News*, 29 April 2013. <https://www.washington.edu/news/2013/04/29/grocery-delivery-service-is-greener-than-driving-to-the-store/>

²⁷ <https://www.cbsnews.com/news/amazon-prime-day-one-day-shipping-has-a-huge-carbon-footprint/>

²⁸ <https://sfreight.ucdavis.edu/evaluating-environmental-impacts-online-shopping-behavioral-and-transportation-approach-0>

Sub-committee on Natural Environment Impact and Emissions Analysis Findings on Changing Emissions and Recommendations to Mitigate Negative Impacts

pollution per customer (although the emissions advantage over individual driving remained).²⁹

- Compounding the problem, Goodchild points out that rapid delivery services can lead customers to make multiple small purchases, instead of one large one, resulting in multiple delivery trips.³⁰ Moreover, it is unclear to what extent these services are actually replacing physical trips to stores in private vehicles, or creating additional overall trips.
- Regardless of other factors, electrifying home delivery vehicles will reduce carbon pollution compared to allowing the vehicles to remain fueled by petroleum.

Moving new mobility services toward electric vehicles will likely help accelerate deployment of EVs in the broader privately-owned vehicle fleet.

- Surveys indicate that public exposure to electric vehicles through ride-hailing services can help encourage broader adoption of zero-emission vehicle technology.³¹ Encouraging electrification of ride-hail vehicles, especially, could be part of Colorado achieving its overall EV deployment goals -- further reducing pollution beyond the direct impact of electrifying the new mobility services themselves.

Moving new mobility services toward electric and shared business models will likely reduce transportation costs.

- Electric vehicles offer significant lifetime cost savings compared to combustion vehicles. For example, Chevy Bolt EVs in the Sacramento city fleet cost on the order of 75 percent less per mile to fuel and maintain than comparable combustion vehicles.³² Looking at all-in costs over 9 years, the New York City fleet reports average savings of close to \$1,000 per year for a Nissan Leaf EV compared to a comparable combustion Ford Fusion sedan.³³ As EV manufacturing scales up, and batteries continue to grow cheaper, EVs are likely to become increasingly economic relative to conventional vehicles.³⁴ Greater adoption of electric vehicles in new mobility services could put downward pressure on the cost of those services (or increase company or driver revenues).

²⁹ Michelle Ma, "Grocery delivery service is greener than driving to the store," *UW News*, 29 April 2013. <https://www.washington.edu/news/2013/04/29/grocery-delivery-service-is-greener-than-driving-to-the-store/>

³⁰ <https://www.cbsnews.com/news/amazon-prime-day-one-day-shipping-has-a-huge-carbon-footprint/>

³¹ Jenn, A., Laberteaux, K., & Clewlow, R., "New mobility service users' perceptions on electric vehicle adoption." *International Journal of Sustainable Transportation*, 12(7), 526–540, 2018.

³² Katie Fehrenbacher, "The Greenest Public Fleet in America," *GreenBiz*, 11 September 2019, <https://www.greenbiz.com/article/greenest-public-fleet-america>

³³ Michael J. Coren, "New York City says electric cars are now the cheapest option for its fleet," *Quartz*, 18 March 2019. <https://qz.com/1571956/new-york-city-says-electric-cars-cheapest-option-for-its-fleet/>

³⁴ For example, see Nic Lutsey, Michael Nicholas, ICCT, *Update on electric vehicle costs in the United States through 2030*, 2 April 2019. <https://theicct.org/publications/update-US-2030-electric-vehicle-cost>

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- Increasing vehicle utilization could further reduce costs. For example, the “Three Revolutions” model put forward by researchers at UC Davis results in an estimated 40 percent reduction in urban vehicle transportation costs by 2050.³⁵ The UC Davis researchers attribute cost savings to the need to purchase fewer vehicles, reduced energy consumption, and reduced need to build or maintain road and parking infrastructure. Moreover, the cost of the system would be shared by a much broader group of users than with individual vehicle ownership.
- Capturing opportunities to reduce the cost of transportation while also cleaning up pollution would accelerate Colorado’s progress towards achieving state carbon pollution reduction goals. For example, consider the Regional Greenhouse Gas Initiative, a program in the U.S. Northeast and Mid-Atlantic states that requires power plant owners to pay for every unit of pollution they emit. That program has generated more than \$3 billion in revenue, which states have largely invested in programs to increase energy efficiency. In 2017, states invested \$315 million of those revenues, unlocking almost \$1.2 billion in lifetime energy savings, while preventing 8 million tons of carbon pollution.³⁶ Simultaneously, the program has reduced electricity rates by 5.7 percent.³⁷ It may seem counterintuitive, but by imposing a cost on the system, this policy unlocks opportunities to save much more money, and reduce pollution. It makes achieving pollution-reduction goals easier and more cost-effective, while ensuring widespread benefits for everyone. Because vehicle electrification and pooling are major cost-saving opportunities, a similar dynamic may be possible to create with transportation policy in Colorado. The state should use any new fee revenue to actively create this kind of result.

This report anticipates an increase of VMT and emissions generated by the six emerging mobility providers by 2030, without additional policy steps. According to the baseline scenario modeled by HDR for this report, by 2030:

- Overall transportation sector carbon dioxide emissions in Colorado could decrease by 23% due to the Corporate Average Fuel Economy (CAFE) enacted in 2011.
- The VMT of new mobility services, as defined by SB19-239, could increase 150% in 2030 over 2018 levels. This would represent about 8% of non-freight statewide VMT in 2030, with low and high estimates ranging from 3% to 17%. In comparison, total non-freight statewide VMT is anticipated to increase about 27% between 2018 and 2030.
- This level of growth in new-mobility services would increase statewide transportation carbon dioxide emissions by 52% after taking into account future CAFE standards; from 2,0004 short tons per day of CO₂e to 3,105 short tons per day of CO₂e in 2030.

³⁵ See: ITS Davis, *Three Revolutions in Urban Transportation*, 3 May 2017, <https://www.itdp.org/2017/05/03/3rs-in-urban-transport/>

³⁶ https://www.rggi.org/sites/default/files/Uploads/Proceeds/RGGI_Proceeds_Report_2017.pdf

³⁷ https://acadiacenter.org/wp-content/uploads/2019/09/Acadia-Center_RGGI_10-Years-in-Review_2019-09-17.pdf

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Principles and Policy Recommendations

Colorado should foster the development of a clean and sustainable transportation system that is energy-efficient, space-efficient, and compatible with a stable climate.

- System-wide transportation policy should be aligned with and facilitate achieving the carbon pollution reduction targets set in HB19-1261.
- The state should encourage the growth of new mobility business models that can contribute to a more stable climate, cleaner air, and healthier people. The state should actively unlock opportunities for those businesses to evolve in ways that reduce pollution and save money.
- The state should promote accelerated deployment of zero emission electric vehicles in new mobility services.
- The state should promote vehicle pooling and sharing in order to increase energy efficiency, reduce demand for transportation infrastructure, reduce the number of vehicles on the road, and reduce pollution. Pooling efforts should encourage increased vehicle occupancy or package loading, rather than encouraging single-occupant or no-occupant vehicle trips.
 - Some policies should be directed at new mobility services. To maximize the effect, complementary policies should also promote sharing and pooling across the broader transportation system, including privately-owned vehicles.
- The state should design policies with an eye towards the future. For example, policies should be flexible enough to help guide the possible introduction of autonomous vehicles in a socially and environmentally beneficial direction, if and when the technology matures.

Colorado should design and implement a fee applied to new mobility services.

- The fee should be structured in a way to promote reduced emissions and increased efficiency.
 - Companies should pay more for using polluting vehicles than zero-emission vehicles.
 - Fees should be higher for single-occupant or no-occupant trips, or for inefficient deliveries.
- A fee structure that most directly creates an incentive for shared, electric vehicles would be based on the amount of tailpipe carbon dioxide emissions per passenger-mile of travel (or per unit-mile for home delivery). This should include all miles traveled, including deadheading.
 - *Challenges to consider for this type of fee:*
 - *Drivers using multiple apps at the same time could lead to double-counting*
 - *App services could require users/drivers to report occupancy, but how to ensure that information is accurate?*

Sub-committee on Natural Environment Impact and Emissions Analysis Findings on Changing Emissions and Recommendations to Mitigate Negative Impacts

- *Access to low-emission vehicles for freight delivery*
- *May not be appropriate for rental car or peer-to-peer car-sharing services.*
- Alternate fee structures, (whether based on VMT, percentage of cost, or flat fee) should have modifiers applied that reduce costs for shared, electric trips and increase costs for inefficient trips taken in polluting vehicles.
- The fee should be set at levels sufficient to generate a meaningful amount of revenue, without unintentionally driving up emissions by discouraging beneficial new mobility business models. (To avoid this, the state should apply similar policy to privately-owned vehicles at the same time. Options could include a registration “feebate,” with charges or subsidies based on how clean or polluting a vehicle is, or a fee that captures the cost of carbon pollution on society from private vehicles).

Colorado should strategically invest the resulting fee revenue to programs that will steer the whole transportation system toward zero-emission vehicles and towards increased levels of vehicle pooling and sharing.

- How the state spends fee revenues is likely to be more impactful than incentives built into the fee structure.
- Colorado should strategically invest new mobility service fee revenue on programs that can unlock energy efficiency opportunities in the transportation sector through improved new mobility services. Priority should be placed on programs that:
 - Reduce tailpipe carbon emissions, such as by facilitating increased deployment of zero emission vehicles in new mobility fleets;
 - Reduce pollution by reducing vehicle travel demand, including by:
 - promoting increased vehicle pooling,
 - prioritizing the movement of shared vehicles, for example in managed or dedicated lanes; or by
 - facilitating compact infill development rather than accelerating sprawl, thereby enabling shorter vehicle trips.
- The state should be open to spending fee revenue in ways that help new mobility companies replace less-efficient private vehicle trips and reduce system-wide pollution.
- Revenues from this fee should not be used for generic transportation infrastructure construction or maintenance, which do not necessarily reduce pollution or improve efficiency. (A broader fee applying to a much broader segment of the transportation system, such as a reformed gas tax, would be more appropriate for that).

APPENDIX I
REPORTS OF THE SUBCOMMITTEES

**Congestion Management
and Shared Ridership
Subcommittee**

To: Stakeholder Working Group for Senate Bill 19-239
From: Subcommittee on Congestion Management and Shared Ridership
Date: October 10, 2019
Subject: Recommendations for Incentivizing Shared Ridership and Congestion Reduction

Introduction

In May of 2019, the Colorado State Legislature passed Senate Bill 19-239 (SB 19-239) which directed the Colorado Department of Transportation (CDOT) to form a Stakeholder Working Group (SWG) with twenty-seven designated representatives from industry to provide recommendations to the Department. The SWG should examine the impacts of emergent mobility technologies on the environment, economy and transportation infrastructure, evaluate whether a fee structure to be applied to emergent mobility providers, and create incentives to improved shared ridership and conversion of Internal Combustion Engine (ICEs) vehicles to Zero Emission Vehicles (ZEVs).

Between July and October of 2019, the Sub-committee met five times (July 24, August 14, August 30, September 10 and October 9) to develop a work plan, review case studies, discuss potential barriers to shared ridership, and develop strategies to increase shared ridership. The goals of decreasing congestion and emissions from SB 19-239 framed the discussion. This memo summarizes the Subcommittee's recommendations with regards to a potential fee structure, identifies existing tools and suggests additional approaches to increased shared rides. Lastly, the Subcommittee discussed ideas for programming revenue generated by a fee structure for consideration by the Stakeholder Working Group, Colorado Department of Transportation (CDOT) and the Colorado Energy Office (CEO).

Sub-Committee Purpose

The purpose of the Congestion Management and Shared Ridership Subcommittee was to address the following request in Senate Bill 19-239. It asks the Stakeholder Working Group to examine a potential fee structure on emerging mobility providers which would under Section 5.b.I.C,

“Incentivize multiple passenger ride sharing for motor vehicles used for commercial purposes the use of such vehicles as a first and a last mile solution for public transit users”

The Subcommittee members first recognized that the changes in behavior would impact the different emerging mobility providers in unique ways. Several initial questions were brainstormed for future discussion:

- How can the state be more effective in adapting to the changes with emerging mobility providers to facilitate the effective movement of people?

Subcommittee on Congestion Management and Shared Ridership Recommendations for Incentivizing Shared Ridership and Congestion Reduction

- Single-occupancy vehicles (SOV) and the future potential of zero-occupancy vehicles (ZOV) with autonomous vehicles (AV) will most likely increase congestion on the transportation network. How can we incentivize people to carpool, vanpool, take public transit, or share rides?
- How can commercial transportation providers be incentivized to promote real-time shared ridership?
- How can the right mode be matched for the right trip, and how can the ease of use between modes be improved?
- As the use of TNCs continues to increase, what role will public transit play, and how can TNCs and public transit complement each other?
- What types of impacts, positive and negative, will AVs have on congestion, and how can negative impacts be mitigated?
- If commercial delivery vehicles are electrified, will their batteries impact carrying capacity, thus leading to more vehicles on the road and hence greater congestion and wear and tear?
- What strategies can be used to limit travel during peak hours of congestion?
- What safety issues should be addressed as shared ridership grows?

Sub-Committee Members:

Doug Rex – Denver Regional Council of Governments (Chair)

Walter Rosenkranz - SHARENOW

Johanna Jamison - SHARENOW

John Hennelly – Teamsters Local 445

Morgan Cullen – Colorado Municipal League

Matt Frommer—Southwest Energy Efficiency Project

Magath Sarr “Max” – Freedom Taxi

Kate Williams – Denver Regional Mobility and Access Council

Bruce Abel – RTD

Michael Ford - RTD

Piper Overstreet – Uber

Jake Swanton – Lyft

Lauren Isaac, EasyMile

Tyler Pritchard – Chris Hansen Fellow*

Benjamin Garrett – Chris Hansen Fellow*

Suzette Mallette—North Front Range Metropolitan Planning Organization*

Elise Jones – Boulder County*

Robert Williams—GetAround *

Ann Rajewski, Colorado Association of State Transit Agencies

(Staff support: Lisa Streisfeld, Tatjana Kunz, and Krista Flynt)

Subcommittee on Congestion Management and Shared Ridership Recommendations for Incentivizing Shared Ridership and Congestion Reduction

Several members of the Sub-committee were not identified members of the greater Stakeholder Working Group. These interested parties have an asterisk by their name. These members were allowed to join the Sub-committee and become part of the discussion.

Sub-committee Primary Recommendations:

1. Develop a user fee structure for TNCs which has a graduated fee to be higher for non-shared rides and to be a reduced fee for shared rides.
2. Provide for a reduced fee structure for rides originating from or ending at mobility hubs in Colorado.
3. Expand existing voluntary employer transportation demand management (TDM) programs through partnerships with Transportation Management Associations (TMAs) and Transportation Management Organizations (TMOs).
4. Explore mandatory employer based TDM programs for employers over 100 staff.
5. Examine other incentives to promote car share, vanpools, carpools, mass transit, and other forms of shared ridership on a statewide basis.
6. Continue implementing targeted TDM strategies for construction zones and for special events.
7. Provide opportunities for shared ridership by developing statewide carpool matching website and smart phone App.

- 1. Develop a user fee structure for TNCs which has a graduated fee to be higher for non-shared rides and to be a reduced fee for shared rides.**
 - Transportation Network Companies (TNCs) offer reduced fares for persons requesting a trip in which it is shared with a second customer. In the Lyft App, this is called a “Shared Ride”. In the Uber App this is called “Uber Pool”. Using this strategy, a fee structure applied to emerging mobility providers would reduce the fee for sharing a ride. The fee could even be graduated for higher occupancy in a vehicle.
 - The fee structure must match the objectives of Senate Bill 19-239.
 - If fees are discounted or waived, it provides a strong incentive for TNCs to promote them.
 - Consider the cost of public transportation and parking when developing a fee structure.
 - The fee structure should make sure that the end cost to the individual rider for taking a shared ride is still less than if the individual rider selected to ride alone.
 - The reduced fee structure for shared rides could be applied to both taxi and TNCs.
 - The per-mile fee should apply to TNC miles as soon as a driver has matched with a passenger and is on-route to their location, in order to reduce congestion and VMT.

**Subcommittee on Congestion Management and Shared Ridership
Recommendations for Incentivizing Shared Ridership and Congestion Reduction**

Applicability of Recommendation to the Six Types of Emerging Mobility Providers:					
TNC	Peer Carshare	Car Clubs/Carshare (non peer to peer)	Taxi	Car Rental	Residential Delivery
Yes	No	No	Yes	No	No

2. Provide for a reduced fee for rides from or ending at mobility hubs.

- This recommendation stemmed from the idea of how to incentivize first and last mile trips from transit, such as bus stops or light rail stations.
- This recommendation is designed to link trips with emerging mobility providers to existing transit.
- This strategy will expand travel options for a consumer, will decrease congestion and will decrease emissions.
- The strategy would designate certain areas Colorado as mobility hubs. One example may be the Denver Union Station or a second example could be the Table Mesa Park and Ride in Boulder. Rides from emerging mobility providers which originate from these locations would have a reduced fee structure compared to other rides originating outside a mobility hub.
- Given that CDOT has several mobility hubs planned along the I-25 corridor, this recommendation could be implemented in the future in various parts of the state.
- Additionally, this strategy encourages the emerging mobility providers to offer service from mobility hubs. For example, a car share may be more motivated with this discount its customers.

Applicability of Recommendation to the Six Types of Emerging Mobility Providers:					
TNC	Peer Carshare	Car Clubs / Carshare (non peer to peer)	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	Yes	No

3. Expand voluntary employer Transportation Demand Management (TDM) programs through partnerships with statewide TMAs and TMOs.

- The Stakeholder Working Group should examine Seattle’s Commute Trip Reduction Program and DRCOGs (Denver Regional Council of Governments) Way to Go programs.

**Subcommittee on Congestion Management and Shared Ridership
Recommendations for Incentivizing Shared Ridership and Congestion Reduction**

- This strategy could provide additional financial support to the state’s TMAs, such as DRCOG’s WayToGo coalition of 7 TMA partners which would have broad reach within the metropolitan area.
- The TMAs and TMOs have the ability to directly coordinate with businesses and provide marketing support to grow TDM strategies to increase the accessibility of the number of commuting options.
- Employer TDM programs can offer shuttle service from a light rail station to a place of employment.
- Employer TDM programs can seed and grow participation in carpools and vanpools.
- Employers may be able to provide incentives to employees for completing shared rides with designated parking for carpools and vanpools, with cost sharing of all access transit passes, such as RTD’s Ecopass, or by cost sharing in the deployment of vanpools.
- Employers can also encourage biking and walking to work by providing bike racks, locker rooms and showers for staff.
- Employers can team with TNCs and Taxis to provide a “guaranteed ride home program” for staff which participate in TDM strategies.
- Employers can team with TNCs, Taxis, Car Shares and Car Rental companies to provide financial incentives to employees who carpool to work in one of these modes.

Applicability of Recommendation to the Six Types of Emerging Mobility Providers:					
TNC	Peer Carshare	Car Clubs / CarShare non peer to peer	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	Yes	No

4. Explore mandatory employer Transportation Demand Management programs

- This strategy would build on the benefits of strategy number 3 above.
- This strategy would require legislative action. Employers with more than 100 employees would be required to develop, implement, and track the performance of a TDM plan.
- The Stakeholder Working Group should consider similar programs in Washington State, California, Oregon which have seen up to a 5-10% reduction on SOV use with mandatory programs.
- Possible plan initiatives may include:
 - Employee education and outreach
 - Allow flexible work schedules and teleworking
 - Vanpool program subsidy, transit pass subsidy, or bike-share pass subsidy
 - Preferred parking for carpools and vanpools
 - Bike racks, lockers, and showers
 - Encourage Micro-mobility

**Subcommittee on Congestion Management and Shared Ridership
 Recommendations for Incentivizing Shared Ridership and Congestion Reduction**

Applicability of Recommendation to the Six Types of Emerging Mobility Providers:					
TNC	Peer Carshare	Car Clubs / CarShare non peer to peer	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	Yes	No

5. Examine other incentives to promote vanpools, carpools, mass transit, and other forms of shared ridership on a statewide basis

- The Stakeholder Working Group should consider providing a financial incentive or credit to shared ridership.
- The biggest challenge in the North Front Range Metropolitan Planning Organization (NFRMPO) is attracting riders to their VanGo Program. Staff have noticed that gas price is the biggest driver, as fueling costs increase, vanpool ridership goes up.
- Incentives could be in the form of a rebate to companies such as TNCs or Taxis which complete a designated amount of shared rides each year.
- This strategy could provide a financial discount on each transaction to individuals who take a pooled trip.
- The implementation of an income tax exemption for commuters who take alternative modes was also suggested. This strategy would need additional research on the feasibility to implement.
- Via Mobility out of Boulder is partnering with the National Renewable Energy Lab and a Canadian software company called Pantonium to deploy a new transit software dispatch service. Pantonium provides real-time transit routing in a form of deviated fixed transit. This increases the number of passengers on transit service. The Stakeholder Working Group should monitor this program and if successful, consider funding its implementation in other parts of the state.
- In the future, data about number of people taking pooled rides could be collected
- Preferred pick up and drop off zones at airports could be offered to taxis and TNCs delivering passengers in a shared ride.

Applicability of Recommendation to the Six Types of Emerging Mobility Providers:					
TNC	Peer Carshare	Car Clubs / CarShare non peer to peer	Taxi	Car Rental	Residential Delivery

**Subcommittee on Congestion Management and Shared Ridership
Recommendations for Incentivizing Shared Ridership and Congestion Reduction**

Yes	Yes	Yes	Yes	Yes	No
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6. Continue implementing TDM strategies for construction zones and for special events

- Preferential parking spaces or reduced parking space fees could be offered at stadiums, parks, mobility hubs, sporting events, or cultural centers for those taking a shared ride.
- Shared ridership strategies should be promoted by public agencies and the media during transportation construction projects in order to decrease VMT.

Applicability of Recommendation to the Six Types of Emerging Mobility Providers:					
TNC	Peer Carshare	Car Clubs / CarShare non peer to peer	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	Yes	Yes

7. Provide opportunities for shared ridership by developing statewide carpool matching website and Smart Phone APP.

- Carpool matching services are currently offered in several existing mobile phone Apps such as Hytch, iCarpool, and Waze Carpool.
- Carpooling was encouraged by CDOT during the SH 82/Grand Avenue Bridge reconstruction in order to decrease VMT on the detour routes.
- The I-70 Mountain Coalition will deploy a carpool App called Gondola to increase shared ridership on I-70 during the winter recreational season.
- Carpool matching services are currently offered with the DRCOG Way to Go program.
- In order to incentivize shared ridership throughout the state, the Stakeholder Working Group could consider deploying a carpool App on a statewide basis.
- A statewide carpool program would increase mobility access for people in rural areas.
- The emerging mobility providers may be able to provide links with to their services on the carpool App platform.

Applicability of Recommendation to the Six Types of Emerging Mobility Providers:					
TNC	Peer Carshare	Car Clubs / CarShare non peer to peer	Taxi	Car Rental	Residential Delivery

**Subcommittee on Congestion Management and Shared Ridership
Recommendations for Incentivizing Shared Ridership and Congestion Reduction**

Yes	Yes	Yes	Yes	Yes	No
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Additional Recommendations

Although the Subcommittee’s primary focus was on methods to incentivize shared ridership, members also discussed other recommendations for implementing a fee on emerging mobility providers.

- A per trip (flat) fee would be the easiest to implement, and would be the most directly relatable to addressing congestion as it directly relates to the number of trips made.
- A mileage based fee (VMT per company) would be more difficult to implement (than a flat fee, but would be easier than a VMT per passenger trip fee) and would more explicitly address air quality and emissions.
- A mileage based fee (VMT per passenger trip) may be difficult in the near term. However, in the future with connected vehicle technology, this information may be easier to deploy.
- The Stakeholder Working Group could consider a mandatory fee program for emerging mobility providers within air quality “non-attainment areas” as defined by the National Ambient Air Quality Standards under the federal Clean Air Act. This option would require communities in non-attainment areas to implement TNC fee structure to offset costs associated with infrastructure investment to bring the region back into attainment.
- The Stakeholder Working Group could consider a higher fee program for emerging mobility providers within air quality “non-attainment areas” as defined by the National Ambient Air Quality Standards under the federal Clean Air Act.
- A dynamic fee structure by time of day pricing was brought up as a tactic to relieve congestion. Higher fees during rush hours would discourage travel. This strategy could be considered to decrease congestion and emissions.
- A fee structure based upon carbon emissions could be used to encourage shared ridership as well—California is considering a fee per gram of carbon emissions per passenger per mile.
- A fee structure on emerging mobility companies which provide residential delivery should consider that large freight vehicles may already be subject to limited hours of operation (i.e. to non-peak/rush hours) in order decrease freight to congestion.
- A fee structure could be levied against same-day residential deliveries by emerging mobility companies, because same-day delivery has a disproportionate impact upon congestion. Same day delivery presents more logistical barriers to combined trips.
- The Subcommittee suggested setting performance targets for implementation of the fees. This would demonstrate whether the goals for conversion to ZEVs, for emission reduction and for increasing shared ridership were being achieved.
- The Subcommittee recommended that the state collect data to determine the effectiveness of the fee structure. For example, could the number of hours a day be measured in which emerging mobility providers are operating on the transportation network?

Subcommittee on Congestion Management and Shared Ridership Recommendations for Incentivizing Shared Ridership and Congestion Reduction

- The Stakeholder Working Group should consider the following criteria when evaluating a fee structure:
 - Ease of implementation
 - Ability to reducing emissions and congestion
 - Effectiveness to increase the number of shared rides. In order to evaluate this, we must know the baseline for how much people are presently taking shared rides.
 - Ease of tracking VMT and hours of operation of drivers of commercial and emergent transportation services.

The Subcommittee discussed whether or not the fee structure should be implemented statewide or in certain regions.

- If an “opt in” strategy was to be considered for the fee structure, then any community in the state could opt into the fee structure. In return, the community would be eligible to receive a share of the revenue generated from the fees on emerging mobility transportation providers.
- The subcommittee recommended that no match would be required for local governments to receive a share of the revenue generated from a fee structure.
- The Subcommittee suggested that communities should provide evidence that they are investing in TDM strategies to reduce congestion and emissions.
- For the state administering agency, a statewide fee structure may be easier to implement than a fee structure which varies by region.
- For emerging mobility providers, a statewide fee structure may be easier to implement than a fee structure which varies by region.
- Keep a fee structure flexible. Allow local governments to make decisions on investments.
- The Subcommittee discussed the possibility of exemptions to the fee structure. The impact of exemptions on the viability of the fee structure should be considered.

Autonomous vehicles were not overly discussed over the course of the Subcommittee’s meetings. This was due to the unpredictability of the timeline of the technology’s development, implementation and deployment in different parts of the state. However, a mileage-based fee structure might be a more flexible and versatile tool to curb deadheading, SOV trips, and possibly zero occupancy vehicle (ZOV) trips by autonomous vehicles in the future. Therefore, by planning and implementing a mileage based fee now, the state could be better prepared to address the congestion and emissions impacts of autonomous vehicles once they are incorporated in public use on Colorado roadways.

Programming Ideas for Revenue Generated from Fee Structure:

Although it was not a key focus of the Subcommittee, the members discussed ideas for programming the revenue that could be potentially generated from the implementation of a fee structure on emerging mobility providers. The Stakeholder Working Group may want to consider one or more of the following options.

1. Development of a community congestion management plans

Subcommittee on Congestion Management and Shared Ridership
Recommendations for Incentivizing Shared Ridership and Congestion Reduction

2. Application of operational funds for transit service providers
3. Application of operational funds for shuttle service to key destinations
4. Development of parking interceptor lots to minimize congestion in downtown areas
5. Application to Transportation Demand Management Plans
6. Application for existing TMAs and TMOs
7. Application to form new TMAs and TMOs
8. Construct new or enhance existing bike and pedestrian facilities
9. Enhancement of options for different types of mobility, including vanpool funding, carpool, micro transit options such as scooter-share and bike-share
10. Public-private partnerships with emerging mobility providers to provide more mobility choices in underserved communities in Colorado.
11. Application to create a multi-modal transportation network and provide people with more mobility choices.
12. Application to assist employer based TDM programs, such as an employer shuttle service or vanpool program.
13. Application to provide all access transit passes (like an Ecopass) to employees of participating companies.
14. Utilize funding to assist with a tax reduction for commuters
15. Application to construct vehicle charging infrastructure
16. Application to encourage emerging mobility providers to locate in mobility hub areas.

APPENDIX I
REPORTS OF THE SUBCOMMITTEES

**Social Impact and Equity
Analysis Subcommittee**

Social Impact and Equity Analysis Subcommittee Tech Memo to the
SB 19-239 Emerging Mobility Impact Study Working Group
10-10-2019

Subcommittee Members:

SWG Lead: Kate Williams, DRCMAC

Technical Support: Aaron Willis, CDOT

Manolo Morales – Drift
Doug Rex - DRCOG
Kate Williams – DRMAC
Mark Savage – CSP
Jake Swanton – Lyft
Sophie Shulman - CDOT
Tyler Pritchard – Chris Hansen Fellow
Benjamin Garrett – Chris Hansen Fellow
Elise Jones – Boulder County
Nicholas Williams – City and County of Denver (DPW)
Robert Williams—GetAround
Celeste Stragand – Ford
Lily Lizarraga - CDOT
Evan Enarson-Hering - Camsys
Jordan Sanchez - BBMK
Julie McKenna - BBMK
Krista Flynt - CDOT
Lisa Streisfeld - CDOT
Manolo Morales - Allstate
Mary Marchun - The Capstone Group LLC

Nicholas Green - Orrick
Sophia Guerrero-Muphy - Conservation Colorado
Ann Rajewski — CASTA
Christopher Primus - HDR
Mary Margaret Golten - CDR Associates
Kay Kelly - NREL
Alana Wilson - NREL
Andrew Karsian - CDOT
Carla Perez - HDR
Elise Jones - Boulder County
George Twigg - Boulder County
Jenifer Brandeberry - BBMK
Jonathan Bartsch - CDR Associates
Jeannie Vanderburg - The Capstone Group LLC
Mari Nakagawa - CDOT
Scott McCarey - Boulder County
Megan Wagner - BBMK
Totsy Rees - Enterprise
Tim Stewart – E-470
Tyler Pritchard – Chris Hansen Fellow

Introduction

The Social Impact and Equity Impact Subcommittee is a subcommittee of the larger SB 19-239 Emerging Mobility Impact Study Working Group, administered by the Colorado Department of Transportation. The committee contains representative stakeholders from a variety of potentially impacted companies, industries, non-profits, and governmental entities. The Subcommittee was tasked with developing a series of recommendations for the Working Group on how to develop regulations and fees that would be most equitable, and reduce the impact on low-income, underserved, and disadvantaged populations. The subcommittees overarching question: What are the social impacts of this mobility transformation and emerging transportation technologies?

The subcommittee met five times: July 24, August 13, September 11, October 2, and October 9. As well, while developing the recommendations, the Subcommittee utilized a digital survey to ensure broad consensus of proposed recommendations.

Social Impact and Equity Analysis Subcommittee Tech Memo to the SB 19-239 Emerging Mobility Impact Study Working Group

The following is a summary of the Subcommittee’s findings, including its recommendations, their applicability to the various affected industries, and where applicable, the rationale behind the development of the recommendation.

Subcommittee Fee Structure Recommendations

Recommendation #1: Any recommended fee structure should consider the ability of emerging technology companies to expand and grow in Colorado. The fees implemented should not hamper the development of innovative solutions especially for rural areas.

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	Yes	Yes

Recommendation #2: The fees should be reduced or eliminated where and when mobility options are limited, such as when public transit is less available during different times of the day and different days of the week.

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	No	Yes	Yes	No	No

Recommendation #3: As a fee structure looks to curb vehicle miles traveled of emerging mobility commercial providers, the Stakeholder Working Group should also consider the equity of the fee structure on companies, and on vulnerable and/or underserved populations. These populations include the vehicle operators (the drivers), passengers (the riders) and E-commerce package recipients.

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery

Social Impact and Equity Analysis Subcommittee Tech Memo to the SB 19-239 Emerging Mobility Impact Study Working Group

Yes	Yes	Yes	Yes	Yes	Yes
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Recommendation #4: The fees should be eliminated or minimized in transportation trips originating in low-income communities according to HUD definitions. Please see: <https://drive.google.com/open?id=1dVJgX4o9zZZo9pFuLAI4H-pZAhD9v8AI>

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	No	Yes	Yes	No	No

Rational: The Subcommittee chose to use the HUD definition of low-income communities due to its easier administration and simplicity than other sources. HUD uses special tabulations of Census data to determine areas where at least 51% of households have incomes at or below 80% of the area median income (AMI).

Recommendation #5: The fee structure should be eliminated or minimized for the commercial delivery of groceries/essential goods in areas that are underserved by grocery stores or deemed “food desert” neighborhoods.

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
No	No	No	No	No	Yes

Recommendation #6: The fee structure should incentivize more affordable and accessible mobility options (e.g. car sharing, Uber/Lyft pools, mass transit) that help to discourage zero and single-occupant trips (e.g. personal vehicle ownership, or a single passenger in Uber/ Lyfts)

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	Yes	No

Social Impact and Equity Analysis Subcommittee Tech Memo to the SB 19-239 Emerging Mobility Impact Study Working Group

Recommendation #7: The fee structure should incentivize 1st/Last Mile rides (The "last-mile" or "first and last-mile" connection describes the beginning or end of an individual trip made primarily by public transportation.)

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	No	No

Rational: The Subcommittee considers this a viable proposal to administer by designating certain areas reduced fee areas, like mobility hubs. Journeys that begin or end at a mobility hub would see the reduced fee.

Recommendation #8: The proposed fee would be applied to all Colorado municipalities.

TNC	Peer-to-Peer Car Share	Non-Peer Car Share	Taxi	Car Rental	Residential Delivery
Yes	Yes	Yes	Yes	Yes	Yes

Rational: The Subcommittee recommended that all of Colorado’s municipalities participate in any fee program in order to reduce administrative burden. If a checkerboard of opt-in and opt-out areas developed it would be unclear how a fee should be charged in proportion to where the journey originated or terminated. As well, requiring statewide participation would reduce confusion and app development difficulties. Allowing certain communities to opt-out may even encourage TNC drivers to drive further in order to operate in a no-fee area, and thus causing more VMT, instead of reducing it.

Recommendations for Fee Revenue Use

Fee usage recommendations were not mutually exclusive, nor necessarily designed to all be enacted together. However, the subcommittee suggested a variety of recommendations that were designed to reduce existing inequities.

- 1) Fees could be used to build infrastructure in transportation deserts
- 2) Fees should not be spent in a way that aggravates social inequity and transportation inequity between geographic areas.
- 3) Fees should be invested into communities of color, low-income, or transit deserts. Consideration should be given for how fees can be used to benefit said communities.
- 4) A portion of fees could be used as a “rebate” to low income passengers in order to reduce the financial impact of fees on said passengers

Social Impact and Equity Analysis Subcommittee Tech Memo to the SB 19-239 Emerging Mobility Impact Study Working Group

Pending Questions & Future Research

As stated in the Transportation Provider Gap Analysis, available in the “Additional Resources & Further Reading” section, “It is recommended that the state of Colorado gather additional data sets on number of providers and location of service areas from the different emerging mobility providers. This data could be compared before and after a potential fee structure is implemented to assess the impacts on the vulnerable populations in the State of Colorado.”

The Subcommittee discussed how Lyft and Uber decide their price points, and customer price sensitivity. It would be helpful for the group to understand who would be impacted by a fee, so that it could be structured to avoid impacts on low-income communities. Understanding this would help find a balance between a fee that benefits shared rides, decreases environmental impacts, and allows people to use TNCs when transit isn't operating.

Different disadvantaged populations within Colorado may have different needs, thus, one single policy may not appease all disadvantaged communities. Fees on transportation providers may unintentionally harm drivers, passengers, and disadvantaged populations.

The impact of fee structures on drivers and their income was not resolved by the Subcommittee.

Definition of a “shared” trip

- The Subcommittee wanted to ensure that the definition of a shared ride was clear in order to prevent future abuses once AVs come online. A shared ride was defined as a ride with two or more passengers, in an AV, all riders would be passengers.
- In addition, in a TNC, a shared ride applies no matter whether the two or more passengers started together in one group, or chose the “pool” option and additional people joined along the journey.
 - However, in a non-Uber Pool shared ride, in order to apply the suggested fee reduction for shared trips, TNCs would need to provide riders the ability to select the number of passengers within the app.
- If a single passenger selects the Uber Pool (or Lyft equivalent) option for a shared ride, the shared ride fee reduction should apply to the whole journey, regardless of how many additional passengers did or did not share the vehicle for various parts of the journey. This structure simplifies the app development and administration of the fee.

Additional Resources & Further Reading

Transportation Provider Gap Analysis -

<https://drive.google.com/drive/folders/1aLLKooitnx2v5UGKlorVBygOehD5Lrbt>

**Social Impact and Equity Analysis Subcommittee Tech Memo to the
SB 19-239 Emerging Mobility Impact Study Working Group**

A Transportation Provider Gaps Analysis was completed by HDR to better understand where TNCs are being used to fill in for a lack of transit service. The analysis focused on vulnerable and disadvantaged populations. This includes:

1. People with disabilities
2. Minorities
3. Low income
4. Households without vehicles
5. Veterans
6. Households over 65
7. People with limited English abilities

APPENDIX I
REPORTS OF THE SUBCOMMITTEES

Safety Subcommittee

Emerging Technologies Safety Subcommittee Memorandum to the Stakeholder Working Group

October 16, 2019

Purpose

The Safety Subcommittee was formed in support of Senate Bill 19-239 to identify and evaluate potential impacts to safety brought forth by emerging transportation technologies and business models. The subcommittee focused on the identifying of various emerging transportation technologies and business models, and the potential positive and negative impacts experienced in Colorado communities as a result of these technologies.

Subcommittee

The Safety Subcommittee featured a multitude of stakeholder members from the community with representatives from the local and state government, law enforcement, freight, taxicab, transportation network companies (TNCs), and the private sector. The Safety Subcommittee was chaired by Lou Davenport of IronStride Solutions, with staff support by Charles Meyer (Traffic Safety Engineer) and Ashley Nysten (Assistant Director for Mobility Technology) at the Colorado Department of Transportation (CDOT). In addition to the chair and staff support leads, the below individuals attended at least one Safety Subcommittee meeting over the course of the study period.

- Brian Cheshner, Colorado Department of Regulatory Agencies
- Carla Perez
- Celeste Stragand, Ford Mobility
- Chris Primus, HDR
- Jake Swanton, Lyft
- John Ehmsen, Colorado State Patrol
- John Featherstone, CDOT
- John Hennelly, Teamsters Local #455
- Julie George, LiveWell Colorado
- Keith Borsheim, HDR
- Lei Zhu, National Renewable Energy Laboratory
- Lisa Streisfeld, CDOT
- Mark Savage, Colorado State Patrol
- Melissa Rary, CDR
- Steve Douglass, Auto Alliance
- Tatjana Kutz, CDOT

Emerging Technologies Safety Subcommittee Memorandum to the Stakeholder Working Group

The subcommittee held a total of four meetings throughout the course of approximately three months and discussed the following topics:

- Identification of emerging transportation technology and business models and observed positive and negative impacts
- Safety requirements of drivers operating vehicles in a commercial capacity
- Safety of the rider/passenger
- Medical certificate requirement by the State of Colorado Department of Regulatory Agencies

The Safety Subcommittee operated with the following assumptions in mind over the course of the meetings and discussion:

- Assumption 1: A fee structure may or may not be implemented. Any impacts identified, as well as the corresponding mitigation, should be considered regardless of the decisions related to a potential fee structure.
- Assumption 2: Determination of a fee structure will be determined by others, but the Safety Subcommittee should identify considerations that could be utilized in the development of a fee structure.
- Assumption 3: Any recommendations from the Safety Subcommittee should serve to mitigate negative impacts to safety or incentivize positive impacts to safety.
- Assumption 4: The Safety Subcommittee recommendations should be focused on impacts of currently or imminently emerging technologies.
- Assumption 5: Any regulation changes should be supported by empirical evidence of improving or encouraging safety, and should not be based on conjecture.

A summary of each meeting is detailed below.

1. Meeting 1 featured an introduction to fellow subcommittee stakeholder members, and a review of the Safety Subcommittee purpose, goals, and scope of work. A high level discussion regarding the scope of the safety subcommittee and various observed safety factors were discussed.
2. Meeting 2 focused on the identification of technologies or business models that may be considered as an emerging transportation technology and potential positive and negative impacts of each technology or business model. The group identified several technologies and models including: TNCs, advanced driver assistance systems (ADAS), connected vehicle (CV) technologies, mobility on demand and micromobility platforms, interoperability and connectivity of transportation platforms, on-demand delivery (goods), and electric vehicles. Table 1 below displays each technology, business model and potential positive and negative impacts identified by the group.

**Emerging Technologies Safety Subcommittee
Memorandum to the Stakeholder Working Group**

Table 1: Emerging Transportation Technologies, Business Models, and Associated Impacts identified by the Safety Subcommittee

Technology/Business Models	Positive Impacts	Negative Impacts
TNC's	<ul style="list-style-type: none"> ● Less impaired driving ● Convenience to the consumer increases usage ● Potential increase of mobility for vulnerable or disadvantaged users 	<ul style="list-style-type: none"> ● Pick-up/drop-off locations that create congestion and unsafe roadways for a number of users ● Transportation mode change hot spots that lack planning ● Vulnerable user safety ● Increased usage potentially increases congestion (and crashes)
Advanced driver assistance systems (ADAS) such as lane departure warning, automatic emergency braking (AEB), forward collision warning	<ul style="list-style-type: none"> ● Safety benefits (many of these systems prevent a crash from occurring) and all benefits from crash avoidance (congestion delay, strain on first responders/LE, etc) 	<ul style="list-style-type: none"> ● Over-reliance without full understanding of limitation (wide variation without training)
Connected vehicle technology	<ul style="list-style-type: none"> ● Promotes collection of information – utilizing data for informed action ● Can get information to drivers sooner 	<ul style="list-style-type: none"> ● Current state of technology (variance) creating possible lack of interoperability

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Technology/Business Models	Positive Impacts	Negative Impacts
Mobility on demand platforms and micromobility options (scooter, bike shares, etc)	<ul style="list-style-type: none"> ● Convenience to the consumer increases usage ● Potential increase in mobility for vulnerable or disadvantaged users 	<ul style="list-style-type: none"> ● Increased usage potentially increases congestion (and crashes)
Increased interoperability and connectivity of transportation platforms	<ul style="list-style-type: none"> ● Convenience to the consumer increases usage 	<ul style="list-style-type: none"> ● Increased usage potentially increases congestion (and crashes)
On-demand delivery (goods)	<ul style="list-style-type: none"> ● Convenience to the consumer increases usage ● Potential increase of mobility for vulnerable or disadvantaged users 	<ul style="list-style-type: none"> ● Increased usage potentially increases congestion (and crashes)
Electric vehicles (EV's)	<ul style="list-style-type: none"> ● Cleaner energy for transportation ● Lower GHG emissions from the transportation system 	<ul style="list-style-type: none"> ● Chemical/hazard fire created by the batteries and lack of experience with these type of crashes by emergency responders

3. Meeting 3 built on the discussion from the second meeting, and featured the drafting of recommendations for identified positive and negative impacts. Appendix A details all identified Safety Subcommittee Recommendations. From this large list of recommendations, the subcommittee chair and the staff work leads paired down the recommendations to be presented to the broader Emerging Technology Stakeholder Working Group on September 26, 2019 at the Colorado Department of Transportation (CDOT). These recommendations were presented alongside the recommendations of the other five subcommittees for discussion among the stakeholder working group. Table 2 illustrates the paired down Safety Subcommittee Recommendations. The Safety

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Subcommittee Chair and the staff work leads categorized the recommendations for ease of review in Table 2 below.

Table 2: Full List of Recommendations identified by the Safety Subcommittee

Safety Subcommittee Recommendation
<ul style="list-style-type: none"> • <i>(Policy)</i> Evaluate areas to improve hotspot pickup/dropoff locations to promote safety for all road users (e.g., peds, vehicles, freight); develop standard/recommended plan (signing, markings, striping, geometric configuration, etc.) for locations
<ul style="list-style-type: none"> • <i>(Data)</i> Gather additional data to improve vehicle miles traveled (VMT) analysis necessary to understand trip generation (e.g., purpose, time of day, replacement vs. new trip)
<ul style="list-style-type: none"> • <i>(Data)</i> Modify the crash form to collect additional data for vehicles driven for commercial purposes (TNCS, car shares, package delivery, and others)
<ul style="list-style-type: none"> • <i>(Policy)</i> Continue to promote research/innovation and provide infrastructure test beds as necessary/helpful, including ADAS and CAV applications.
<ul style="list-style-type: none"> • <i>(Education)</i> Educate Colorado drivers on emerging technologies (e.g., ADAS, TNCS)
<ul style="list-style-type: none"> • <i>(Policy and regulation)</i> Review regulations on hours of service among various commercial providers (e.g., TNCS, taxis, car shares, package delivery, and others)
<ul style="list-style-type: none"> • <i>(Education)</i> Develop first responder training programs to educate on emerging technology impacts to crash scene management (e.g., EV batteries in a car fire).
<ul style="list-style-type: none"> • <i>(Data)</i> Gather additional data to better understand the safety impacts of the medical provision and other driver qualifications, certifications, training needs

- Meeting 4 featured prioritization of the drafted safety recommendations. Each Safety Subcommittee member was asked to prioritize the recommendations and to suggest a timeframe for implementation. The Subcommittee opted to not place strict timeframes on the recommendations as some elements may take years to implement.

The results were reviewed as a group and the table below summarizes the consensus, listing the recommendations that received more than one subcommittee member support per that recommendation in that time sequence. The Safety Subcommittee members listed a few considerations to keep in mind during implementation of these recommendations. Some recommendations may need to be started right away to get going (due to a long lead time), but may not be ready for implementation until the mid- or long-term stage. An annual or semi-annual review of each should be conducted. Data-oriented analyses take years of analysis to draw meaningful conclusions, so that is both an immediate concern but also a long term outlook.

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Table 3: Prioritized List of Recommendations identified by the Safety Subcommittee

Near-Term Recommendations	Mid-Term Recommendations	Long-Term Recommendations
<ul style="list-style-type: none"> ● Review regulations on hours of service among various commercial providers (e.g., TNCS, taxis, car shares, package delivery, and others) ● Gather additional data to better understand the safety impacts of the medical provision 	<ul style="list-style-type: none"> ● Gather additional data to improve vehicle miles traveled (VMT) analysis necessary to understand trip generation (e.g., purpose, time of day, replacement vs. new trip) ● Modify the crash form to collect additional data for vehicles driven for commercial purposes (TNCS, car shares, package delivery, and others) ● Develop first responder training programs to educate on emerging technology impacts to crash scene management (e.g., EV batteries in a car fire). 	<ul style="list-style-type: none"> ● Continue to promote research/innovation and provide infrastructure test beds as necessary/helpful, including ADAS and CAV applications. ● Educate Colorado drivers on emerging technologies (e.g., ADAS, TNCs)

Conclusion

The Safety Subcommittee identified positive and negative impacts brought forth by emerging transportation technologies and business models. Based on the identified impacts, the Safety Subcommittee formally presents the recommendations in Table 3 above for inclusion into the Emerging Technologies Stakeholder Working Group and for consideration by policymakers moving this effort forward.

APPENDIX I
REPORTS OF THE SUBCOMMITTEES

**Fee Structure for
Emerging Mobility
Providers Subcommittee**



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Overview

The Fee Structure for Commercial Transportation Vehicles and Transportation Network Companies Subcommittee is one of six subcommittees formed to support the development of recommendations, as required under Colorado Senate Bill 2019-239 (SB 19-239).

The goal of the Fee Structure Subcommittee is to develop recommendations to the Working Group regarding the type of fee and its structure to be implemented on several (6) different types of emerging transportation providers which were highlighted in SB 19-239 (transportation network companies, taxis, peer to peer car share companies, non-peer to peer car share companies, rental cars, and E-Commerce/residential delivery). The Working Group communicated that it was not a goal of the Fee Structure Subcommittee to determine how to distribute the funds collected from a potential fee structure. The other subcommittees and the Working Group will develop recommendations on how to use revenue generated from the fee(s) to address the impacts of emerging technology on transportation infrastructure and the environment.

Membership

The Fee Structure Subcommittee is made up of almost 60 stakeholders that cover the six commercial vehicle categories identified in SB 19-239. See Annex A for the full list of members.

Tasks:

1. Identify criteria that an ideal fee structure would meet (for instance, raise a certain amount of revenue, incentivize shared ridership, not placing a disproportionate burden on low-income populations, etc.).
2. Review road user charge (RUC) study results and programs with effective fee structures.
3. Conduct an analysis of these different programs and identify which policy best addresses the identified criteria.
4. Discuss changes to the fee structure that may be necessary to meet local goals and to avoid potential unintended consequences.
5. Determine what data is required to administratively collect a fee. What data can other states, cities, companies, and vehicles provide?
6. Consider possible incentives to change driver behavior.
7. Determine the geographic scope of the fee structure.

Data Needs:

- Road user charge (RUC) (otherwise known as a “mileage-based fee”) study results;
- Number of vehicles on the road and total vehicle miles traveled (VMT) for revenue projections;
- Fee structures that have been effective at raising revenue and incentivizing desirable behavior in other states or countries;
- How revenues from fees in other states and/or cities have been spent.



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Challenges

How should the state government administer this fee? Fees could potentially discourage some desirable behaviors and disproportionately impact low-income communities—fee structures should be designed with potential unintended consequences in mind.

Opportunities

When designed well, fees have the potential to spur innovation and shift behavior. A fee structure has the potential to raise revenue to fund new transportation projects while bringing the state closer to reaching climate goals.

Meetings held

The subcommittee met four-times at CDOT Headquarters between August and October 2019:

- August 7, 2019 (9:30 am – 12:00 pm)
- August 19 2019 (12:00 – 1:00 pm)
- September 20, 2019 (1:00 – 3:30 pm)
- October 17, 2019 (1:00 – 3:30 pm)

Topics Discussed

Key topics discussed by the subcommittee members include:

- Criteria to evaluate fee options;
- Lessons learned and fee structure examples from other states, based on the literature review presented to the Working Group;
- Data necessary to collect a fee and data currently available;
- Difference between a tax and a fee according to TABOR case law;
- Connecting fees to investments;
- Fee options under consideration: Mileage-Based Fee; Percentage of Transaction Fee; Flat Fee;
- Consideration of if/how fee level should change for internal combustion engines, zero occupancy vehicles, zero-emission vehicles, and zero occupancy vehicles, by the time of day, location, and air quality;
- Data needs for the modeling team;
- Pros and cons of fee structures under consideration, including feasibility for the State of Colorado and companies, and goals outlined in SB 19-239. Key questions posed during this discussion included:
 - How easy or difficult are the different options to administer?
 - Would any of these options change how you do business?
 - How would these options impact shared rides and EV adoption?
 - Would it impact your geography of operation in Colorado?
 - Do any of the fee options provide an advantage to one industry over another?
- Feedback from subcommittee members on fee structures under consideration:



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- Mileage-Based Fee
 - Challenging to administer;
 - Difficult to track for rental cars, particularly when traveling or renting across state lines;
 - Could cause confusion and potential double-counting for Transportation Network Companies (TNC) drivers that use multiple apps;
 - Privacy concerns for drivers and users;
 - Highly reliant on the use of technology to track mileage - challenging for some industries;
 - Addresses emissions considerations;
 - Residential delivery vehicles will pay more because of lack of pick up/drop off locations (i.e. circling the block);
- Percentage of Transaction Fee
 - For delivery of goods, it is difficult to determine if the goods were purchased out of state to determine the cost;
 - For car rental, it is difficult to identify how many people are in the car.
- Flat Fee
 - Easiest to administer;
 - Would disadvantage rental car customers due to other fees currently imposed;
 - Low level modeled is higher than most other states, outside of New York
- General Fee Comments
 - Fee combination options should be considered;
 - Revenue generated from the fee should be shared with local governments;
 - Ease of implementation is a key consideration for the industry;
 - Consideration should be given to fees already in place for the industry;
 - The fee will impose costs to the TNC industry that don't currently exist and may detract from existing initiatives to support EV adoption;
 - Additional feedback from the Colorado Motor Carriers Association (CMCA) and SHARENOW on the fee structures is included in Annex A and Annex B;

Gap Analysis

Subcommittee members identified a number of key questions that are outside the scope of the Fee Structure Subcommittee, and in some cases outside the 19-239, but are important to capture for future discussion. They include:

- Why are we only applying these fees to a segment of transportation services that account for a small (2-3) % of total VMT?
- How much money is the state trying to raise and what will it pay for?
- How is the reduction in VMT that commercial vehicles contribute to (through food delivery etc.) taken into account?
- The subcommittee stated that the revenue generated should be shared with local governments.



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- Commercial delivery data is very limited and meant that it was not possible to appropriately model the estimated VMT for the three fee structures identified by the subcommittee. Gathering adequate VMT data from the commercial delivery sector will be important for future studies to accurately capture its impact.

Fee Structures and Ranges Modeled

The project team reviewed different types of fee structures, based on the literature review presented to the Working Group, that are either being planned or are already implemented in a combined 40 cities, airports and states.

There are three potential ride types under consideration that produce different rates. The most desirable ride type, which reduces the most congestion and carbon emissions, is a pooled or shared ride in an EV. This has the lowest vehicle emissions impact fee and, in some cases, has no fee. The least desirable ride type is assumed to be a single occupancy trip in an ICE (internal combustion engine) vehicle because this is the least efficient in moving people and has higher carbon emissions than an EV. The rates were also suggested for the simplicity of modeling purposes and these fit well within the national ranges as outlined above.

Vehicle type	Mileage-Based Fee (\$ per vehicle mile)		Flat Fee (\$ per trip or day)		Percent-Based Fee (percent of transaction)	
	Low	High	Low	High	Low	High
ICE, single occupancy	\$0.01	\$0.015	\$1.00	\$2.50	3%	5%
Pooled ride or Zero Emission Vehicle (ZEV)	\$0.005	\$0.01	\$0.50	\$1.40	1%	2%
Pooled ride and ZEV	\$0	\$0.005	\$0.00	\$0.10	0%	1%



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Recommendation

Fee subcommittee members could not reach consensus or agreement on a single fee structure to recommend to the Working Group. As a result, the Fee Subcommittee recommends the Working Group consider one, or a combination of, the three fee structures modeled: mileage-based, flat, and percent-based. A summary of the key pros and cons of each fee structure identified by the subcommittee is outlined in the table below.

Any fee structure should take into account the fees already imposed on the commercial vehicles covered by SB 19-239.

Pros and Cons of Fee Structures Modeled

Fee Type	Pros	Cons
Mileage-Based Fee	<ul style="list-style-type: none"> ● Best fee structure to meet the goals of SB 19-239 ● Addresses emissions considerations ● Could capture deadheading 	<ul style="list-style-type: none"> ● Challenging to administer ● Highly reliant on the use of technology to track mileage ● Requires increased data collection ● Concerns raised around privacy and the type of data collected
Flat Fee	<ul style="list-style-type: none"> ● Easiest to administer ● Requires less data ● The most common fee to be administered by other cities and states 	<ul style="list-style-type: none"> ● Doesn't address the goals of SB 19-239 directly. However, funds generated could be used for this purpose ● Low flat fee modeled was flagged as higher than other cities, outside of New York
Percent-Based Fee	<ul style="list-style-type: none"> ● More representative of the length of a trip ● The most common fee to be administered by other cities and states 	<ul style="list-style-type: none"> ● Extremely difficult to administer for residential delivery. Additional data is required from this provider to appropriately model its impact on VMT for all three fee structures. ● Doesn't address the goals of SB 19-239 as directly as a mileage-based fee. However,



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		funds generated could be used for this purpose
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Annex A: Fee Subcommittee Members

Name	Organization
Nick Farber (Chair)	HPTE
Simon Logan (Technical Lead)	HPTE
Jonathan Bartsch (Facilitator)	CDR Associates
Chaz Tedesco	Adams County
Melanie Sloan	Adams County
Charles Tedesco	Adams County
Melissa Young	All-State
Jeff Cleland	Amazon
Jeff Cleland	Amazon
Marilen Reimer	American Council of Engineering Companies
Jennifer Brandeberry	Brandeberry Mckenna Public Affairs
Julie Mckenna	Brandeberry Mckenna Public Affairs
Megan Wagner	Brandeberry Mckenna Public Affairs
Jordan Sanchez	Brandeberry Mckenna Public Affairs
Marie Nakagawa	CDOT
Andy Karsian	CDOT
Sophie Shulman	CDOT
Lisa Streisfeld	CDOT
Benjamin Garrett	Chris Hansen Fellow
Morgan Cullen	Colorado Municipal League
Terri Livermore	Colorado Advocates
Jep Seman	Colorado Advocates
Tony Milo	Colorado Contractors Association
Jim Moody	Colorado Contractors Association
Jim Moody	Colorado Contractors Association
Greg Fulton	Colorado Motor Carriers Association (CMCA)
John Ehmsen	Colorado State Patrol
Dorothy Jones	Denver Metro Chamber of Commerce
Jenny Adler	DOR/DMV
Manolo Morales	Drift
Meegan Wood-Trombley	Enterprise Holdings
Drew Carpenter	Enterprise Holdings
Sean Tully	Enterprise Holdings



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Name	Organization
Meegan Woodtrombley	Enterprise Holdings
W. Celeste Davis Stragand	Ford
Carla Perez	HDR
Chris Primus	HDR
Chris Hansen	House District 6
Scott Spendlove	Intermountain Corporate Affairs
Lou Davenport	Iron Stride Solutions
Pete Kirchhof	Kirchhof Group Inc
David Spector	KPMG
Julie George	LiveWell
Jake Swanton	Lyft
Melissa Ray	Mediate
bgarret8@msudenver.edu	MSU Denver
Joshua Sperling	National Renewable Energy Laboratory (NREL)
Alejandro Henao	National Renewable Energy Laboratory (NREL)
Tony Rees	Rees Consulting and Public Affairs
Kaylyn Bopp	Regional Air Quality Council
Steve McCannon	Regional Air Quality Council
Walter Rosenkranz	SHARENOW
Johanna Jamison	SHARENOW
Walter Rosenkranz	SHARENOW
Travis Madsen	Southwest Energy Efficiency Project (SWEEP)
Matt Frommer	Southwest Energy Efficiency Project (SWEEP)
Travis Madsen	Southwest Energy Efficiency Project (SWEEP)
Mary Marchun	The Capstone Group
Jeannie Vanderburg	The Capstone Group
Ethan Wilson	Turn
Piper Overstreet	Uber



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Annex B: Written Feedback from Colorado Motor Carriers Association

September 29, 2019

Dear Nick and Friends,

I apologize that I was unable to attend the last meeting of the Fee Structure committee related to possible fees for commercial transportation vehicles. While I was unable to attend, I did want to share some questions and concerns that have been raised by some of our companies that perform residential delivery today. Being that no fee of this nature exists in the country today on residential delivery, it has generated a number of questions and issues that we wished to share with the group. Here are some of the questions that have been raised and should be considered if any fee concept on home delivery were to be considered:

- What products delivered via residential delivery would be subject to a fee? Will certain products such as those that are exempt from state sales tax today, such as groceries and prescription drugs, also be exempt from this fee?
- Where will the fee be assessed? Would it be on the retailer at the time of purchase or on the transporter?
- How will the State monitor to see that all home deliveries that are provided by a wide range of businesses pay the fee? If it is a percentage of the service cost and the seller provides “free delivery” how is that resolved?
- Will retailers be provided a percentage of the delivery for the costs associated with collecting and remitting the fee to the state, similar to the state sales tax?
- How do we ensure that certain disadvantaged groups or less-served groups do not bear a disproportionate cost when their choices are limited?
- What will be the cost for retailers to modify their software and systems to add this change and how long a period of time will it take? (With sales tax within the state, the Colorado Department of Revenue indicates that it takes 18 months to 2 years for companies within the state. Realizing that this would apply to shipments originating from out of state, this could take years before there was full compliance)
- Will the fee be applied to all home deliveries or only on-line purchases? Many home deliveries are ordered by phone.
- Should a fee be applied to home delivery services in cases where that service may actually translated into less VMT and emissions than a consumer traveling to a brick and mortar store?
- What will be the costs to implement this system by the state? What actions would be put in place to avoid evasion on the fees?



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- If the fee is not collected by the retailer or the transporter, would the customer be liable in the case of an audit to pay it and any penalties or interest associated with the lack of payment?
- What would be the costs for businesses to modify their systems and software to incorporate this additional fee as part of the transaction as well as remit it to the state?
- There has been some discussion on providing exemptions or price breaks for lower income and fixed income individuals. How would this be done for residential package delivery? Package delivery routes span various income areas and different individuals may live in the same home, some above the poverty line and others below. How would the State resolve this matter?
- The question of the purpose or objective of applying a fee on home delivery services is one that would also need to be addressed. Is the purpose to encourage changes in the manner of transporting/delivering products (i.e consolidation of deliveries, delivery lockers in central locations) , influencing consumer behavior (encouraging consumers to bundle purchases or have a specific day to receive deliveries), reducing VMT and congestion (more delivery spaces in congested areas, off-peak delivery of products) or to modify the means of transporting these products (moving toward ZEV or other clean transport).

Thank you for your consideration of these questions.

Greg Fulton, CMCA

Annex B: Written Feedback from Johana Jamison, SHARENOW

October 23, 2019

Thanks for this information, and apologies we were not able to join for last week's Fee Structure Subcommittee meeting given other pressing activities. After reviewing the materials there are a few notes I'd like to pass along for your information and consideration:

Modeling

Based on the results displayed in slide 13 of the provided meeting #4 slide deck, the flat fee in particular appears to have a disproportionate impact on non peer-to-peer carshare, increasing costs up to 28% - more than any other service examined - despite the fact that its magnitude in terms of trips, VMT, tons of daily CO2 emissions, etc. is the slightest of any modeled service with the exception of only peer-to-peer carshare. We've observed significant challenges in



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other markets where short-term rentals are taxed at a much higher rate (compared to the trip cost) than multi-day rentals.

Existing fees

The table is very helpful, but seems to be missing a few pieces of information in the non peer-to-peer carshare column. For car2go specifically, in addition to the listed taxes and fees we also pay 7.25% in local (Denver), 1% in RTD, and .10% in Cultural Facilities District, taxes.

Regarding the final row of the matrix, for a free-floating service like ours the \$850 fee is per vehicle, not per space (as indicated), since our area permit allows our vehicles to be parked in any public, on-street space that is metered for 2+ hours or residential within the service or "Home" area. In cases where we desire to dedicate an on-street space where only our vehicles can be parked, we pay a separate and additional fee (as already outlined in the table) for that.

We hope this is helpful, let us know if you have questions or would like additional information.