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Section 1

Technology

The rapidly evolving realm of transportation technology is poised to provide great benefits to the region's transportation system. Emerging technologies are helping travelers make better-informed decisions regarding how and when they will travel and the path they will take to get there. For instance, integrated planning and payment applications may facilitate multi-modal trips by providing information about the entire transportation system and allowing travelers to pay for different modes in one convenient location.

New technologies are also placing safety and mobility at the forefront of transportation innovation. As in-vehicle safety systems continue to advance, travelers are better protected. Meanwhile, technologies to provide enhanced mobility for persons with disabilities and the older adult population, such as safety systems for transit users with a disability, have continued to advance as well.

Though technology promises to provide significant enhancements to safety, mobility, and efficiency, its inherent uncertainty presents a significant challenge to long-range planning. Without knowing which technologies will last, which technologies are yet to come, and how these technologies will transform society, it is difficult to confidently develop plans and policies before these technologies hit the market. Still, given the enormous potential to positively impact transportation across the region, the NFRMPO remains dedicated to exploring and supporting technological progress with an eye toward maximizing benefits while minimizing unintended consequences.

A. Connected and Autonomous Vehicles (CAV)

Connected Vehicles (CV) and Autonomous Vehicles (AV) present some of the greatest opportunities and challenges in the realm of transportation planning today. Collectively referred to as CAVs, this emerging arena of technology is poised to transform the region's transportation network and operations and therefore, requires careful consideration.

Connected Vehicles (CV)

Connected Vehicles refers to the systems of technologies enabling the sharing of data between vehicles, known as vehicle-to-vehicle communication (V2V) and the sharing of roadway information with vehicles, known as vehicles-to-infrastructure communication (V2I). In general, the potential of vehicles to share or receive data from any technology system is referred to as vehicle-to-everything communication (V2X).

This ability to share data, or to communicate, means vehicles can receive real-time information about traffic and roadway conditions, resulting in potentially significant increases in safety. The positive benefits of connected vehicles directly correlate with the number of vehicles on the road with the pervasiveness of V2X technology.

Already, the National Highway Traffic Safety Administration (NHTSA) has proposed rules to require V2V capabilities in new vehicles. And while policy will certainly help cement progress towards safety, the market is already responding to demand on its own; many auto manufacturers have begun including these capabilities in new vehicles.

It is important to recognize, even as policies change and the market evolves, that realizing the full benefit of these new technologies will require a tipping-point percentage of the fleet to

adopt and incorporate these communications technologies.

In addition to the adoption of in-vehicle communication systems, roadway infrastructure will also need to change to allow V2I communications. Fiber-optic connections provide uninterrupted high-speed connection and may help to service the growing demand imposed by emerging communications technologies.

In fact, developing a strong fiber-optic backbone is a high priority at the State level, as outlined in CDOT's RoadX Program. The CDOT RoadX program was developed to address anticipated increases in congestion and travel delay by 2040 through the strategic and integrated implementation of transportation-oriented technologies. Connected vehicles and connected infrastructure is one of the core strategies of the RoadX program.

Autonomous Vehicles (AV)

The Society of Automotive Engineers (SAE) defines five levels of vehicle automation as shown in **Figure 3-1.** Level 1 Automation is present in most of the region's fleet today and includes features like cruise control. Level 2 Automation, with options like parking assist, lane assist, and driver assist, is also already on the market and becoming increasingly popular. Though Level 3 through Level 5 vehicles have been tested and employed to a limited extent, significant market penetration of these vehicles is likely more than a decade away.

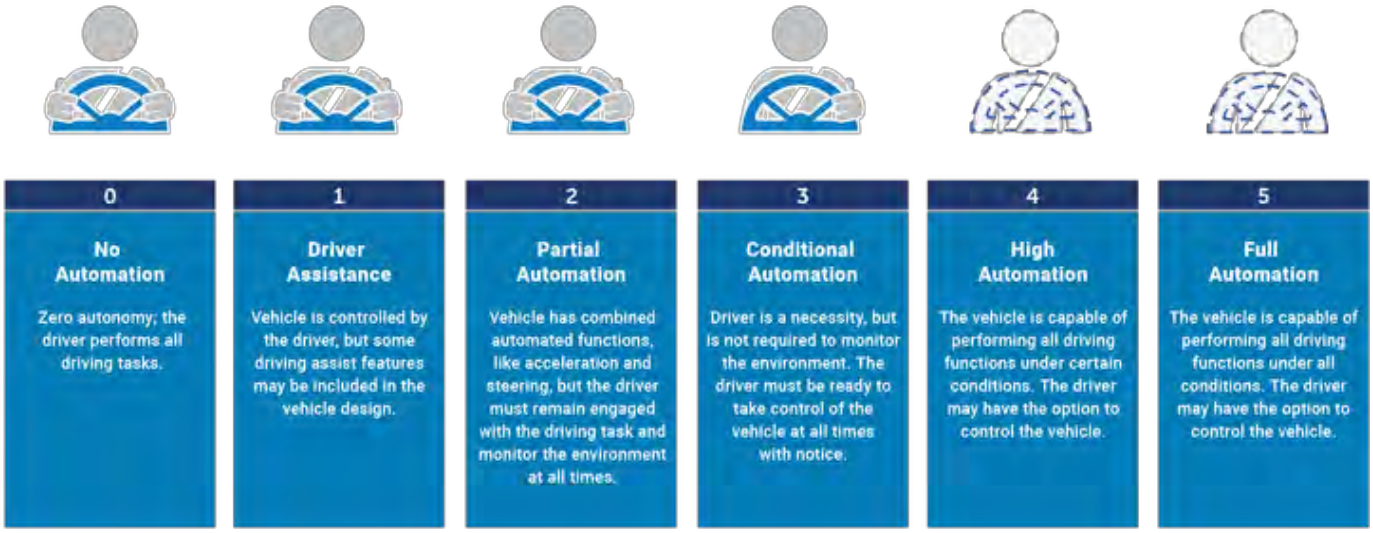
Some automobile manufactures anticipate having Level 4 and Level 5 vehicles for sale in 2020; however, potential costs, cyber security concerns, and general distrust of fully automated technology may initially serve as barriers to market penetration. Still, given the large advancement in technology, even over the past decade, the consideration of potential impacts on the transportation network is necessary.

Though Full Automation could dramatically enhance safety, mobility, and efficiency, especially when paired with CV technology, some travel models predict a significant penetration of Full Automation vehicles could actually lead to an increase in vehicle miles traveled (VMT), sprawl, or gridlock within urban cores.

With the ability to do other tasks while the vehicle is in motion, travelers may be willing to take much longer trips, which could lead to an increase in VMT and even promote sprawl as people are more willing to live further from their destinations. Other models predict Full Automation could prompt an increase in driverless ridesharing. While this could lead to a decrease vehicle ownership, without the appropriate policy and infrastructure in place, these automated vehicles may circulate continuously, potentially resulting in gridlock within the urban core.

Ensuring the benefits of CV and AV technology are reaped, while avoiding the associated negative consequences will require continued modeling, vigilant monitoring, and the flexibility and ability to react swiftly to emerging trends.

Figure 3-1: Society of Automotive Engineers (SAE) Automation Levels



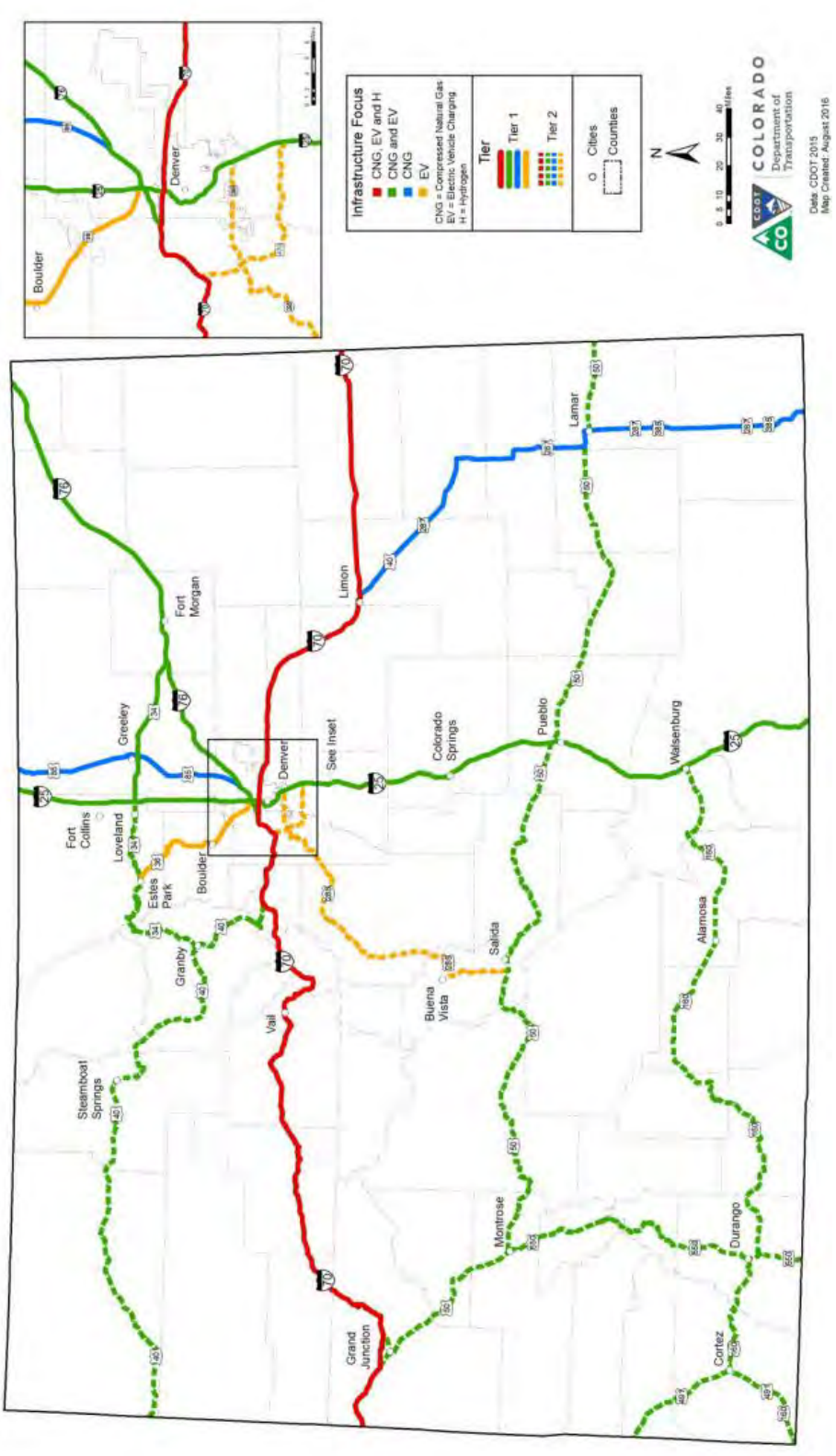
Source: FHWA, 2019

B. FAST Act Alternative Fuels Corridors

In 2016, CDOT collaborated with a working group made up of members from the Statewide Transportation Advisory Committee (STAC) to compile a list of CDOT nominations for FAST Act Designation of Alternative Fuel Corridors in the State of Colorado. The focus of this statewide network was to develop a convenient and sustainable alternative fuels market for compressed natural gas (CNG), electric (EV), hydrogen, and propane fuels that would provide flexible statewide travel as well as connections to adjacent states and the national transportation network.

Specifically, for the NFRMPO region I-25, US34, and US85 are part of the Tier 1 list of corridors in the State. Both I-25 and US34 are identified as CNG and EV focus corridors, while US85 is a CNG focus corridor. **Figure 3-2** shows the Alternative Fuels Corridors for Colorado. The goal of this corridor identification is to provide signage for alternative fuel vehicle owners travelling along the State's highways to know where stations with their specific fuel needs are located throughout the state in an effort to reduce anxiety for drivers.

Figure 3-2: FAST Act Alternative Fuels Corridors



C. Mobility

The idea of mobility is growing beyond separate transportation silos with disparate information sources. New technology is making people aware of the options that exist beyond just a single-occupancy vehicle (SOV). Helping people understand their options can round out the first mile/last mile issue many transit agencies face, improve quality of life for residents and visitors, and can help transportation providers build partnerships and find efficiencies.

Shared Mobility

Shared mobility is a developing concept where transportation services and resources are shared among users, either concurrently or one after another.[25] Shared mobility can include bike- and scooter-sharing; carsharing; ridesharing and ridehailing; public transit; and microtransit. Additional options beyond just the SOV can make trips more efficient, reduce congestion, and provide options for people who cannot afford or do not want to own or maintain a car.

Currently in the NFRMPO region, Uber and Lyft offer on-demand service; Pace Bikeshare is available within Fort Collins; and ZipCar has vehicles located on Colorado State University's campus. Transfort and CDOT are pursuing the idea of mobility hubs, where travelers can transfer between modes at key locations throughout the City and State. The Kendall Parkway Park-n-Ride on I-25 in Loveland will be a first-in-the-State facility connecting local transit, regional transit, a Park-n-Ride, and non-motorized trail access. The Park-n-Ride will have an area for carsharing drop-offs and pick-ups.

Mobility as a Service

Alongside shared mobility, Mobility as a Service (MaaS) is meant to give people information about their available transportation options to make it easier to plan, pay for, and complete trips. MaaS relies on technology like a One-Call/One Click Center or a mobile app to improve the traveler's experience.

The Bustang mobile app allows users to download schedules, purchase tickets, see travel alerts, and track the bus. This type of app allows users to have one location for Bustang information.

The NFRMPO is partnering with local agencies to study the feasibility of a One-Call/One-Click center in Northern Colorado. The goal is to create a central location for information about mobility options in Larimer County and potentially allow users to book rides by calling, going to a website, or using an app. Having these options makes the technology more useful for older adults, rural residents, and individuals who do not own a smartphone.

[25] https://sharedusemobilitycenter.org/what-is-shared-mobility/