CAV TO NON-CAV INTERACTION

The intersection of new CAV technology with human driving behavior is a complex area of study. There remain many questions about how the general public will respond to technology-based information in their own vehicles and how they might interact with non-CAV drivers in the adjacent travel lanes. Early theoretical predictions claimed major upgrades in throughput with CAV technology, as much as double existing capacity. A recent study[4] by Texas Transportation Institute (TTI) of the I-35 Corridor in Austin, however, showed much different results. TTI's model simulations of that 12-mile highly congested urban freeway corridor evaluated freeway throughput per lane, volumes, and overall travel speeds related to increasing proportions of CAVs in the vehicle mix. The authors demonstrated a major degradation of mobility, in terms of throughput, speeds, and safety as CAVs were added to the vehicle mix due to interactions between CAVs and non-CAVs. In fact, the higher the CAV share, the lower the travel speeds and freeway throughput, and greater the travel times became, which is a counter-intuitive outcome.

One of the major performance factors in the mixed vehicle environment is associated with the friction created between CAVs and non-CAVs in the pursuit of traffic harmonization. When a CAV communicates to other CAVs of upcoming traffic, the CAVs respond accordingly but the non-CAVs may or may not. This tends to exacerbate the existing bottlenecks and be more problematic because of increased lane changing as non CAVs navigate around CAVs that are obeying the rules of the road. These types of behaviors not only impact congestion but tend to degrade the expected safety benefits of traffic harmonization.

LONGER TERM IMPLICATIONS TO TRAVEL CHOICES

Another aspect of CAV evolution that is relevant to the US 20 corridor is a broader effect on community travel choices and auto ownership, which is based on not just CAV technologies, but more about the convergence of CAVs with Shared and Electric vehicle adoption. This convergence is often referred to as Autonomous, Connected, Electric, and Shared (ACES) vehicle evolution. As the CAV market penetration rises, the availability of Transport as a Service (TaaS) may introduce a fundamental shift in how current transport choices are made. As the cost of drivers is removed from the business equation, the concept is that Transportation Network Carrier (TNC) type activities, like Uber and Lyft, will grow exponentially by offering transportation at a fraction of the current cost per trip. Early estimates by the ReThinkX research group[5] are that TaaS will offer vastly lower cost transport alternatives, as much as four to ten times cheaper per mile than buying a new car and two to four times cheaper than operating an existing vehicle. In addition, they predicted that switching from internal combustion engine vehicles to all electric powered for TaaS

[4] Impacts Of Connected Vehicles In A Complex, Congested Urban Freeway Setting Using Multi-Resolution Modeling Methods, International Journal of Transportation Science and Technology, Volume 8, Issue 1, March 2019,

[5] RethinkX, Rethinking Transportation Choices 2020-2030, 2017. https://bit.ly/2AeAxJR