



TO: ACC-OC Infrastructure and Technology Committee

FROM: Eric Joseph, Policy Analyst

DATE: April 12, 2018

SUBJECT: Automated Vehicles White Paper (Final Draft)

This white paper discusses the current and future impacts of automated vehicles (AVs) on local municipalities. It lays out practical legal and policy considerations and is intended to help cities make informed decisions regarding AVs by detailing the benefits and challenges that these vehicles present to local communities.

Introduction

A Chevrolet Bolt maneuvers through San Francisco's Civic Center, traveling past City Hall before seamlessly edging into an intersection on Grove Street. First checking for pedestrians and then for oncoming traffic, the Bolt ultimately makes a left turn onto Van Ness Avenue. Meanwhile, two thousand miles away in Michigan, a Ford Fusion repeats these same driving maneuvers on the streets of Ann Arbor.

At first glance, both cars seemingly have nothing in common aside from adhering to rules of the road, making a left turn, and possessing a single driver. However, with closer examination, these cars have one striking similarity that distinguishes them from most vehicles on the road that day. They are automated vehicles and the individual sitting behind the wheel is an occupant, not the driver.

The Bolt and Fusion safely navigated the busy streets of Ann Arbor and San Francisco, no minor accomplishment as human error accounts for tens of thousands of driver related deaths each year.¹ AVs have arrived and increased driver safety, one crucial reason that they are here to stay. Cities throughout California need to begin planning today to prepare for the future.

Since the introduction of the automobile to the United States in the late 1890s, the automotive industry has played an integral role in shaping economic, safety, health, workforce, and land use policies in the United States. This industry, which during the mid-nineteenth century was the largest in the nation, still accounts for approximately \$665 billion of the Gross Domestic Product (GDP) and 1.7 million jobs.² One significant reason that vehicles have remained economically relevant for over a century are the advancements made in the automotive and technological industry.

The automotive industry was revolutionized in the twentieth-century with the development of the automatic transmission, catalytic converters, and fuel injection systems. In addition to generating billions of dollars for the U.S. economy, these technological advancements helped to shape America, particularly the development of cities. Municipalities responded by creating public policies and infrastructure to address the development of motor vehicles.

Automated vehicles have the potential to transform cities in the twenty-first century. Today's local governments must prepare to examine, create and modify policies to meet the new challenges, benefits, and needs AVs present. Cities will need an open, creative, and collaborative mindset to maximize the benefits of this developing technology.

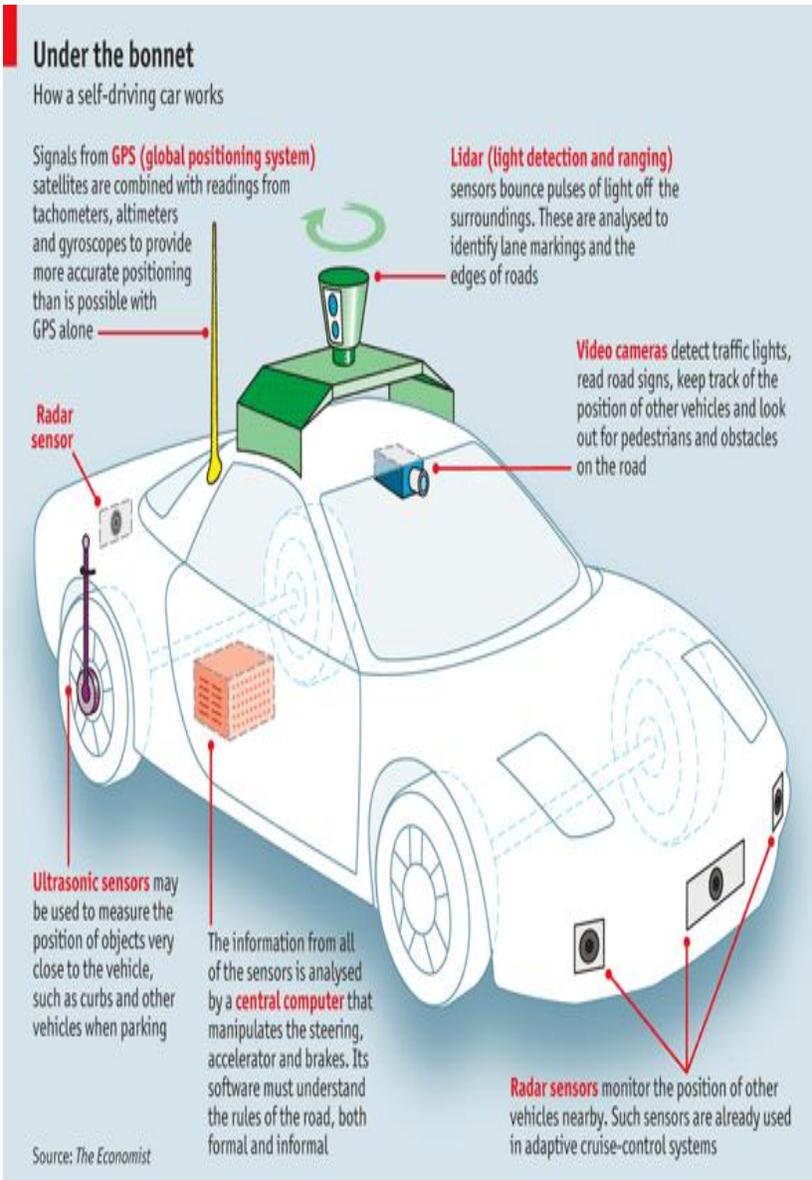
Defining Automated Vehicles

The term “automated vehicle” refers to any vehicle (e.g. car, truck, bus) that incorporates aspects of automated technology and that is capable of performing at least some features of

¹ According to an October 2017 [report](#) compiled by the National Highway Traffic Safety Administration (NHTSA), an agency of the US Department of Transportation, motor vehicle-related crashes claimed 37,461 lives in 2016. In California the number of vehicle related fatalities totaled 3,623.

² [Data](#) compiled by the Bureau of Economic Analysis, a research arm of the U.S. Department of Commerce, states that the nation's Gross Domestic Product (GDP) totaled over \$19 trillion in 2017. The Center for Automate Research [estimates](#) that the automotive industry accounts for 3-3.5 percent of the overall GDP.

a safety-critical control function (e.g., steering, throttle, and/or braking) without direct driver



input.³ Current automated technologies include video cameras, light detection and ranging (LIDAR) systems, and radar sensors.⁴ These various technologies are integrated directly into the vehicle infrastructure and comprise what is called the automated driving system. The automated driving system is capable of self-driving the vehicle with no connectivity to other vehicles and the surrounding infrastructure.⁵ Automated technologies enable AVs to perceive the surrounding environment and to make decisions using a “sense-plan-act” design. This design refers to the ability of an automated vehicle to sense

and analyze its surroundings, plan a course of action, and act in an appropriate manner.

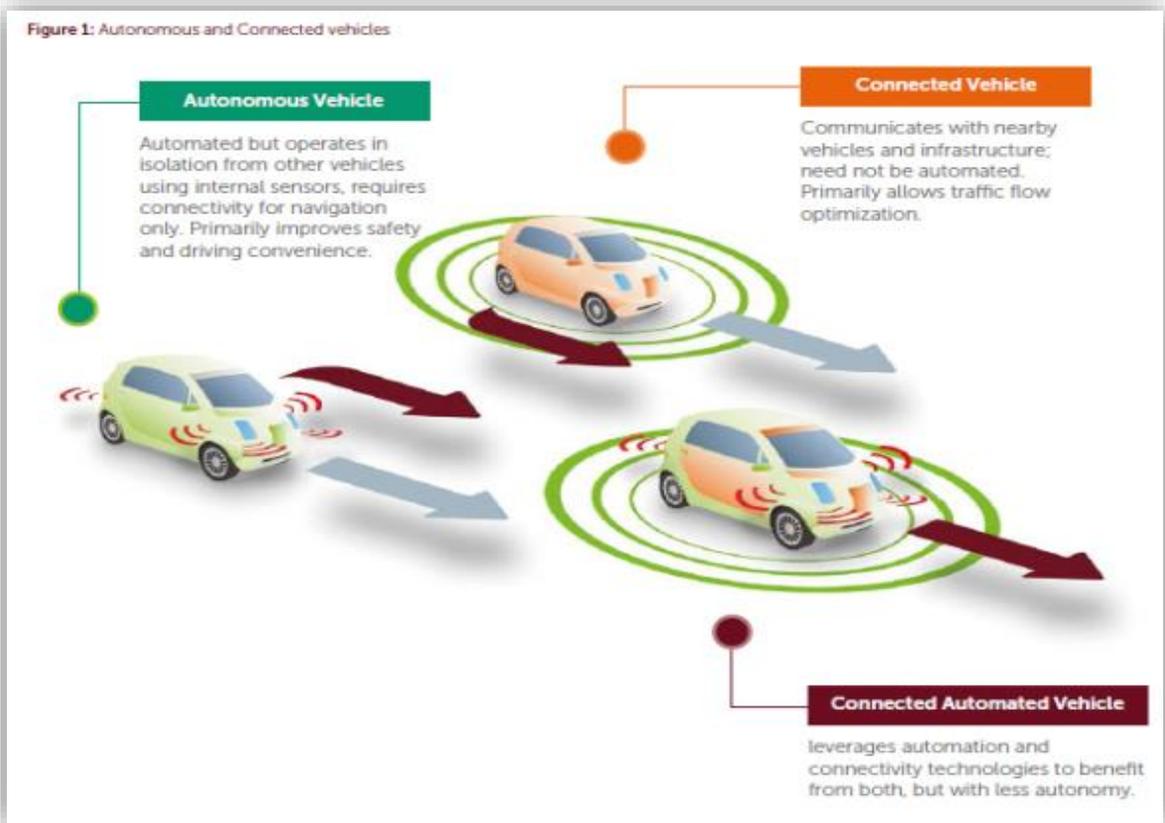
³ U.S. Department of Transportation, “[Automated Vehicles.](#)”

⁴ Further information on automated technology and their various functions can be found [here](#).

⁵ Automated vehicles that are capable of self-driving are often referred to as “fully automated” or “autonomous” vehicles. See the Society of Automotive Engineers International’s (SAE) nationally recognized [classification system](#) for a full breakdown of the different levels of automated vehicles.

When these automated driving systems are working properly, AVs are capable of avoiding mistakes caused by human error.

Many experts predict that automated vehicles will also integrate aspects of connected technology into their driving system (e.g. WiFi, 4G, and dedicated short range communication (DSRC) systems). Connected and automated vehicles (CAVs), as they are commonly referred to, do not operate in isolation of infrastructure and vehicles like AVs, but instead communicate with vehicles, infrastructure, and other connected devices. Experts believe that a combination of both technologies will allow for vehicles, and therefore cities and relevant stakeholders, to best capitalize on the many projected benefits of the two industries.



Benefits of Connected and Automated Vehicles

The potential benefits of AVs for municipalities are vast. These vehicles could significantly impact local safety, mobility, energy, and land use policies. The benefit of automated vehicles on these areas is discussed below.

Safety

According to the National Highway Traffic Safety Administration's (NHTSA) annual *Motor Vehicle Crash Overview*, there were 6,296,000 motor vehicle-related crashes in the United States during 2015, which resulted in 2,440,000 million injuries and 35,092 fatalities.⁶ Since 2005, an average of 5,808,272 motor vehicle-related accidents have occurred every year in the U.S., or approximately 15,913 accidents per day. Automated vehicles could provide municipalities with a long term, cost reducing safety solution.

AVs have the potential to significantly reduce the frequency of traffic-related accidents and deaths. The Insurance Institute for Highway Safety (IIHS) estimated that if all vehicles were equipped with collision and lane departure warning systems, sideview (blind spot) assist, and adaptive headlights, nearly one-third of crashes and fatalities could be prevented. Most automated vehicles are currently equipped with these systems. Additionally, other automated technologies currently being developed could further reduce crash and fatality rates by replacing human error with advanced self-driving systems. This is particularly true given that over 90% of motor-vehicle fatalities each year are due to human error.⁷

The reduction in motor vehicles accidents and fatalities could directly correlate to annual budget savings for local governments. Municipalities will have the ability to redirect funds and personnel to non-safety related priorities.

Mobility

In the United States, approximately one in every five persons, or more than 57 million individuals, has a disability. Of these 57 million disabled individuals, approximately 6 million have difficulty accessing the transportation that they require.⁸ This lack of access is not only a challenge for individuals with disabilities, but for the entirety of the non-driving community (e.g., the disabled, elderly, and youth under the age of 16). Nearly 16 million seniors age 65

⁶ National Highway Traffic Safety Administration (NHTSA), "[2015 Motor Vehicle Crashes: Overview.](#)"

⁷ U.S. Energy Information Administration, "[Study of the Potential Energy Consumption Impacts of Connected and Automated Vehicles.](#)"

⁸ Ruderman Family Foundation, "[Self-Driving Cars: The Impact on People with Disabilities.](#)"

and older live in communities where they lack access to transportation and this number could continue to rise as the aging population grows.⁹

Automated vehicles have the ability to substantially increase access and mobility options for the non-driving community and to provide them with benefits such as personal independence, reduction in social isolation, access to essential services, and growth in workforce and educational opportunities. Mitigating transportation related obstacles for individuals with disabilities would enable new employment opportunities for approximately 2 million individuals with disabilities, and save \$19 billion annually in healthcare expenditures from missed medical appointments. An influx in new jobs and healthcare savings, could result in an increase of city revenue.

Additionally, automated vehicles also possess the potential to increase mobility among the driving community by significantly reducing the time that drivers spend in traffic. Statistics show that drivers typically waste 5.5 billion hours in traffic each year, one-third of these hours due to vehicle accidents. AV technology could allow for individuals to reclaim lost driving hours and boost the Gross Domestic Product by over \$1 trillion.¹⁰

Energy

According to the U.S. Energy Information Administration's (EIA) *Study of the Potential Energy Consumption Impacts of Connected and Automated Vehicles*, AVs have the potential to improve energy use and environmental outcomes by reducing greenhouse gas (GHG) emissions. This report details several potential features that automated vehicles could incorporate in order to decrease overall energy consumption and GHG emissions:

- Eco-driving
- Crash avoidance and smoother traffic flow (roadway throughput)
- Platooning
- Vehicle lightweighting and right-sizing
- Powertrain electrification

⁹ New York Times, "[Self-Driving Cars Could be Boon for Aged, After Initial Hurdles.](#)"

¹⁰ More information can be found [here](#).

Experts predict that the most significant environmental impact of automated vehicles is due to the fact that they could be electric, zero emission vehicles. Although not all car companies are currently on board, General Motors and Tesla have already laid out clear plans for an all-electric automated vehicle future. “Zero emissions. Zero crashes. Zero congestion,” said GM CEO Mary Barra when discussing GM’s automated vehicle plan.¹¹

Automated vehicles could help California meet its GHG reduction goals for 2020 and 2030. The California Global Warming Solutions Act (Assembly Bill 32) set a target of reducing greenhouse gas emissions to 1990 levels by 2020, which equals about 431 million metric tons. In 2016, the Governor and the Legislature established a 2030 target of an additional reduction of 40 percent below 1990 emission levels.¹² Research shows that the transportation sector is one of the largest contributors to GHG emissions throughout the country, automated vehicles could significantly reduce their emissions and improve the quality of life and health for California residents. For cities the reduction of fossil fuel dependency would provide additional cost savings.

Land Use

Driving is the dominant mode of passenger travel in the United States. Yet, the typical automobile is parked on average for about 95% of its lifetime. As a result, a large portion of municipal land use is dedicated to parking. Experts predict that many of the first generation automated vehicles will not be privately owned, but instead use a shared service model. This could sharply reduce the parking needs of municipalities. Not all AVs would need to park; rather, they would simply travel to pick up the next passenger. Those vehicles that require parking, could be redirected to designated lots on the periphery of the city.

As a result, congestion could decrease and valued land would be made available for other development options such as housing, commercial, and recreation. Local economies would benefit from this transition in land use, as cities reprioritize their non-parking needs.

¹¹ General Motors, “[GM Outlines All-Electric Path to Zero Emissions.](#)”

¹² More information on California GHG reduction goals can be found [here](#).

Challenges with Connected and Automated Vehicles

Despite the data and statistics available highlighting the many benefits of AVs, potential challenges still exist. Cybersecurity, affordability, job loss, and the reduction of traditional revenue sources are issues that could arise with the development of these vehicles and technologies.

These vehicles will need access to networks that must be equipped to handle significant amounts of data, therefore safeguarding these networks is of utmost importance. The technology employed by AVs will constantly evolve; cybersecurity threats will present new challenges.

Affordability of automated vehicles is a topic that cities should monitor closely. General consensus among experts is that for the next one or two decades, automated vehicle ownership will remain unaffordable for most of the population due to the production and technology costs. As a result, the early use of AVs will likely focus on automated ride-hailing and shared vehicle services. This usage will spread the costs across multiple users. Cities must be prepared for continuous change.

The loss of jobs and traditional revenue sources are other important factors for cities to consider. According to research conducted by Goldman Sachs, the work force could see job loss at a rate of 25,000 a month, or 300,000 a year. The bulk of that loss, according to the report, will be truck, taxi, and public transit operators.¹³ This shift in employment presents cities with the challenging opportunity to rethink employment needs.

Traditional revenue sources could be impacted by automated vehicles due to the reduction of parking and traffic related revenue, major sources of income for municipal budgets. Cities must be prepared to develop new and creative revenue sources, capitalizing on the potential changes brought by AVs.

¹³ More information can be found [here](#).

Exhibit 8 Autonomous Vehicle Potential Benefits and Costs

Benefits	Costs/Problems
<p><i>Mobility for non-drivers.</i> Provide independent mobility for non-drivers, and therefore reduce the need for motorists to chauffeur non-drivers, and to subsidize public transit.</p>	<p><i>Increases costs.</i> Requires additional vehicle equipment and services, and possibly roadway infrastructure.</p>
<p><i>Reduced stress, and increased comfort and productivity.</i> Reduce the stress of driving and allow motorists to rest and work while traveling.</p>	<p><i>Additional risks.</i> May introduce new risks, such as system failures, be less safe under certain conditions, increase crash severity due to platooning and higher speeds, and encourage road users to take additional risks (offsetting behavior).</p>
<p><i>Reduced driver costs.</i> Reduce costs of paid drivers for taxis and commercial transport.</p>	<p><i>Reduced security and privacy.</i> May be used for criminal and terrorist activities (such as bomb delivery), vulnerable to information abuse (hacking), and features such as GPS tracking and data sharing may raise privacy concerns.</p>
<p><i>Increased safety.</i> May reduce accident risks and therefore crash costs and insurance premiums. May reduce high-risk driving, such as when impaired.</p>	<p><i>Induced vehicle travel and increased external costs.</i> By increasing travel convenience, autonomous vehicles may induce additional vehicle travel and sprawled development.</p>
<p><i>Increased road capacity, reduced costs.</i> May allow platooning (vehicle groups traveling close together), narrower lanes, and reduced intersection stops, reducing congestion and roadway costs.</p>	<p><i>Social equity concerns.</i> May have unfair impacts, for example, by reducing the convenience and safety of other modes.</p>
<p><i>Increase fuel efficiency and reduce pollution.</i> May increase fuel efficiency and reduce pollution emissions.</p>	<p><i>Reduced employment and business activity.</i> Jobs for drivers should decline.</p>
<p><i>Reduced parking costs.</i> Can drop off passengers and park away from destinations.</p>	<p><i>Reduced support for other solutions.</i> Optimistic predictions of autonomous vehicle benefits may discourage communities from implementing more cost-effective transport solutions such as better walking and public transit improvements, and other demand management strategies.</p>
<p><i>Supports vehicle sharing.</i> Could facilitate carsharing and ridesharing, helping to reduce total vehicle ownership, leveraging reductions in total vehicle travel.</p>	

Federal Legal Considerations

In 1966, the National Traffic and Motor Vehicle Safety Act authorized the U.S. Department of Transportation, through NHTSA, to issue federal motor vehicle safety standards for “motor vehicles” and “motor vehicle equipment.” Once NHTSA has adopted such a safety standard, the federal law preempts the states from adopting conflicting legislation or regulations. State and local government maintain regulatory primacy over the “driver,” whom they regulate through insurance rules, licensing, and common law tort guidelines. States and municipalities can likewise act if NHTSA has not yet adopted a safety standard. Automated vehicles disrupt this balance of power however, because vehicle hardware and software can now be programmed in advance to perform tasks formerly within the scope of the driver’s control. The distinction between “drivers” and “vehicles” is thereby blurred and so is the key distinction that has been used to allocate regulatory responsibility between states and the federal government for the past 50 years.

As a result, traditional roles that cities and states play in developing safety standards for their citizens are being called into question. The lack of clarity between these levels of government is leading to a policy disruption as automated vehicles do not fit neatly into a preexisting legislative or regulatory safety scheme used for other “motor vehicles”.

The H.R. 3388 SELF DRIVE Act and S.1885 AV START Act of 2017 are the first pieces of federal legislation introduced to provide a regulatory framework for AVs and cities should follow their development closely. Section 3 of the SELF DRIVE ACT states that “No State or political subdivision of a State may maintain, enforce, prescribe, or continue in effect any law or regulation regarding the design, construction, or performance of highly automated vehicles, automated driving systems, or components of automated driving systems unless such law or regulation is identical to a standard prescribed under this chapter.” Part A of Section 3 further clarifies that “Nothing in this subsection may be construed to prohibit a State or a political subdivision of a State from maintaining, enforcing, prescribing, or continuing in effect any law or regulation.... on the street within a State or political subdivision of a State... unless the law or regulation is an unreasonable restriction on the design, construction, or performance of highly automated vehicles, automated driving systems, or components of automated driving systems.”¹⁴

It is important that cities have a basic understanding of these sections because of their potential implications for the near future. Although H.R. 3388 is designed to promote innovation, it has the potential to undermine this goal by preempting any state or local government from adopting or enforcing “any law or regulation regarding the design, construction, or performance of highly automated vehicles, automated driving systems, or components of automated driving systems,”¹⁵ even in the absence of a federal motor vehicle safety standard. This preemption could create a safety gap that will persist for some time. The SELF DRIVE ACT would direct NHTSA to issue a final rule within two years. During this time, state and local government would be challenged to create policies that fill this regulatory void.

To date, despite possessing the sole authority to do so, NHTSA has not adopted any mandatory federal safety standards for AVs. Instead it has issued a series of voluntary policy guidance documents that lay out best practices for car manufacturers. Consequently, if the House legislation is enacted into federal law, AV manufacturers could continue to make use of city streets and public highways as their private laboratories without adequate safety

¹⁴ <https://www.congress.gov/bill/115th-congress/house-bill/3388>

¹⁵ <https://www.congress.gov/bill/115th-congress/house-bill/3388>

protections, as most recently seen in Florida and Arizona. Local governments will need to work with local, state, and federal agencies and stakeholders to assure that their interests are reflected in public policy. Fortunately, local governments still have time to play a role at the policy making table.

State Legislation

California Vehicle Code (CVC) Section 38750 grants the Department of Motor Vehicles (DMV) the power to adopt regulations governing both the testing and public use of autonomous vehicles on California roadways. Since adopting its first CAV regulations, the DMV has worked extensively to refine its connected and automated vehicle regulations, holding multiple public comment periods. The most current regulations became effective in April of 2018 and can be found [here](#).

Current state AV regulations which govern municipalities, potentially would need to adapt to the passage of federal legislation. Local governments will need to work with local, state, and federal agencies, legislatures, and stakeholders to insure that their interests are reflected in public policy.

Strategies and Policies for Automated Vehicles

The following recommendations are intended to help Orange County municipalities prepare for the arrival of automated vehicles in their communities. They focus on solutions that address the benefits, challenges, and legal issues detailed previously in this policy paper.

Recommendation 1: Policy Advocacy

As an immediate step, the Association of California Cities - Orange County (ACC-OC) will work with local cities, transit agencies, and other member agencies to address the potential problems in the currently proposed federal legislation. In order for the advocacy to succeed, it is vital that ACC-OC membership speak with a uniform voice. This will require a concrete plan of action. This plan of action should help shape new state and federal legislation and safety regulations by:

- 1) Ensuring that the traditional federal partnership with state and local governments continues.

- 2) Guaranteeing that federal legislation establishes limited federal preemption by prescribing specific policies to remain with state and local governments.
- 3) Reflecting the interests of ACC-OC members.

Recommendation 2: Update City General Plan

Currently, most Orange County cities do not mention automated vehicles as part of their general plan. To help address this gap, ACC-OC staff will work with cities to update their plan to include short and long term automated vehicle transportation goals. Together, ACC-OC staff and city planners will develop an individualized plan for each city that focuses on their societal, transportation, and economic needs as well as the needs of Orange County.

Recommendation 3: Infrastructure Inventory and Upgrades

Due to the technology of automated vehicles, their driving systems will continue to be reliant on municipal infrastructure in order to properly interpret their surroundings. ACC-OC staff will work with our local cities and the Orange County Transportation Agency (OCTA) to conduct a thorough infrastructure inventory and identify necessary transportation infrastructure upgrades. A simple yet effective and cost efficient short term solution for cities is to invest in signage and road marking improvements. Improving signage and markings will help automated vehicles achieve their potential safety benefits. Another short term solution is for municipalities to invest and work closely with OCTA to update their traffic signal control technologies. Upgrading to Advanced Traffic Controllers (ATCs) systems will provide cities the functionality and capabilities to support automated vehicles with connected features.

Recommendation 4: Partnerships and Funding

ACC-OC recognizes that many cities currently lack the resources, both funding and staffing, needed to invest in an automated vehicle future. ACC-OC staff will work with local, state, and federal agencies to address these shortages. Staff will analyze current measures, such as SB 1, as well as identifying new funding and partnership opportunities at the federal, state, and local level.

Conclusion

Automated vehicles pose a variety of challenges for cities due to the ambiguity of their technology and because long term planning must be built on uncertainty. However, AVs present local communities with a variety of benefits and opportunities; cities must get in front of this technology and make it an integral part of their future.

The Association is here to help our members meet the challenges and capture the benefits of this changing technology. With committee approval, ACC-OC will begin implementation of the four recommendations made in this policy paper.