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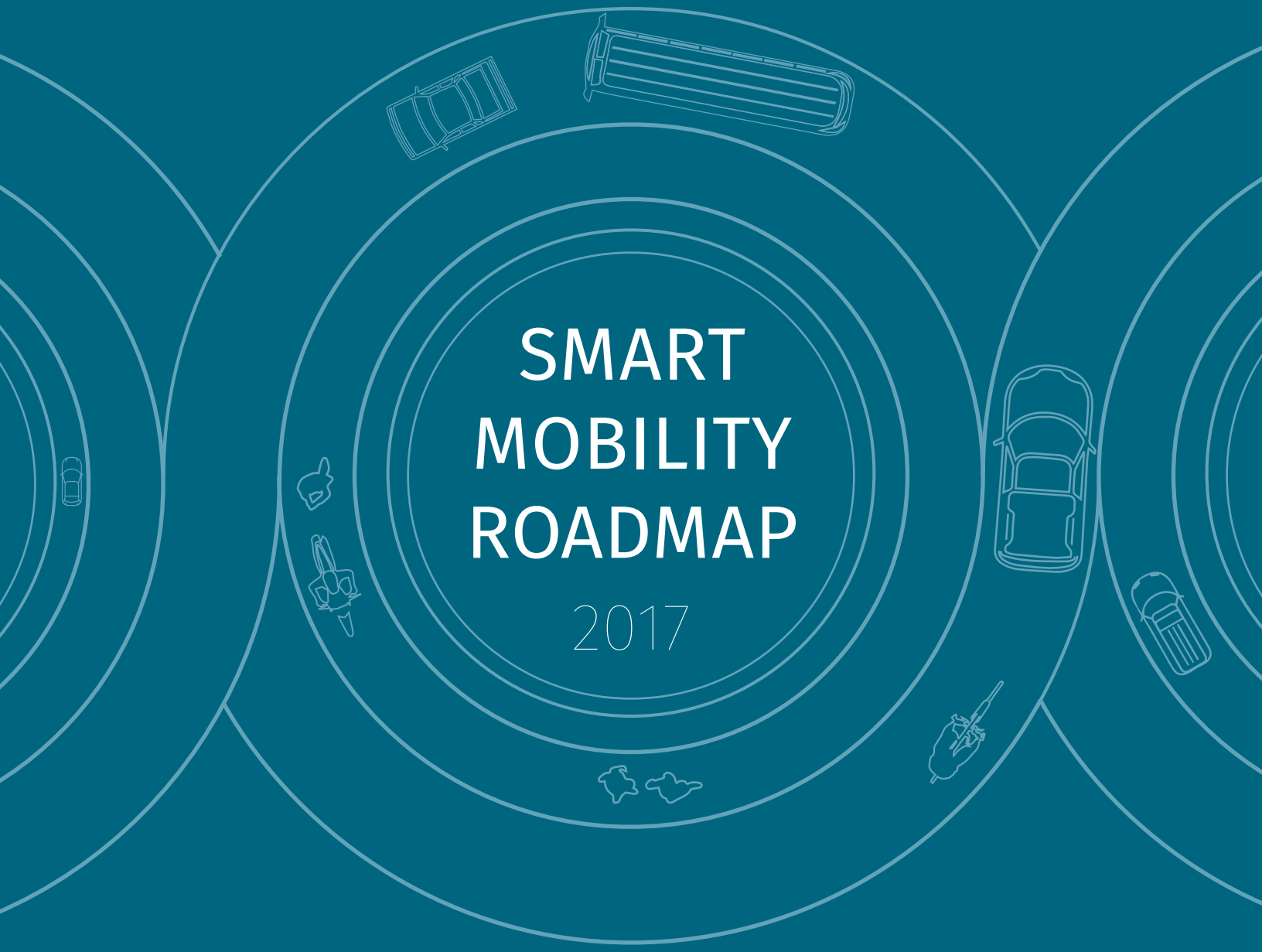


SMART MOBILITY ROADMAP

2017

AUSTIN'S APPROACH TO SHARED, ELECTRIC, AND AUTONOMOUS VEHICLE TECHNOLOGIES

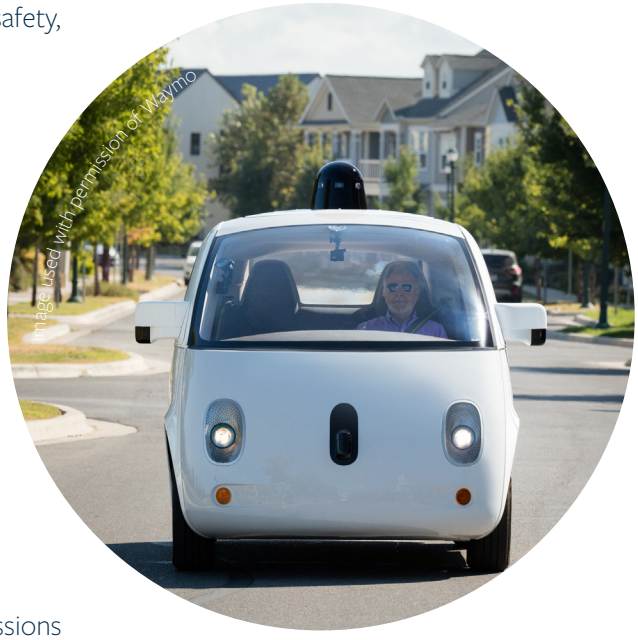
Austin, Texas

METRO

EXECUTIVE SUMMARY

Mobility in a community can be an economic driver or divider. It can facilitate commerce or create barriers to accessing the full opportunities of the workforce. As Austin's growth curve continues on a rapid trajectory, nearly doubling the population in the city and the Austin region over the next two decades, the mobility challenges of sprawl, congestion, lack of access, safety, affordability and more – will likely double too.

With rapidly emerging and disruptive technologies for shared, electric, and autonomous vehicles on the short-term horizon, Austin is at an inflection point to learn how to direct and harness the new technologies' best attributes and reduce the risks of an uncertain future. For example, the advent of autonomous or "self-driving" vehicles on the horizon may help with some aspects, like safety and convenience, but may negatively impact congestion levels if consumers choose to ride alone.



Above: A legally blind man serves as a passenger in an autonomous Google (now Waymo) car in Austin's Mueller neighborhood in 2015.

THE CONVERGENCE OF SHARED USE, ELECTRIC AND AUTONOMOUS VEHICLES

Shared, electric and autonomous vehicle technologies each offer their own sets of benefits and challenges. Electric vehicles will decrease emissions over existing gas-powered vehicles, while autonomous vehicles can increase safety and provide mobility solutions for seniors, the disabled and people without driver's licenses. However, autonomous vehicles also have the strong potential to increase single-occupancy vehicle use and significantly increase vehicle miles traveled on city roadways.

Pairing electric motors with autonomous vehicles can bring these environmental, safety and accessibility benefits together. The challenges lie in motivating consumer behavioral changes, when the financial and convenience aspects of shared, electric and autonomous vehicles meet or exceed current technologies.

The biggest game changer for mobility, however, is in shared-use mobility which allows options to travel without needing to own a vehicle. Shared-use mobility can reduce congestion, greenhouse gas emissions and household transportation costs, even without the benefit of electric and autonomous vehicles, offering a more immediate way to shape the future with affordable, accessible and equitable multimodal options.

The convergence of shared, electric and autonomous vehicle services can offer a lower cost, more efficient and accessible, less polluting and less congested transportation system. Therefore, this plan will seek to address the synergy to incorporate all three platforms – shared, electric and autonomous – into a comprehensive strategy.

FOCUS ON OUTCOMES

The Austin City Council and the Capital Metropolitan Transportation Authority (Capital Metro) Board of Directors each requested their organizations create a roadmap for achieving smart mobility technologies and services for the Austin region, with resolutions Resolution 20170302-39', AI-2017-463, respectively. Each

organization focused on the outcomes the technologies can provide to their constituents – such as safety, mobility, access, affordability and equity – versus the technologies alone. The City of Austin and Capital Metro staff, supported by numerous agencies and institutions, prepared this joint initial roadmap, which will be available for public comment before a final document will be proposed.

As a strategic roadmap, this document does not commit to specific budgets or metrics but serves as a vision and communications document to capture a wide variety of viewpoints into Austin's mobility future. This roadmap will be incorporated into the larger Austin Strategic Mobility Plan to be finalized and approved at a future date. Critical to the development of the broader Mobility Plan will be an extensive analysis of the resource requirements for implementation of this shared, electric and autonomous vehicle (e-av) Roadmap. Only with an understanding of those requirements can appropriate decisions about resource allocation, cost and project prioritization be made. Interim projects may be pursued through public–private pilots with little or no cost to the City or Capital Metro, or with specific authorization from City Council and Capital Metro for early projects or studies.

As such, the vision described in Imagine Austin, the City's comprehensive plan, was the starting point in developing this roadmap:

> "Austin is accessible. Our transportation network provides a wide variety of options that are efficient, reliable, and cost-effective to serve the diverse needs and capabilities of our citizens. Public and private sectors work together to improve our air quality and reduce congestion in acollaborative and creative manner."[2]
>
> - Imagine Austin

This shared, electric and autonomous vehicle roadmap is the start of a community discussion about the emerging mobility opportunities within the Austin region. That dialogue will be coordinated with the Austin Strategic Mobility Plan, Capital Metro's Project Connec, and will be shared with the Capital Area Metropolitan Planning Organization (CAMPO) for broader regional context.

Pilots, policies and programs are called out that may jump-start this vision, while continued in-depth planning and integration into the Austin Strategic Mobility Plan is needed to shape the opportunities ahead. The roadmap will evolve as the technologies and policies that it discusses continue to develop and are analyzed for their ability to support and accelerate our community's preferred mobility outcomes.

Today, the City of Austin is already home to some of the most advanced autonomous mobility testing. Google X chose Austin as its second city, after its home town of Mountainview, California to deploy its autonomous vehicles. Continuing a proactive and deliberate approach to these new mobility capabilities will ensure a future that is equitable, affordable, prosperous and data-driven.

The City of Austin and Capital Metro's Smart Mobility Roadmap encompasses five key areas:

- Shared-Use Mobility
- Electric Vehicles and Infrastructure
- Autonomous Vehicles
- Data and Technology, and
- Land Use and Infrastructure

The first section of this roadmap will provide insight into each of these areas as well as the convergence of technology. It also discusses national efforts related to shared, electric and autonomous mobility.

The second section looks at how this technology will affect Austin, through the lenses of equity, affordability and safety. Economic impacts and workforce implications are also investigated, especially as they relate to autonomous vehicles.

The final section encompasses the nuts and bolts of the roadmap, discussing the current Council and Board resolutions and initiatives. It uses historical data from Austin and other cities on how executing a plan like this relates to project and operational resources.

SHARED-USE MOBILITY

Shared-Use Mobility encompasses transportation services that are shared among users, including public transit; taxis and limos; bikesharing; carsharing (round-trip, one-way and personal vehicle sharing); ridesharing (car-pooling, van-pooling); ridesourcing/ ride-splitting; scooter sharing; shuttle services; neighborhood jitneys; and commercial delivery vehicles providing flexible goods movement.[3] It is the use of any combination of shared mobility services, above, that have the effect of improving options to travel without a vehicle.

Image used with permission of Chariot, a division of Ford Smart Mobility.

Promoting shared-use practices now will have immediate benefits of taking drivers off the road and reducing the congestion, greenhouse gas emissions and household transportation costs, even without the benefit of electric and autonomous vehicles, offering a more immediate way to shape the future with affordable, accessible and equitable multimodal options. Cultivating shared mobility practices now is important to start the behavioral shift towards a shared, electric autonomous vehicle future.

Shared-use vehicle technology is already here and is rapidly advancing. Using public transportation service as the backbone of the transportation network, shared services can provide first and last mile options; or multi-passenger "micro-transit" options operated in areas where high-capacity transit is not feasible. The alternative, less desirable scenario—is one of individually owned and operated electric autonomous vehicles.

ELECTRIC VEHICLES AND INFRASTRUCTURE

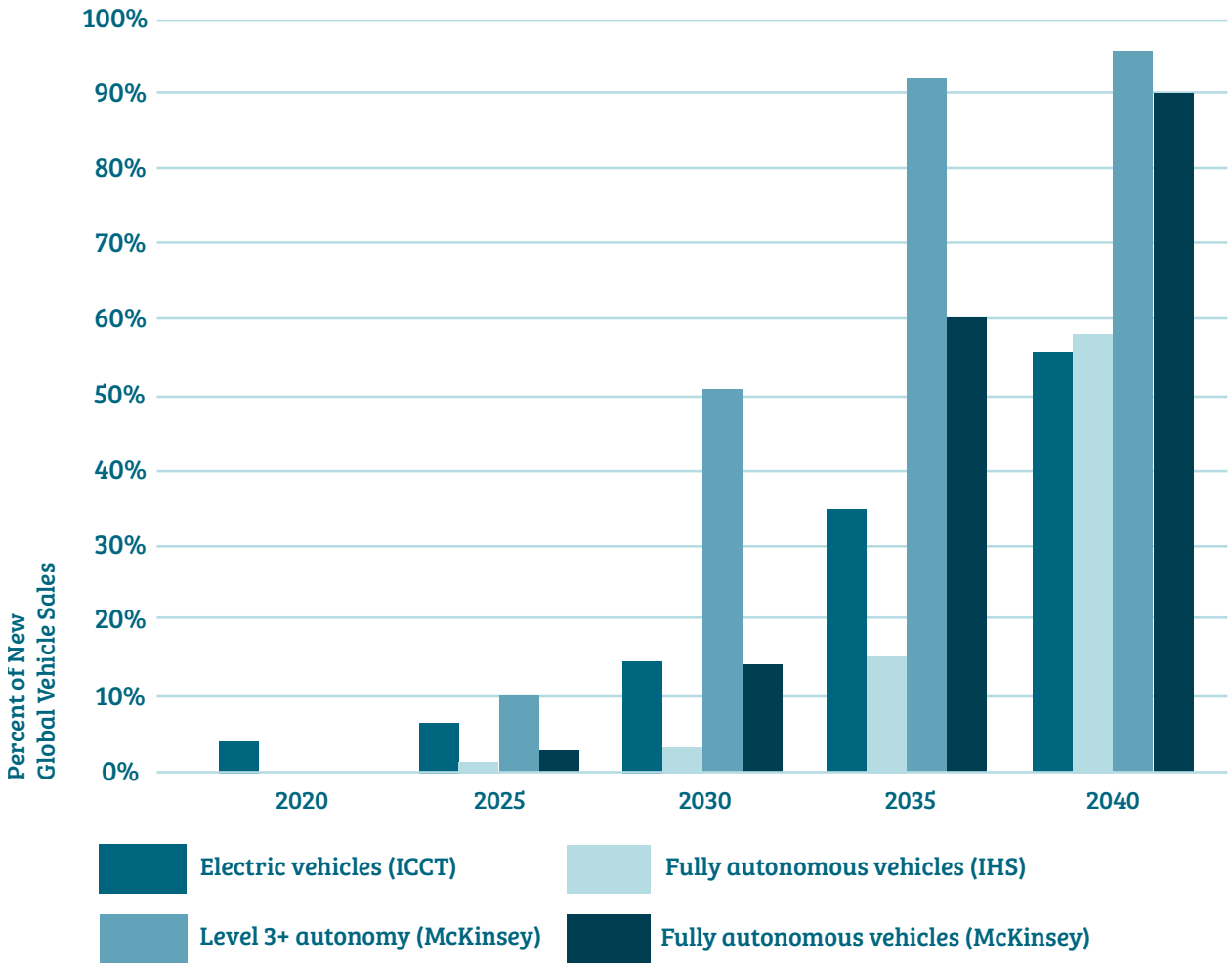
Currently in the Austin area there are approximately 4,000 EVs that represent approximately 22 percent of the Texas EV market and a 55 percent annual EV growth rate over the last three years.[4] Global EV projections vary widely with some of the more aggressive models predicting EVs overtaking internal

> "Shared-use mobility, from bike-sharing to ride-sourcing, car-sharing and public transit is part of a 'seismic shift' in mobile technology and changes in travel behavior, that is altering our transportation landscape."
>
> - Sharon Feigon, executive director of the Shared-Use Mobility Center, a national clearinghouse for mobility research and policy development

combustion sales by as early as 2038. But regardless of source, each major model does predict a continued growth curve in EV sales.[5] The rate of adoption is important because the increased deployment of electric vehicles in lieu of internal combustion engine (ICE) technology is an important strategy to reduce emissions, total cost of ownership and energy usage in the transportation sector.

But the pairing of electric motors and autonomous vehicles is not a given.[6] In order for Austin to help accelerate EV adoption on a wider consumer scale beyond fleets, incentives and innovative policies to purchase and drive EVs will need to be complemented with increased electric charging infrastructure.

Projections of Electric, Semi-Autonomous and Fully Autonomous Vehicle Sales



Graphic recreated with permission, from "New Mobility: Today's Technology and Policy Landscape," July 2017, International Council on Clean Transportation.

AUTONOMOUS VEHICLES

How quickly fully autonomous, or self-driving, vehicles are on our streets is widely debated amongst experts, with predictions ranging from 15 to 50 percent of sales by 2030. There is consensus that fleet services will be the first to use autonomous vehicles because of their ability to use the vehicle for longer periods to offset the higher technology-rich vehicle price. Expect to see semi- and fully autonomous vehicle fleet services as early as 2025.[7]

There will be numerous pilots, testing and controlled environment uses for AVs in the coming decade. Policies and actions, such as dedicated lanes, data collection and analysis, and human-centered engineering approaches will need to be considered so that semi- and fully automated cars can safely co-exist with human-driven vehicles in the interim period of 10 plus years.

The University of Texas and other research organizations have begun framing the types and magnitude of changes that will impact society due to the wide availability of AVs. From this research, various themes for further analysis are worth noting, including[8]:

- Expanded mobility options for all,
- Opportunities for system capacity gains,
- Opportunities for data-driven development,
- Potential increase in vehicle miles traveled,
- A potential threat to the viability of traditional transit services, due to the affordability and convenience that will likely accompany autonomous ridesourcing,
- A significant increase in roadway safety, with a corresponding reduction in crashes,
- An extended adoption period in which there will be mixed traffic (AVs and human-driven vehicles), lasting decades, due to the disruptive nature of new technologies, and
- Significant economic and social changes

DATA AND TECHNOLOGY

To manage transportation for specific access, mobility, affordability, safety and emission outcomes, city and regional partners need to rely on current, live, reliable data—the kind of data and analysis that we often lack today. The data of tomorrow for shared, electric and autonomous vehicles will be even more sophisticated, elaborate, voluminous and complicated.

Cities are starting to collect and manage data from a wide variety of sources including connected Dedicated Short Range Communications (DSRC) infrastructure, bluetooth and smart phone data, along with a host of new sensors that can measure air quality to road temperatures and conditions and more. Expansion of DSRC or 5G technology could be the connective tissue that delivers smart mobility, linking shared/EV/AV vehicle information to the infrastructure and to the cloud.

LAND USE AND INFRASTRUCTURE

From a land use perspective, autonomous vehicles have the potential to encourage individuals and households to move further away from the city center under the assumption that long drive times can be used for work or entertainment purposes. If those same vehicles were electric, it may reduce emissions, but not the area's congestion problem. To get ahead of this issue, the City of Austin will need the bold land use policies prescribed in the City's Imagine Austin comprehensive plan to be adopted into the CodeNEXT regulatory document that will encourage densification and discourage single-occupancy commuting options.

To achieve the maximum benefit of the emerging technologies and outcomes such as mobility, affordability, access and more, the City of Austin should pursue a collaborative process across disciplines, city, and regional partner systems. The City also plans to engage the public as Austin moves forward with various pilots and strategies to ensure that the community's needs are met.

While the price of this technology may reduce costs for personal mobility, autonomous vehicles will have an impact on city and agency budgets in significant ways. Examples of possible impacts and the opportunities to explore new revenue sources are discussed later in this document.

SHARED, ELECTRIC, AND AUTONOMOUS ROADMAP RECOMMENDATIONS

Shared-Use Mobility Services

RECOMMENDED ACTIONS:

1. Engage citizens, businesses and visitors on how this technology can meet their needs and address community issues
2. Incentivize alternative means of transportation
3. Provide on-demand service—accessed via smartphone app or call
4. Seek regional recognition of registered private mass transit vanpool/shuttle operators to access regional toll lanes for free
5. Expand bikeshare system(s); Launch shared e-bike system
6. Launch an electric scooter shared system
7. Develop a report card that requires an annual assessment of progress on action items
8. Test various first/last mile solutions with public and private transportation providers
9. Develop and promote a comprehensive Shared-Use Mobility Plan
10. Create multi-modal mobility hubs adjacent to transit stops to offer a variety of first-and last-mile options
11. Encourage public and private operators to accept pay-as-you-go cards
12. Pair regional park-and-ride lots with regular and on-demand shuttle service to major employment areas
13. Explore downtown transit "ride free" zone or shuttle route to encourage driverless commutes
14. Pursue regional integrated multi-modal transportation and payment platform, including cell phone app and integrated payment method

Autonomous Vehicles

RECOMMENDED ACTIONS:

1. Engage citizens, businesses and visitors on how this technology can meet their needs and address community issues
2. Hire an Executive level Officer of EV/AV Transportation
3. Develop a Master Plan roadmap for emerging electric – connected and autonomous vehicle (E-CAV) technologies
4. Create an interdisciplinary AV Work Group
5. Create an infrastructure task force to examine electric, technology and land use infrastructure requirements
6. Test Dedicated Short Range Communication (DSRC) technology for vehicle to infrastructure (V2I) reciprocal safety messages
7. Test 5G technology for vehicle to infrastructure (V2I) reciprocal safety messages; compare to DSRC
8. Increase public awareness of electric autonomous (E-AV) shuttles in various Austin locations through EV/AV pilots
9. Increase public awareness of last mile E-AV delivery robots
10. Establish an EV/AV Commercialization Opportunities/ Economic Development Work Group
11. Create Shared/EV/AV focused team
12. Increase public awareness of electric and autonomous vehicle benefits
13. Create a regional New Mobility Workforce Training task force for new job training and educational opportunities for those with legacy occupations

Electric Vehicles and Infrastructure

RECOMMENDED ACTIONS:

1. Engage citizens, businesses and visitors on how this technology can meet their needs and address community issues
2. Launch electric technology demonstrations; (See the Shared Mobility Recommendations section)
3. Adopt buy/lease "Electric First" or "Zero Emission" policy for all City fleet vehicles unless business case or technology limitations preclude early adoption
4. Deploy shared-electric mobility and charging infrastructure to include low income neighborhoods
5. Increase public awareness of EV benefits
6. Deploy 'smart' public, private and fleet charging infrastructure
7. Expand rapid charging station on-street network; Examine free parking options for EVs
8. Create electric vehicle-for-hire priority access incentives for Austin-Bergstrom International Airport (ABIA)
9. Conduct vehicle managed charge and grid integration pilots

Land Use and Infrastructure

RECOMMENDED ACTIONS:

1. Engage citizens, businesses and visitors on how this technology can meet their needs and address community issues
2. Allow reduced or zero parking requirements with TDM, on-site access to shared mobility guarantees
3. Establish market-based performance pricing for parking
4. Allow for shared parking between businesses
5. Enhance compact and connected land use along key urban transit/travel corridors and transit oriented developments using E-AVs
6. Create policies to actively manage the curb space on public streets
7. Unbundle parking costs from city building leases and purchases
8. Encourage adaptable parking garages for future re-use as residential buildings, office spaces and retail spaces
9. Implement building codes to support EV-ready and EV infrastructure requirements

Data and Technology

RECOMMENDED ACTIONS:

1. Promote community dialogue, public engagement and education on data and mobility innovations
2. Invest in and leverage technology to improve mobility through open data; Support traffic "Data Rodeo" collaboration
3. Promote public-private data partnerships for transportation information to optimize mobility options; Support Austin CityUP and community data hack-a-thons
4. Create a data analysis contract and grow internal capability
5. Examine kiosk technology for multi-modal transportation information; Wi-Fi access
6. Create "One System" regional integrated approach to traffic operations
7. Equip City fleet with DSRC technology and/or other vehicle sensors
8. Develop a technology-driven universal way-finding system to optimize parking assets and manage congestion
9. Reexamine curb and parking technology applications to actively manage use of curbs
10. Reexamine right of way technology applications to actively manage use of right of way