

# AUTOMATED, CONNECTED, & ELECTRIC VEHICLES

As technology evolves, it changes the way we live, work, learn, play, and move. Automated, connected, and electric vehicle technologies have the potential to be as transformative as the internet or cell phones, and they may be closer to reality than you think. Even when only a small portion of Central Floridians have adopted these technologies, travel patterns around the region could dramatically change. These technologies will change how and when we travel, improve safety and mobility, and reduce transportation's impact on the environment.

These technologies will also come with new challenges, including cybersecurity threats, the need for substantial capital and operating investments, and a re-evaluation of current transportation funding sources. Equity will be a critical consideration as these new technologies are deployed. With effective planning and policy guidelines, these technologies can be used to mitigate some of today's equity issues.

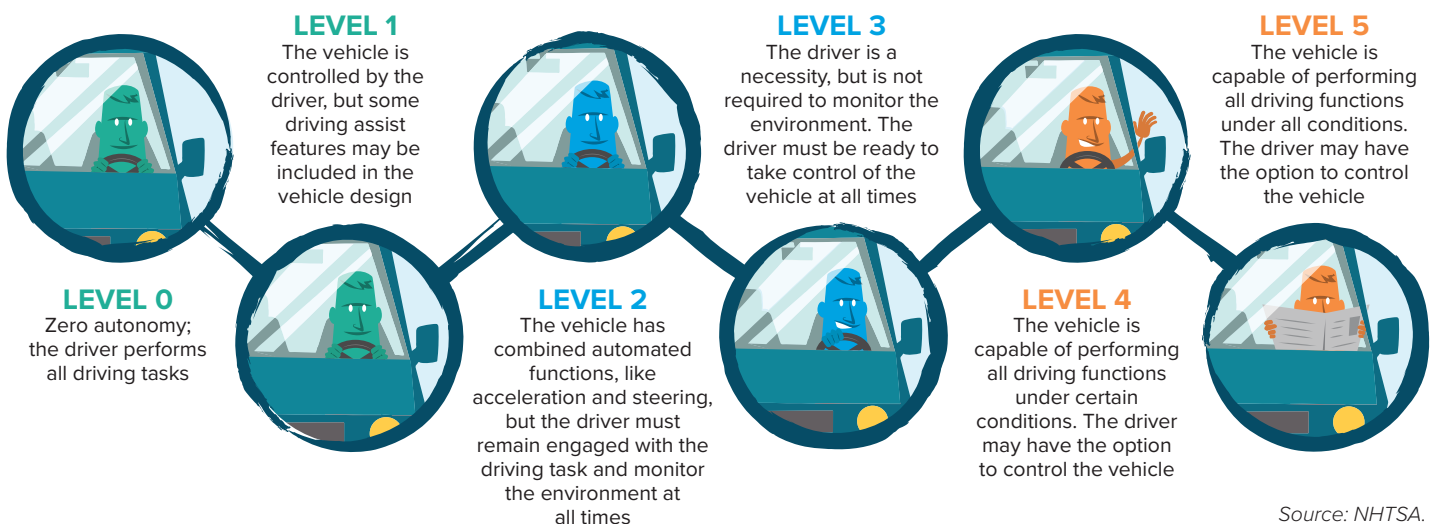
Without careful consideration, equity issues could get worse. Transportation users without access to a cell phone or users without a bank account may not be able to easily access these new transportation options. With focused planning and policy, outreach and education, and research and development, Central Florida can be a leader in the development and implementation of these technologies.

# AUTOMATED VEHICLES

## BACKGROUND

An automated vehicle (AV), also referred to as a self-driving or driverless vehicle or driverless or automated driving system (ADS), is simply that, a vehicle with the capability of driving itself with little or no human intervention. To be considered an AV, the vehicle must use information obtained via sensors to make its own judgments and take action in a driving environment. AVs also have some aspect of a safety-critical function and have the potential to increase transportation safety, making it easier to safely get from Point A to Point B. AV technology can also streamline transit service making it possible to increase network coverage.

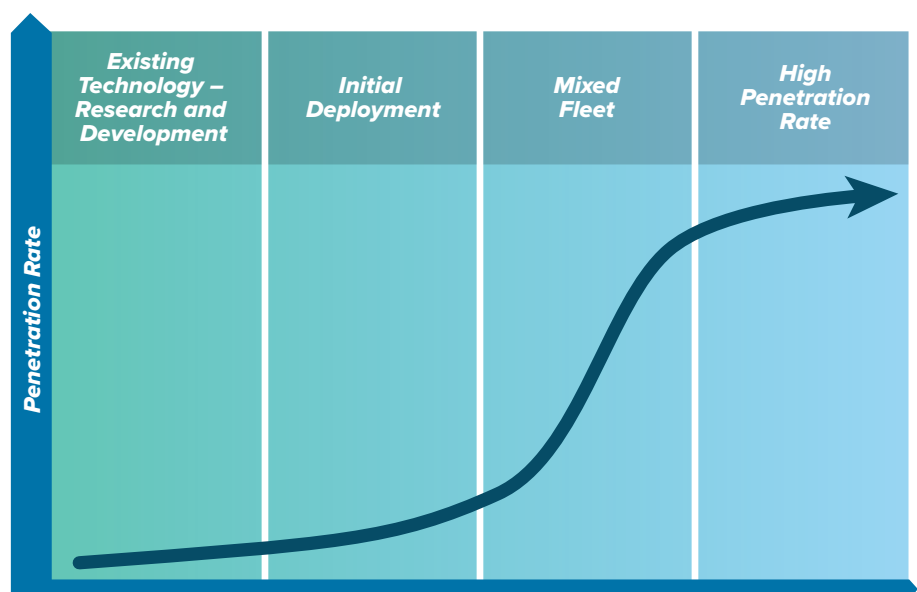
Many vehicles in the market today already include some level of automation, such as adaptive cruise control, lane-keeping assistance, and parking assist, with more features rolling out on Central Florida's roadways every year.



Source: NHTSA.

## TRENDS

Most people want to know exactly when AVs will be on our roads in significant numbers, but the answer is complicated. Today, AVs for the most part are in research and deployment, with some initial features on the market. We expect initial deployment to become more widespread in the coming years, followed by a long period in which a mixed fleet of vehicles with different technology levels share the roads. Experts provide a wide range of estimates for AV adoption rates – as much as 90% of new vehicle sales – any where between 2040 and 2060. Most experts agree that freight vehicles will likely be early adopters of AV technology to help alleviate driver shortages and allow for round-the-clock driving.



Source: Cambridge Systematics, Inc.



## POTENTIAL IMPLICATIONS FOR...

### CENTRAL FLORIDIANS

- They tell me my chances of being involved in a crash or crash-related delays will decrease significantly but I am still a little nervous about giving up control of my own car.
- I can spend more time working, socializing, or relaxing during my morning commute and could have more flexibility in where I live.
- I thought giving up my car keys meant giving up my freedom – but my new automated vehicle subscription service gets me to the doctors, shopping, and lunch with friends whenever I need a ride.
- I can take an automated shuttle from the airport directly to my hotel and rely on automated vehicle subscriptions to get to and from dinner every night.
- I miss seeing my neighborhood delivery driver but I have to admit, the driverless truck full of packages and drones that deliver boxes directly to my doorstep are pretty cool.

### LOCAL GOVERNMENTS

- We need to ensure the safety of Central Floridians along every step of technology advancement.
- We should invest in helping roadways and transit systems prepare for new technologies. Even the lower-cost investments in signals and pavement markings are critical for AV deployment.
- We need to evaluate our existing driving codes and regulations, including parking requirements, to ensure they allow for effective AV deployment.

### METROPLAN ORLANDO

As the regional transportation planning agency, MetroPlan Orlando can:

- Track, monitor, and report on the number and type of AVs on Central Florida's transportation system.
- Encourage consideration of AV impacts in long range plans, foster collaboration, and build expertise in AV technologies in Central Florida.
- Evaluate the need for truck parking and staging areas to support automated truck activity and identify key locations that support a broader automated freight network.
- Help build policy and procedures to guide local governments and partner agencies in planning for AVs.
- Develop and promote educational programs for key stakeholders and community partners on the trends, opportunities, and challenges related to AV technology.

## AV PILOT PROJECT

Driverless shuttles, which operate at maximum speeds of 25 mph and typically have a capacity of 8-10 people, are being piloted in neighborhoods throughout the country.

The Lake Nona shuttles, operated by Beep, run seven days a week across five routes on public roads. All routes connect to the key destinations within the community such as the Town Center, Orlando VA Medical Center, medical campuses, and residential areas. Since the launch of its first route in September, 2019, Beep has experienced high rider adoption while safely transporting tens of thousands of passengers with thousands of hours of operations.

Source: Beep - <https://ridebeep.com/wp-content/uploads/2021/05/Case-Study-FINAL-Lake-Nona.pdf>



## AUTOMATED FREIGHT

The trucking industry may be the first to implement fleets of fully autonomous vehicles, at least for their long haul segments. Unlike passenger vehicles, freight vehicles are more likely to follow a fixed route and spend as much time as possible on interstate highways and expressways, which are more predictable and easier to navigate than surface streets. While the technology to automate truck movements is the same as in passenger vehicles (onboard computers, sensors, communication devices), automated trucks need to have sensors calibrated for their operation (e.g., monitor conditions farther in advance to accommodate longer stopping distances). Perhaps most importantly, automated trucks will help mitigate the ongoing truck driver shortage and improve safety on the roadway.

# CONNECTED VEHICLES

## BACKGROUND

A connected vehicle (CV) is a vehicle that is equipped with some sort of wireless communication device that allows it to share information with other vehicles and objects on the roadway. CV technologies enable various types of vehicles, roadway infrastructure, mobile devices, and other objects to communicate quickly to share vital information. CV technologies enable vehicles to communicate with infrastructure (vehicle-to-infrastructure, or V2I), between vehicles (vehicle-to-vehicle, or V2V), and with other objects on the roadway such as bicycles, pedestrians, or obstacles (vehicle-to-everything, or V2X). Some CV technologies are already widely available, like real-time traffic notifications in navigation apps, while others, like notifications that a pedestrian is in an upcoming crosswalk, will require more infrastructure investments.

### VEHICLE-TO-VEHICLE (V2V)

e.g., Emergency vehicle approaching

### VEHICLE-TO-INFRASTRUCTURE

e.g., Traffic signal ahead turning red



## TRENDS

Connectivity is rapidly becoming standard on new vehicles as drivers demand more safety features and carmakers respond to government safety regulations. Advanced Driver-Assistance Systems (ADAS) like lane-keeping assist, automatic emergency braking, and adaptive cruise control are all examples of connected vehicle technologies that can help improve safety. In fact, connected car penetration exceeded 80% of new vehicles in 2018.<sup>1</sup> Wireless connectivity (aided by 5G development) is spreading, enabling CVs to deliver more value to drivers.



<sup>1</sup> Markets and Markets, Connected Car Market, 2020.

## POTENTIAL IMPLICATIONS FOR...

### CENTRAL FLORIDIANS

I was skeptical when they said my commute was going to get better but the new technology that indicates when I should change lanes or take an alternate route has made such a difference, even during rush hour.

I love that my car knows when a lane is blocked or when there is going to be construction on my route and automatically shows me a faster option.

I was so glad my vehicle warned me about the pedestrian in the crosswalk at night.

### LOCAL GOVERNMENTS

Technology has helped to streamline travel on state roads but we need to figure out where we are going to get the money to fund the technology infrastructure necessary to improve performance on our local roads.

### METROPLAN ORLANDO

As the regional transportation planning agency, MetroPlan Orlando can:

Help identify the technology and infrastructure investments that will stand the test of time.

Spearhead the shift from physical capacity investments to roadside technology improvements that improve efficiency.

Help develop policies and procedures to guide partner agencies preparing to support CV.

Develop and promote educational programs for key stakeholders and community partners on the trends, opportunities, and challenges related to CV technology.

Establish a clear delineation of state, local, and agency-specific regulatory, deployment, and legislative roles in order to foster uniform collaboration and achieve CV policy objectives at all levels.

## INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

Intelligent Transportation Systems (ITS) and Transportation Systems Management and Operations (TSMO) programs integrate advanced information and communication technologies into transportation and traffic management systems to optimize the mobility and reliability of existing systems with limited resources. ITS devices, such as traffic signals that adjust timing based on traffic volumes and dynamic message signs, improve safety and mobility by leveraging technology to get more out of our roads. While ITS and TSMO concepts and tools are not new, they are becoming consistently more refined and powerful, and state-of-the-art deployments have demonstrated additional capabilities that were not possible even just a few years ago. The impact of some ITS tools is currently dependent on driver response; they will only get more powerful as more connected and automated vehicle technology hits the road.



## CV PILOT PROJECT

The Tampa Hillsborough Expressway Authority (THEA) Connected Vehicle Pilot has equipped buses, streetcars, and hundreds of privately owned vehicles with technology that enables them to communicate with each other and with elements of the transportation infrastructure. Equipment in the vehicles alerts drivers to emergency braking ahead, warns them of the need to decelerate before the end of ramps, warns them about the potential for forward collisions, and identifies when pedestrians are in crosswalks. The technology also enables signal priority for transit vehicles and alerts drivers to wrong-way entry onto expressway ramps. During the pilot, alerts warned 14 wrong-way drivers, helped drivers avoid 9 potential trolley crashes, and gave approximately 1,500-speed advisories per month on expressway exit ramps.



# ELECTRIC VEHICLES

## BACKGROUND

Electric Vehicles (EV) also are changing the way we travel. There are many kinds of electric vehicles – two important kinds to be aware of are Battery Electric Vehicles (BEV) and Plug-In Hybrid Electric Vehicles (PHEV). A BEV relies on battery-only propulsion with no internal combustion engine backup and has up to 400 miles in range depending on the make and model of the vehicle, like the Tesla Model 3. PHEVs (or “hybrids”) have a relatively short range on a full battery (about 40 miles), after which the internal combustion engine engages, like the Toyota Prius. PHEV range is based on a combination of battery and motor fuel.

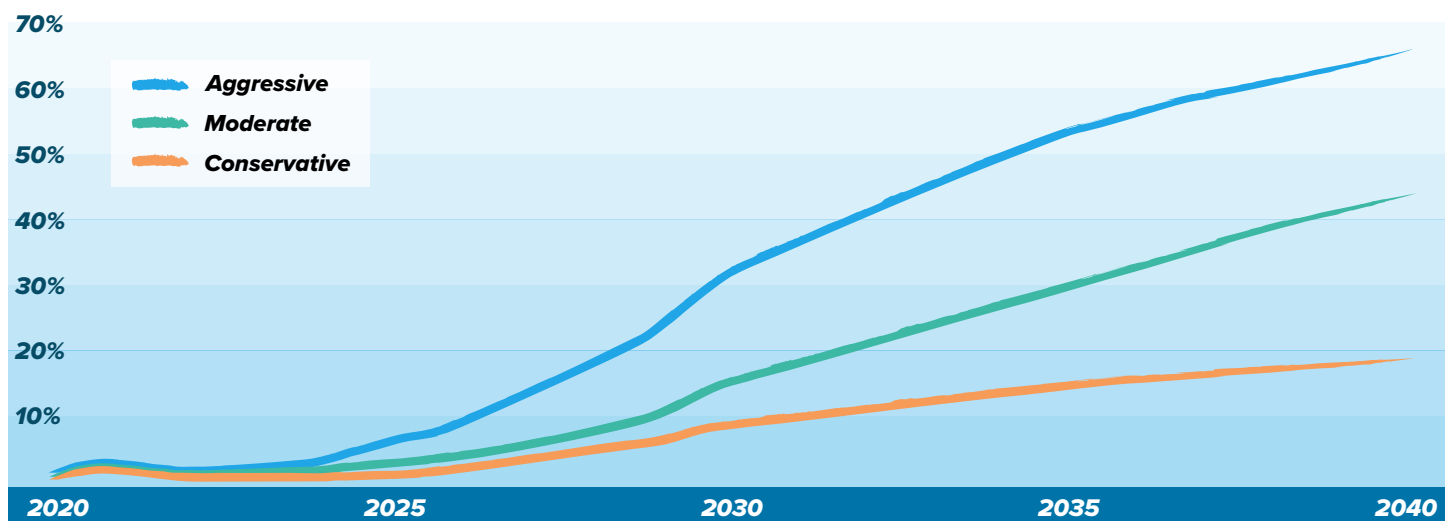
EV sales are growing, but lack of easily accessible charging stations, especially for long-distance trips, and the relatively high cost of EVs are barriers to broader adoption. Widespread adoption of EVs could lead to a dramatic decrease in greenhouse gas emissions and air quality pollutants based on the charging power source (e.g., fossil fuel, solar, wind). Increasing the energy diversity for transportation can also reduce the over-reliance on specific energy sources and create a more stable energy market.

## TRENDS

The market for EVs has been growing in the U.S. and overseas, with a marked increase in sales starting in 2017. California has by far the largest annual sales percentage with EVs accounting for over 6% of all vehicles sold in 2020. Several other states have reached annual EV sales percentages of 3% to 4%. The U.S. national average has increased slowly and is now just under 2% of annual vehicle sales, with Florida just below the national average.

A primary indicator used to monitor societal preference, and ultimately market adoption, is the percent of new EVs sold compared to all new car sales. The graph below shows EV sales forecasts specific to Florida.

### ELECTRIC VEHICLE SALES FORECASTS (2020-2040)



Source: FDOT Electric Vehicles Infrastructure Master Plan.



## POTENTIAL IMPLICATIONS FOR...

### CENTRAL FLORIDIANS

It is becoming easier and more convenient to operate and own or lease electric vehicles for personal travel, and I've been saving a lot on gas.

Even though I live downtown and the streets are always busy, there is hardly any traffic noise. I certainly don't miss the smell of vehicle exhaust while I'm waiting to cross the street.

I would consider buying an electric vehicle but there are no charging stations near my office or apartment building.

My service dog keeps me in check but it is still a little unnerving to not hear these quiet electric vehicles until they are right next to me.

### LOCAL GOVERNMENTS

We need to identify mobility hubs as we are planning and locating electric vehicle charging stations for both passenger and freight vehicles.

We need to consider revisions to our municipal codes to ensure buildings have enough charging stations to support our community.

We need to ensure there are enough charging stations to support evacuation in case of an emergency.

We need to ensure the utility grid has capacity to handle the vehicle charging network.

### METROPLAN ORLANDO

As the regional transportation planning agency, MetroPlan Orlando can:

Proactively identify key locations or gaps for electric vehicle charging infrastructure investments.

Conduct electric vehicle charging station pilots and integrate best practices, including equity considerations into the planning processes.

Evaluate the impacts of reduced vehicle emissions on air quality.

Develop and promote educational programs for key stakeholders and community partners on the trends, opportunities, and challenges related to EV technology.

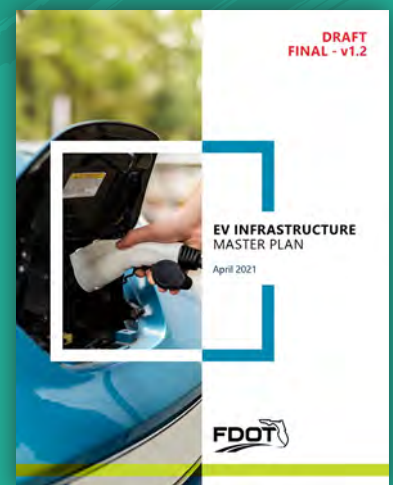
## ELECTRIC VEHICLE IMPACTS ON TRANSPORTATION FUNDING

EVs will have a substantial impact on Florida's transportation funding. Currently, motor fuel taxes make up a significant portion of the funding used for transportation improvements at the federal, state, and local levels. The growing number of EVs on Florida's roadways combined with more fuel efficient vehicles will lead to reduced revenues if current funding policies remain. Electric vehicles are heavier than internal combustion vehicles, meaning they will wear roadways faster, requiring more frequent maintenance.. Projections suggest state revenue losses could range from 8 to 30% by 2040 based on rate of adoption.



## FLORIDA ELECTRIC VEHICLE INFRASTRUCTURE MASTER PLAN

The Florida Department of Transportation (FDOT) developed the Florida Electric Vehicle Infrastructure Master Plan (EVMP) to guide the development of the electric vehicle charging infrastructure on the State Highway System. The primary goals of the EVMP are to support short- and long-range electric vehicle travel, encourage the expansion and use of electric vehicles in the state, and ensure adequate charging infrastructure on state evacuation routes.



COMMUNICATE

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[www.metroplanorlando.org](http://www.metroplanorlando.org)

MetroPlan Orlando is in a position to help Central Florida prepare for the impacts of automated, connected, and electric vehicle technologies. MetroPlan Orlando is committed to:

- Evaluating the capabilities of these technologies.
- Identifying and understanding the challenges and tradeoffs associated with these technologies.
- Promoting sensitive data and information are secure.
- Supporting equitable access to new and emerging transportation solutions for all residents, visitors, and businesses.
- Building partnerships, both public and private to help Central Florida embrace these technologies.

**For more information, visit:**

[MetroPlan Orlando CAV Readiness Study](#)

[FDOT Electric Vehicles Infrastructure Master Plan](#)

[FDOT Guidance for Assessing Planning Impacts of Automated, Connected, Electric, and Shared-Use Vehicles](#)

[FDOT CAV Business Plan](#)

[CUTR Autonomous Vehicle and Alternative Fuel Vehicle Florida Market Penetration Rate and VMT Assessment Study](#)

[NHTSA Automated Driving Systems](#)

[USDOT Automated Vehicles](#)

[ITS America](#)