ORLANDO'S 2030
ELECTRIC MOBILITY ROADMAP

CITY OF ORLANDO

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A LETTER FROM MAYOR DYER

Dear Community Members,

As our residents', commuters', and visitors' travel preferences evolve alongside a rapidly changing marketplace, opportunities to advance widespread community benefits are emerging through the electrification of all types of vehicles. As electric vehicles, buses, bicycles, and trucks become more available and affordable, we have the opportunity to transform our transportation landscape to achieve ambitious goals in climate change mitigation, air quality improvement, and equitable access to mobility. We have convened the Orlando E-Mobility Task Force to drive our community towards those goals.

Our 2018 Community Action Plan established foundational goals to shift our reliance towards multimodal transportation options like biking, carpooling, and mass transit while reducing our emissions by moving away from fossil fuels and single-occupancy vehicle use. The Orlando E-Mobility Roadmap seeks to build on that vision in collaboration with key transportation stakeholders in greater Orlando, and to develop more in-depth and robust strategies to accelerate adoption of electric mobility.

We have already made great progress in collaboration with countless critical partners by installing 100 public EV charging stations, adding electric vehicles to our city fleet, launching an Electrified Dealerships program, electrifying the downtown LYMMO bus service, and adopting an EV Readiness code. With the unified vision in this roadmap, we can go further to ensure that Orlando is ready for the future of mobility and pursues a just transition in which everyone experiences the benefits that electric mobility options can bring to our community. Thank you for your support—and let's continue striving to become the most sustainable city in the nation while ensuring we forge an equitable path along the way.

Sincerely,

Buddy Dyer
Mayor
City of Orlando

EXECUTIVE SUMMARY

In 2021, the City of Orlando organized an E-Mobility Task Force, composed of transportation stakeholders from government, utilities, transit authorities, and others, which convened over the course of six months to create this roadmap — a unified vision of how mobility will transform in Orlando by 2030 and beyond. This roadmap provides a snapshot of the status of mobility in greater Orlando today, the long-term transportation plans in place, initiatives underway, and community-perceived barriers to ideal mobility faced today.

TASK FORCE VISION STATEMENT:

"By 2030, we aim to create mobility opportunities that embrace emerging technologies, reduce emissions that harm public health, bolster climate change resilience, and increase access and affordability for our disadvantaged communities."

The Task Force identified four overarching goals and assigned targets and indicators that will serve to measure progress. It also workshopped a variety of strategies under each goal and prioritized the most attainable and impactful ones, described below. This list is not intended to limit pursuit of new opportunities that arise, but to coordinate and focus the efforts of Task Force partners to drive progress forward.

As part of the implementation process, the Task Force concluded that quarterly convenings were essential to effectively coordinate efforts. To monitor progress and drive meaningful impact, the Task Force will create progress reports every other year based on the indicators and targets. Finally, as the community and the mobility marketplace continue to evolve, the Orlando E-Mobility Roadmap will be updated every five years.

GOAL	TARGETS/INDICATORS	STRATEGIES
1. Provide equitable and affordable access to e-mobility	• 100% of Orlando residents live within 10-minute walk of a Level 2 public charging station or 10-minute drive of a DCFC by 2030 • Proportion of e-mobility adoption and use by demographics match city demographics (race, income) by 2030 • 100% of disadvantaged communities are served by electric buses by 2030	• Develop robust, ongoing engagement, feedback, and evaluation with disadvantaged communities to guide e-mobility initiatives, including EV charger siting and micromobility strategies • Conduct outreach and education with disadvantaged communities through trusted messengers on the full spectrum of e-mobility benefits and receive input on tailoring e-mobility policy and programs
2. Accelerate EV adoption in multiple transportation sectors	• 30% of all light-duty registered vehicles in Orlando are electric by 2030, and 80% by 2050 • City and Orlando Utilities Commission (OUC) establish 100% light-duty fleet procurement policy by 2025; perform a medium- and heavy-duty transition analysis by 2025 • 30% of goods deliveries are zero emission by 2030	• Establish an EV bulk purchase program • Create a fleet electrification plan and procurement policy designed to reach targets • Offer technical assistance to electrify fleets, with a focus on supporting fleets that work with disadvantaged communities • Develop program to support used EV adoption that includes incentives and financing and targets low- and moderate-income residents • Pilot freight electrification program in partnership with OUC and a company with an ambitious electrification commitment • Create an e-mobility education and experience center • Establish a portion of driver's ed curriculum on EVs • Explore introducing zero-emission zones for deliveries or all trips in select locations

GOAL	TARGETS/INDICATORS	STRATEGIES
3. Develop a robust charging ecosystem	• City has 1,400 Level 2 public ports and 250 DCFC public ports by 2030 • City has 200 city-owned Level 2 public ports and 40 DCFC public ports by 2030	• Pass EV Readiness land development code to increase current and future charging access in multifamily and commercial (nonresidential) properties • Establish coordinated funding and financing strategy for EV charging, including by pursuing grants, forming public–private partnerships, collecting revenue, etc. • Expand solar charging canopies to additional city facilities for fleet, employee, and public charging • Expand OUC EV fast-charging hub pilot to reach eight total hubs • Pilot EV charging station incentive programs for new and existing low- and moderate-income multifamily housing • Expand "Right to Charge" legislation to include rental properties • Launch equitable workforce development program to support EV charging installation certification • Pilot managed charging and charging plus storage with commercial fleets • Incentivize new development to include e-mobility access (EV charging, EV car sharing, e-bike sharing or charging, etc.) • Partner with business community networks and leaders to educate about and encourage workplace charging
4. Advance multimodal e-mobility options	• Transit and school bus fleets are all-electric by 2040 • 75% of commute trips are zero emission (walking, biking, electrified transit or shared mobility, EV, or avoided) by 2030	• Pursue additional charging hubs in partnership with LYNX, OUC, and others with DCFC, micromobility charging, and other technologies, with an emphasis on underserved communities • Partner with Orange County Public Schools (OCPS) and LYNX to support electrification of school and transit bus fleets, prioritizing deployment in disadvantaged communities • Pilot a low- and moderate-income car-sharing or other electrified shared mobility service • Support development of integrated apps / platforms to enable more seamless use of multiple modes and charging options and inclusive payment methods by encouraging open data standards and utilization of the FDOT SunStore • Work with the city's for-hire vehicle permitting and local companies to support acceleration of electrified ride hailing and electrification of other for-hire vehicles, such as taxis, limos, and shuttles • Pilot e-bike incentive program for low- and moderate-income residents • Pilot e-cargo bikes for deliveries in areas experiencing delivery congestion • Convert rail transit and freight to all-electric

Table ES1. Summary of the Orlando E-Mobility Task Force goals, targets, indicators, and strategies.

ACKNOWLEDGMENTS

Thank you to the following companies and organizations for contributing to the development of this roadmap:

Central Florida Clean Cities Coalition

Central Florida Expressway Authority (CFX)

Central Florida Transportation Authority (LYNX)

City of Orlando

CHISPA Florida Conservation Voters

Delivery Associates

Drive Electric Florida

Duke Energy

Electrification Coalition

EV Transports

EVHybridNoire

MetroPlan Orlando

Natural Resources Defense Council (NRDC)

NovaCharge

Orange County Government

Orlando Utilities Commission (OUC)

Southern Alliance for Clean Energy (SACE)

University of Central Florida (UCF)/ Florida Solar Energy Center (FSEC) Energy Research Center

A special thanks to the Bloomberg Philanthropies American Cities Climate Challenge for supporting this effort and to NRDC, EVHybridNoire and Delivery Associates for facilitating the E-Mobility Task Force workshop series.

KEY TERMS AND DEFINITIONS[1]

Alternative Fuels Data Center (AFDC): An organization that provides information, data, and tools to help fleets and other transportation decision makers find ways to reach their energy and economic goals through the use of alternative and renewable fuels, advanced vehicles, and other fuel-saving measures.

Electric Vehicle (EV): A vehicle powered by one or more electric motors that can be plugged in (both PHEVs and BEVs). EVs plug into off-board sources of electricity and store the energy in a battery.

Internal Combustion Engine (ICE) Vehicle: A vehicle with an engine that generates mechanical power by burning a liquid or gaseous fuel (i.e., most conventional gasoline and diesel vehicles).

Hybrid Electric Vehicle (HEV): A vehicle powered by a traditional gasoline or diesel ICE and by one or more electric motors that use energy stored in a battery. The battery is charged by the ICE and through regenerative braking. The vehicle cannot be plugged in to charge.

Plug-in Hybrid Electric Vehicle (PHEV): A vehicle that is like an HEV but has a larger battery that allows it to travel on electricity alone. The battery can be charged by plugging into an electric power source, through regenerative braking, and by the ICE. PHEVs don't have to be plugged in before driving. They can be fueled solely with gasoline, like an HEV.

Battery Electric Vehicle (BEV): A vehicle that runs on electricity alone. It is powered by one or more electric motors that use the energy stored in a battery (larger than the batteries in an HEV or PHEV). BEV batteries are charged by plugging the vehicle into an electric power source and through regenerative braking.

Electric Vehicle Supply Equipment (EVSE): The hardware, including connectors, fixtures, devices, and other components, required to charge an electric vehicle.

EV Charging Port: A single plug or outlet that can charge an EV. Some EV charging stations have multiple ports per station (e.g., dual-port stations are common), enabling multiple vehicles to charge at a time.

Level 1 EVSE: Alternating current (AC) equipment (often referred to simply as Level 1) that provides charging through a 120- volt (V) AC plug and can add 2 to 5 miles of range per hour of charging. Most, if not all, EVs come equipped with a Level 1 charger.

Level 2 EVSE: AC equipment that offers charging through 240-V (typical in residential applications) or 208-V (typical in commercial applications) electrical service and can add 10 to 20 miles of range per hour of charging. This charging option can operate at up to 80 amps and 19.2 kW. However, most Level 2 equipment operates at lower power (e.g., 30 amps), delivering 7.2 kW of power. As of 2020, more than 80% of public ports in the United States were Level 2.

Direct Current Fast Charging (DCFC): Charging equipment (typically 208/480 V AC three-phase input) that enables rapid charging, adding 60 to 80 miles of range per 20 minutes of charging. As of 2020, more than 15% of charging outlets in the United States were DC fast chargers. There are three types of DC fast charging systems, depending on the type of charge port on the vehicle: SAE Combined Charging System (CCS), CHAdeMO, and Tesla.

EV Capable: Equipped with electrical panel capacity and conduit enabling future planned EV parking spaces (a requirement for a certain percentage of spaces built in new construction under an EV ready ordinance).

Electric Vehicle Supply Equipment (EVSE) Installed: Installed EV charging stations in new parking spaces rated at a minimum of 32 amp, 7.2 kW (a requirement for a certain percentage of spaces built in new construction under an EV ready ordinance).

Disadvantaged Communities: Communities that experience disproportionately high and adverse economic, human health, climate-related, environmental, and other cumulative impacts.

Electric Vehicle Training Program (EVITP): A program that provides comprehensive training for the installation of EVSE equipment in North America. "EVITP offers a full overview of the Electric Vehicle industry including an extensive section on Customer Relations & Customer Satisfaction."

Transport network companies (TNCs): Providers of on-demand transportation services for passengers, such as Uber and Lyft; also known as ride-hailing companies.

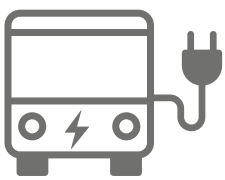
INTRODUCTION

ELECTRIC MOBILITY OVERVIEW

Electric-powered mobility has become an increasingly viable and beneficial strategy to reduce emissions from the transportation sector thanks to technological advancements, declining battery costs, and cleaner electricity generation nationwide. It also provides additional benefits including direct economic savings for drivers, improved public health, and reduced noise pollution. In 2017, transportation surpassed the power (electricity) sector to become the largest contributor of greenhouse gas (GHG) emissions in the United States. This means that decarbonizing transportation systems will be critical to achieving GHG reduction goals necessary to mitigate the harmful impacts of climate change.[2]

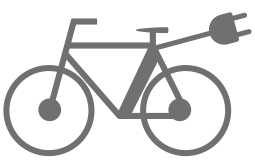
The advancement and adoption of electric mobility has become the prominent strategy to decarbonize transportation. For the purposes of this roadmap, electric mobility refers to the movement of people or goods by any vehicle powered by electricity via a battery charged by plugging into the grid. Practically speaking, this includes everything from electric buses and trucks to electric personal vehicles, scooters, and bicycles. The widespread adoption of these options presents complex challenges for cities, states, and regions and requires coordination among multiple stakeholders.

ELECTRIC TRUCKS



ELECTRIC BUSES

ELECTRIC CARS



ELECTRIC BIKES

ELECTRIC SCOOTERS

BENEFITS OF ELECTRIC MOBILITY

The adoption of electric mobility offers numerous benefits to communities, including:

REDUCED GREENHOUSE GAS EMISSIONS: Total life cycle greenhouse gas emissions (including manufacturing) are substantially lower for EVs than for vehicles with internal combustion engines (ICE).[3] During the use-phase, which excludes manufacturing and disposal, in Florida's current (2020) electricity grid mix, EVs emit 63% less GHGs per mile.[4] Additionally, by the mile shared scooters produce half as many grams of greenhouse gas as cars.[5] As the grid continues to become cleaner with more electricity generated by renewable sources, the upstream GHG emissions from electricity generation will continue to decrease.

IMPROVED AIR QUALITY AND PUBLIC HEALTH: ICE vehicles are a major cause of air pollution in Orange County, contributing 85% of carbon monoxide (CO) emissions and 73% of nitrogen oxide (NOx), which are precursors to ozone.[6] Air pollution directly impacts human health and often affects vulnerable racial and socioeconomic groups disproportionately.[7] With zero tailpipe air pollutant emissions and lower life cycle emissions, EV adoption will improve local air quality and reduce the negative health impacts in communities suffering the most from transportation-related emissions. Another zero-emission transportation option, the e-bike, can improve cardiorespiratory fitness in physically inactive individuals.[8]

FINANCIAL SAVINGS FOR CONSUMERS: E-bikes increase the range of miles a person can travel on a bicycle. While more than conventional bicycles, the upfront and maintenance costs of an e-bike are a fraction of those for ICE vehicles and EVs. E-bikes offer a viable and affordable commute option for people traveling 10 or less miles to work each way. Charging an electric vehicle in Florida costs only $1.08 per "e-gallon," compared with the equivalent $2.83 for a gallon of gas, representing savings of more than 60%.[9] With fewer moving parts, electric vehicles also incur lower maintenance costs — typically half that of conventional vehicle upkeep, saving consumers approximately $4,600 in maintenance alone over the life of a vehicle.[10] While electric vehicles are still often more expensive upfront than conventional vehicles, analysts expect upfront costs of EVs to drop below those of traditional vehicles by the middle of this decade.[11] An electric vehicle cost-benefit analysis for Florida estimates that a scenario of high EV adoption would save drivers $84.5 billion cumulatively by 2050 in vehicle operating costs.[12]

ECONOMIC AND WORKFORCE DEVELOPMENT: In addition to providing direct cost savings to EV drivers, EV adoption offers financial benefits to all electric utility customers due to greater utilization of the grid during off-peak hours and increased utility revenues from charging. By 2050, it's estimated that electric utility customers statewide in Florida would save $21.7 billion in reduced rates in a high-EV-adoption scenario.[13] Relying on locally generated electricity, EVs keep more money in the local economy, producing greater economic impact: analyses in other states have shown that EV adoption can result in up to 25 new jobs in the local economy for every 1,000 EVs on the road.[14] The transition to electric mobility also provides opportunities to add new high-quality jobs in the industry directly, from vehicle manufacturing and maintenance to EV charging installation. For every $1 billion spent on charging infrastructure, analysts estimate 10,000–15,000 jobs will be created.[15]

RESILIENCE AND EMERGENCY PREPAREDNESS: EVs have the potential to play an important role in grid stabilization, such as by offloading stored energy back to a home or the grid during peak demand times. They can also provide emergency power during blackouts caused by weather or other disruptive events. For example, the upcoming Ford F-150 Lightning will be able to power an average home for up to three days using the electricity stored in the vehicle's battery pack. EVs by their nature can also be easily relocated where power is needed most. This dynamic charge and offload process can have a negative impact on a battery's capacity and longevity, but as battery technology has continued to improve, this effect is shrinking. EV chargers placed along evacuation routes also improve preparedness in the event of a natural disaster; the strategic leveraging of access to chargers will be critical for residents needing to move or evacuate areas within or near Orlando.

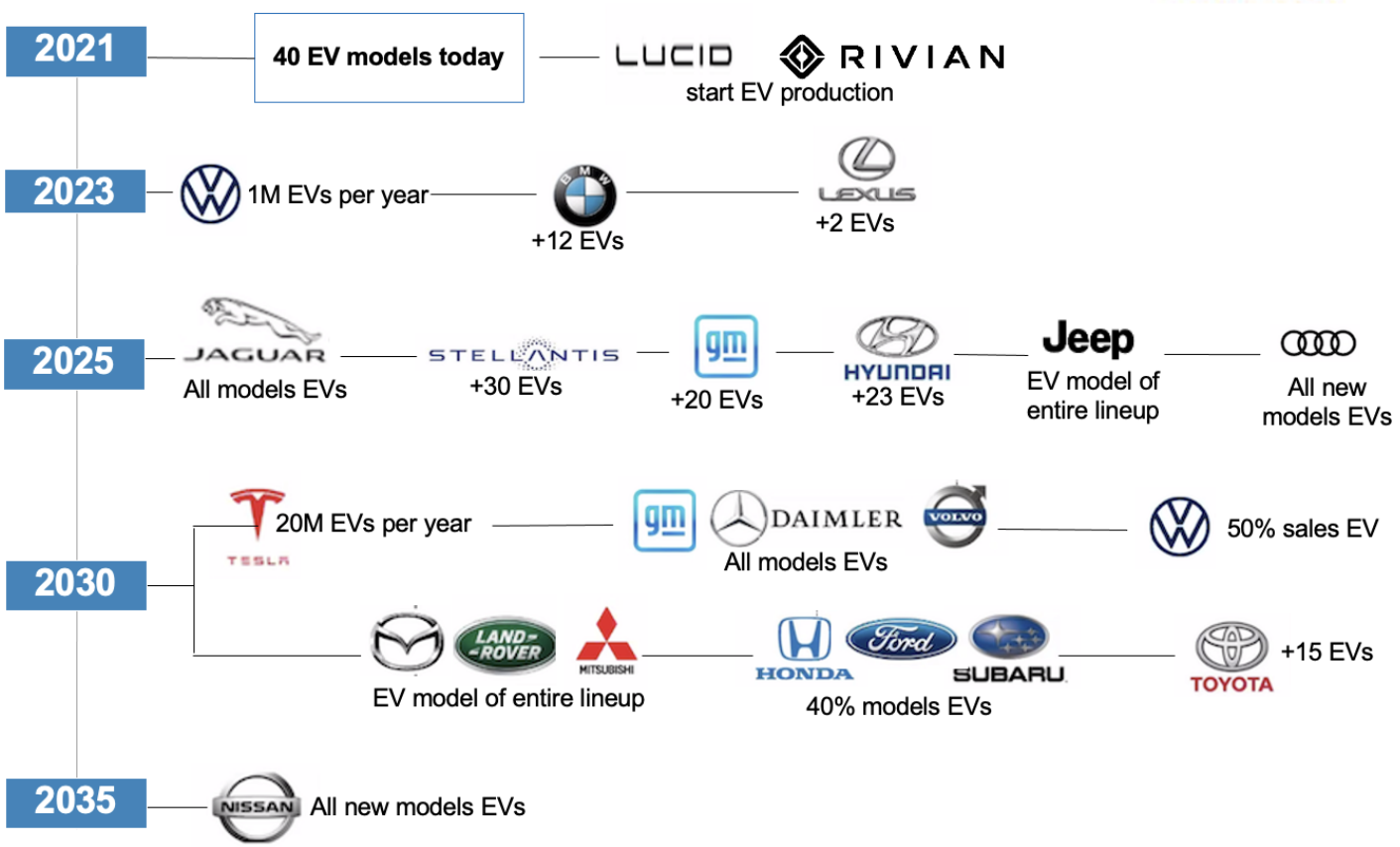
TRENDS IN ELECTRIC MOBILITY

As technology improves, governments implement policies, and industry actors invest, electric mobility adoption is growing quickly and is poised for rapid acceleration in this decade and beyond. Some of the key trends driving the transition to electric mobility include:

COST REDUCTIONS: Battery costs, a key driver in the increased price for electric vehicles, have declined 97% since EVs were introduced commercially in 1991, and analysts anticipate these costs will continue to go down over this decade.[16] Combined with economies of scale from increased production and other factors, this should bring electric vehicle costs to parity with conventional vehicles for certain model types by the middle of this decade, analysts say.[17]

INDUSTRY INVESTMENTS AND COMMITMENTS: Automakers are investing substantial amounts in research and development and marketing of electric vehicles, and are making bold commitments to electrify their models, further spurred by President Biden's executive order setting a goal for 50% of new vehicle sales to be zero-emission by 2030.[18] Companies are also investing in e-bikes and scooters, such as BMW's iVision AMBY or VW's folding electric bike.

BMW's electric bicycle. Source: BMW Group



Automaker commitments to electrification as of August 2021.[19]

SOME HIGHLIGHTS:

- General Motors plans to electrify 40% of its vehicle models by 2025, and 100% of them by 2035. It also plans to invest $35 billion in EV R&D by 2025.
- Ford is aiming for all electric sales in Europe by 2030 and plans to invest $22 billion in EV R&D. In May 2021 it unveiled an electric pickup, the Ford 150 Lightning, which will be available to consumers in 2022.
- Honda has set a goal for 100% of its global sales to be electric by 2040.[20]

TECHNOLOGY IMPROVEMENTS: Electric vehicle range increased, on average, more than 130% between 2011 and 2019 for certain EV models, and analysts expect ongoing improvements.[21] At the same time, charging speeds for EV charging stations have been increasing both for Level 2 and DC fast charging stations, enhancing convenience for consumers. In micromobility, technology improvements are improving rider experience – such as integrated helmet systems, smart torque and acceleration, and learning modes for new riders.

VEHICLE MODEL AVAILABILITY: In 2020, 48 electric vehicle models were available for sale in the United States, and 100 more are expected by 2024, including in popular vehicle classes like SUVs and pickups.[22] In other sectors, electric transit buses and vans, school buses, and trucks of various models are becoming more commercially available, and affordable electric bikes, cargo bikes, and scooters are also becoming more widespread. Additionally, used electric vehicles are becoming increasingly available at affordable prices, as low as $6,000 in many communities.

Driven by the developments above, as well as by policy efforts on the part of cities, states, and utilities, passenger electric vehicle adoption is increasing rapidly nationwide: year over year sales were up 43% in January 2021 and are expected to continue climbing rapidly this decade.[23] Demand has also been accelerating for e-bikes: in 2020, e-bike sales were up around 100% over the previous year.[24]

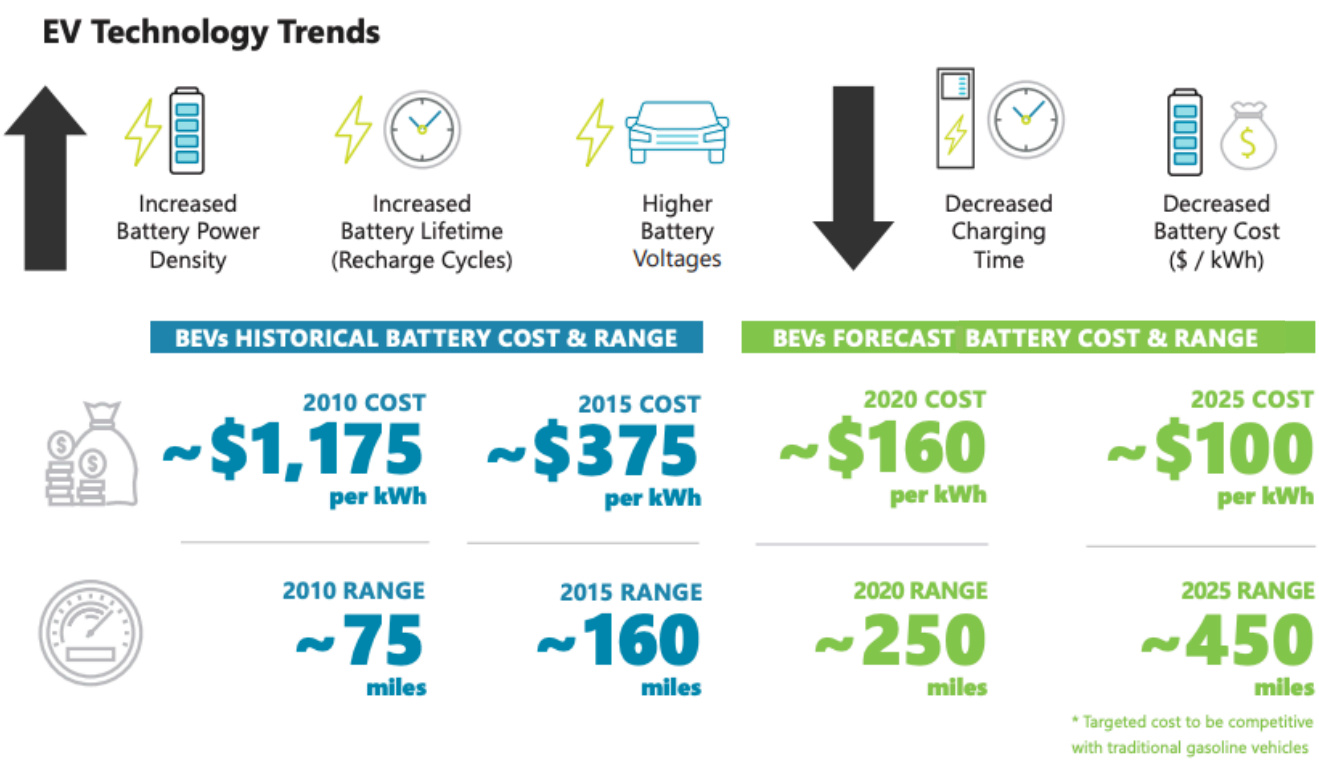


Figure 2: EV technology and cost trends [25]

BARRIERS TO WIDESPREAD ELECTRIC MOBILITY ADOPTION IN ORLANDO

The following table highlights key barriers both to equitable mobility broadly and to acceleration of electric mobility adoption specifically. It is informed by research on electric mobility barriers nationwide and by key informant interviews conducted in Orlando by EVHybridNoire.

DEPENDENCE ON A PERSONAL VEHICLE

Stakeholders cited a lack of reliability and quality service as barriers to greater use of public transit and shared mobility options in the Orlando area, leading to dependence on more costly personal vehicles.

"I've lived in other places where ground transportation was great. You didn't even really need a car to go to work or to get around, but here if you don't have an automobile, it poses problems for moving from one place to the other."

Community need by the numbers:

- In Orange County, the average monthly household cost of driving is $1,079, while a monthly bus pass is only $50. [26]
- Orlando households spend an estimated 23% of income on transportation. In cities with more mobility options, like Washington, D.C., and Philadelphia, transportation takes up an estimated 9–15% of income. [27]

PUBLIC TRANSIT THAT DOES NOT MEET COMMUNITY NEEDS

Stakeholders highlighted how low-income communities and communities of color in Orlando rely more on public transportation despite lack of quality service and coverage, which poses challenges to accessing jobs, health care, and other opportunities. Black, Indigenous, and people of color (BIPOC) communities experience spatial mismatch, a phenomenon wherein predominantly affects people of color.

"I can't get a job on the weekend because the bus services over here have very limited schedules on the weekend."

Community need by the numbers:

- People of color are three times less likely than white residents to own a vehicle in Orlando.[28]
- Black commuters in Orlando make up 22% of total commuters but 60% of public transportation commuters.[29]
- LYNX bus routes do not meet current demand: LYNX runs 300 buses to service 2,500 square miles. In contrast, Pittsburgh's transit agency services 745 square miles with 700 buses.[30]

Just 14% of Orlando residents live near transit service that runs at high frequency during rush hour (i.e., a bus that comes every 15 minutes).[30] Transportation takes up an estimated 9–15% of income.[31]

TRAFFIC SAFETY AND CONGESTION

Interviewees identified safety and congestion as key issues inhibiting transportation choices. Congestion and traffic safety are closely linked: The more people drive, the greater their exposure to potential crashes. As Orlando roadways have become more crowded, options such as biking and walking feel less feasible given the high rate of traffic crashes in the region. The burden of traffic safety is not shared equally across races, age groups, and other factors: Nationwide between 2010 and 2019, Black people walking were struck and killed by drivers 82% more often than white people.[32]

Community need by the numbers:

- The Orlando–Kissimmee–Sanford metropolitan area is ranked as the most dangerous for pedestrians in the United States, with 704 pedestrian fatalities between 2010 and 2019.[33]
- Central Florida commuters spend an average of 46 hours per year in traffic congestion at an economic cost of nearly $1,000 per commuter. [34]

LACK OF EDUCATION AND AWARENESS

Interviewees suggested that disadvantaged community members in Orlando have developed misperceptions about EVs, including about financing options, maintenance costs, and vehicle operation. This points to a need for education and outreach efforts that are accessible to multilingual communities; delivered through trusted channels and messengers; and at times, locations, and in formats that are feasible for community members to attend.

Community need by the numbers:

- More than half a million residents in Orlando speak Spanish as a first language, with Haitian Creole as the third most spoken language after English and Spanish.[35]
- Nationwide, while 98% of survey respondents say they have heard of electric vehicles, only 30% say they are knowledgeable about the technology.[36]

EV PURCHASE PRICE

While fueling and maintenance costs tend to be substantially lower for electric vehicles than for conventional vehicles, their upfront cost is still often higher, presenting a hurdle for many. These costs will continue to decline but may remain a barrier for the next several years for some vehicle types. Some interviewees said that some affordable and used electric vehicles are becoming available, suggesting that this barrier may be more perception than reality in some cases.

"When I got my electric vehicle, when I told friends how much it cost, they were very surprised. They thought it would cost a lot more than what it actually did."

Community need by the numbers:

- 43% of survey respondents nationally say purchase price is holding them back from purchasing an EV.[37]
- Cost parity between new ICE vehicles and EVs is anticipated in the mid-2020s. This will lead to lower used EV prices and cost parity with used gasoline vehicles, benefiting low-income households in the 2025-2030 time period.

EV CHARGING ACCESS

Insufficient access to a diversity of charging options is another critical barrier. Drivers need to know they can reliably charge at or near home, as well as at their regular destinations and along frequent travel routes. Interviewees also mentioned this barrier, citing doubts that they would have good access to charging based on lack of quality roads, transit, and other infrastructure. Most EV drivers charge at home, though renters and multifamily residents often must rely more on public charging.

Community need by the numbers:

- 65% of Orlando residents live in rental housing, and 56% live in multifamily housing with three or more units, according to the American Community Survey.
- Nationwide, 28% of survey respondents say lack of charging at home prevents them from buying an EV. Forty-eight percent report that "not enough public charging stations" holds them back.[38]

E-MOBILITY TECHNOLOGY

Aspects of electric vehicles, such as limited range and model availability, have held some back from adoption, though these drawbacks are improving as the industry evolves.

Community need by the numbers:

- Nationwide, survey respondents cited insufficient range (42%) and lack of vehicle model options (14%) holding them back from buying an EV.[39]

ORLANDO'S VISION FOR ELECTRIC MOBILITY

In response to the climate crisis and the mitigation opportunity presented by the rapid shift in the marketplace of the electric vehicles, the City of Orlando convened an E-Mobility Task Force composed of transportation stakeholders from government, utilities, transit authorities, and others, which convened over the course of six months to create this roadmap — a unified vision of how mobility will transform in Orlando by 2030 and beyond.

In January 2021, the Task Force was convened with support from Bloomberg Philanthropies American Cities Climate Challenge, with the intent to develop a roadmap and prioritized strategies needed to achieve that vision. A five-part workshop series was facilitated by the Climate Challenge partners including the city's NRDC EV Specialist and Climate Advisor, with additional support from Delivery Associates and EVHybridNoire to compose this roadmap — a unified vision of how mobility will transform in Orlando by 2030 and beyond.

When the Task Force considered in an ideal world, what mobility in Orlando would look like in the year 2030, it envisioned a future that was user friendly, healthy, and affordable and leveraged advanced technologies. A clear vision was articulated in which user experience would be seamless, with end-to-end passes for multimodal transportation options that enabled a shift away from vehicle ownership. The shared vision emphasized a future centered on social equity in which no one would be left behind — where location, access, and affordability would be key considerations and where EV chargers, transit options, and car-sharing programs would be available to all. The Task Force also shared a vision that embraced emerging technologies, with autonomous, connected, electric, and shared mobility composing the majority of on-road vehicles. This shared vision served as a guide for the Task Force workshop series and identification of the goals, targets, and strategies contained in this roadmap.

TASK FORCE VISION STATEMENT:

"By 2030, we aim to create mobility opportunities that embrace emerging technologies, reduce emissions that harm public health, bolster climate change resilience, and increase access and affordability for our disadvantaged communities."

The graphic below captures the key themes that emerged. The city's vision for electric mobility by 2030 is a transportation system that results in dramatically reduced greenhouse gas emissions, ensures accessibility to clean options for people of all incomes and backgrounds, is resilient, and supports the addition of new high-quality jobs to the region, where there will be a diversity of electric mobility options and community-identified infrastructure needs will be met. These options will leverage new technology and be renewably powered, affordable, convenient, and safe. These goals build upon the City of Orlando's 2040 goals established in the 2018 Green Works Community Sustainability Action Plan (CSAP) and many of the key stakeholder long-term plans identified in the box below.[40]

2018 ORLANDO COMMUNITY SUSTAINABILITY ACTION PLAN TRANSPORTATION GOALS:

1. Majority of trips are made by foot, bike, carpool, or transit.
2. Achieve a Gold ranking from the League of American Bicyclists for the city's Bicycle Friendly Community Score.
3. Increase miles of safe, sustainable transportation infrastructure (bike lanes and paths, transit lines, and sidewalks).
4. Double the street miles within the city that meet "complete streets" criteria.
5. Eliminate pedestrian and bike fatalities.

ELECTRIC MOBILITY ROADMAP GOALS

In the E-Mobility Roadmap, the Task Force established and prioritized four goals as the pillars needed to achieve their shared vision for Orlando's e-mobility future. These goals are not mutually exclusive and are meant to complement one another. In particular, while equity is a core goal, it is also woven throughout the implementation strategies of the other three goals.

1. Provide equitable and affordable access to e-mobility: Ensure equity and inclusion in shaping electric mobility opportunities and ensure that the benefits of clean transportation are broadly shared.

This roadmap aims to center equity to ensure that the benefits of the transition to e-mobility reach Orlando's underserved communities and improves their quality of life across a range of outcomes. Historically, the benefits and burdens of transportation have not been equally distributed, with low-income communities and communities of color disproportionately bearing the negative impacts of displacement during "urban renewal" and air pollution from highways and freight hubs. These communities often have less access to quality transit as well. The Task Force determined that an equitable transition would require the city to develop holistic solutions to upfront costs and charging accessibility, address the unique barriers in the used-EV market, provide at-home charging for multifamily housing developments, support less costly alternatives to vehicle ownership (e.g., EV car sharing), provide education and engagement, and support community ownership.[41]

2. Accelerate EV adoption in multiple transportation sectors: Promote EV adoption in the light-, medium-, and heavy-duty vehicle sectors at a scale sufficient to meet the city's climate goals.

While there are fewer medium and heavy-duty vehicles on the road than light-duty passenger vehicles, they are often more heavily utilized, are less fuel efficient, and emit more air pollutants, having a greater impact on community health. As part of the 2018 CSAP, the City of Orlando committed to reducing greenhouse gas emissions 90% by 2040. To reach this ambitious goal, the city must tackle emissions from the transportation sector, which currently accounts for approximately 20% of overall greenhouse gas emissions. The 2018 CSAP also commits the city to obtaining 100% of electricity from clean, renewable sources citywide by 2050, ensuring that electric mobility solutions become cleaner over time. Accelerating adoption of electric vehicles across all vehicle sectors — including light-duty personal vehicles, commercial vehicles of all sizes, and heavy-duty trucks and buses — will be essential to reach the city's climate goals, as well as to provide co-benefits like reduced air pollution, noise, and health impacts.

3. Develop a robust charging ecosystem: Expand charging infrastructure in a way that ensures access citywide, supports resilience, and meets the needs of multiple use cases.

To support a rapid transition to electric mobility, it will be essential to enable residents, commuters, fleets, and visitors to charge conveniently, affordably, and at different speeds anywhere in the city. A robust, widely distributed, and diverse network of charging stations will be needed to support all vehicle types and use cases. Additionally, the charging network should be built to be resilient to climate change impacts; it could even strengthen the city's resiliency by providing backup power from vehicles during emergencies.

4. Advance multimodal e-mobility options: Support the expansion of electric mobility options that advance alternatives to driving single-occupancy vehicles, which reduces congestion, encourages active lifestyles, and improves quality of life.

The city has goals to improve and diversify mobility options, particularly active modes such as walking, bicycling, and taking public transit. Supporting alternatives to personal vehicles provides Orlando residents, businesses, and visitors with more choices and improves quality of life by encouraging physical activity and reducing time spent in congestion. To complement the city's ambitious mobility goals, this roadmap prioritizes strategies that advance the adoption of electric options besides personal vehicles and avoid incentivizing personal electric vehicles over other modes of transportation. Figure 3 illustrates the prioritization of different electric and non-electric transportation options in policies, programs, and initiatives.

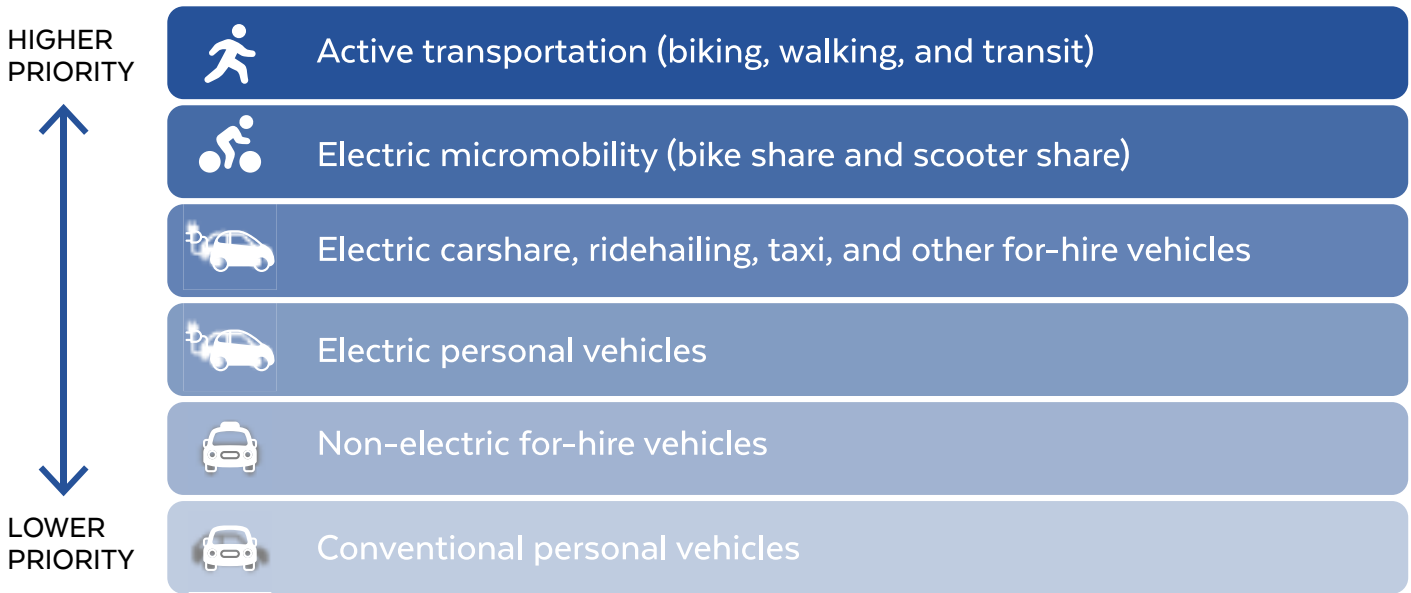


Figure 3: Prioritization of personal transportation options

ELECTRIC MOBILITY ROADMAP PROCESS

Many partners and stakeholders, both within the city and externally, contributed to the research, analysis, and input that has shaped this roadmap. The following figure summarizes the key steps taken to develop the roadmap:

Figure 4: Electric Mobility Roadmap Development Process

The following processes have been identified to actively advance the goals contained within this roadmap:

- **Implementation**: The city's Office of Sustainability and Resilience and Department of Transportation will continue to convene a Task Force of internal and external stakeholders to guide and support implementation of the roadmap **on a quarterly basis.**
- **Monitoring**: The city's Office of Sustainability and Resilience, with support from key stakeholders, will report on progress toward achieving the roadmap's goals, targets, and strategies publicly **every 2 years**.
- **Updates**: The roadmap will be updated **at least every 5 years** to account for the dynamic nature of the e-mobility market, technologies, and policies at other levels of governance.

ORLANDO'S ELECTRIC MOBILITY LANDSCAPE

HOW ORLANDO RESIDENTS TRAVEL

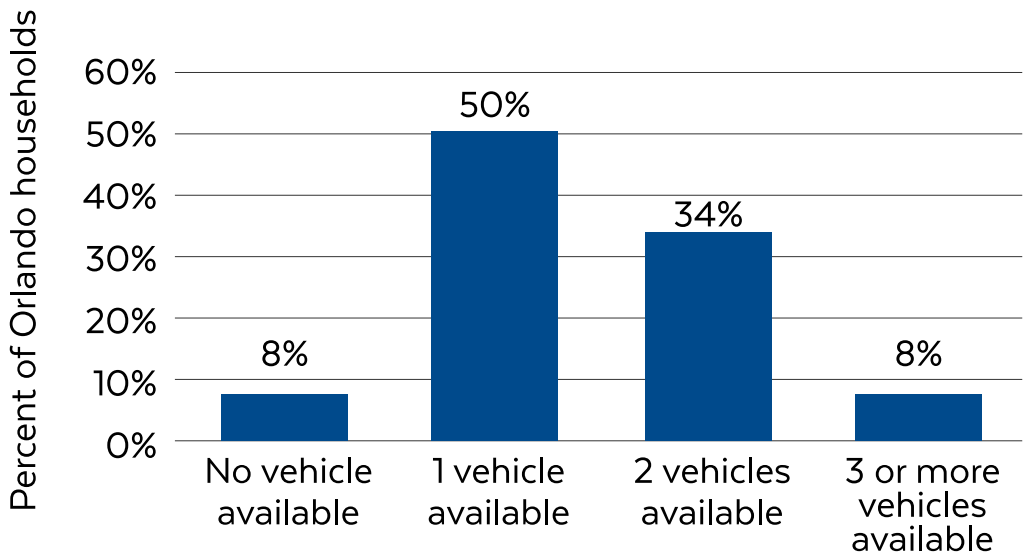


Figure 5: Vehicle ownership in Orlando, Florida

As of 2019, 50% of Orlando households owned just one vehicle, and 8% owned none (Figure 5).[42] In the same year, 77% of Orlando workers drove alone to work, while 23% commuted by some other means or worked from home at least part of the time (Figure 6). Much is still unknown about how people will commute and travel after the COVID-19 pandemic, though many believe that people who are able to work from home will continue to do so. While the number of people walking, biking, and taking transit to work remains a small portion of the overall share of commuters, the city has been investing to improve safety and access to these modes, adding more than 260 miles of on-street bike lanes and more than 40 miles of off-street trails. Orlando residents also have access to LYNX's 84 bus routes, LYNX ACCESS (paratransit), and other services, as well as the SunRail commuter line that opened in 2014.

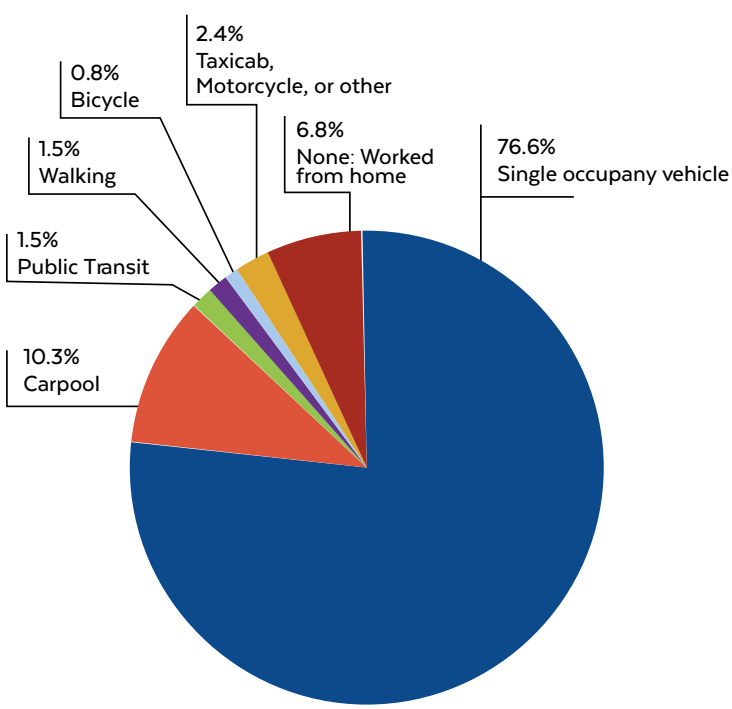


Figure 6: Means of transportation to work in Orlando, 2019 (American Community Survey)

AVAILABILITY AND ADOPTION OF ELECTRIC MOBILITY OPTIONS IN ORLANDO

ELECTRIC VEHICLE ADOPTION TO DATE

While light-duty EV purchases are still a small percentage of overall sales in the Orlando metro area, sales have been increasing dramatically, with EV market share growing 75% just between 2018 and 2019. Historically, the Orlando area percentage has lagged behind the statewide sales share, though it has caught up in recent years. And the state itself has trailed nationwide averages, with a sales share of 1.3% in Florida compared with 2.1% nationally in 2019; this was likely due to an absence of vehicle purchasing incentives, EV charging incentives, and other policies found elsewhere. In 2020, however, Florida had the second-highest number of registered EVs in the nation.[43] The Orlando region ranked 37th in EV market share out of the largest 50 metropolitan areas in the United States, behind peer regions such as Miami (21st) and Tampa (22nd).[44]

As of April 2021, 73% of the EVs registered to zip codes within the City of Orlando were battery electric vehicles, while 27% were plug-in hybrids.[47] The five most popular EVs registered in Orlando zip codes, by manufacturer, were:

1. Tesla (2,454)
2. Chevrolet (452)
3. BMW (285)
4. Nissan (274)
5. Ford (215)

While adoption has been rising steadily, it has not been even across communities, with some Orlando zip codes seeing much higher rates of adoption than others. Studies in other communities have found that early adopters of EV technology have tended to be disproportionately white and wealthy and live in single-family homes, characteristics that could explain the geographic variability in adoption in Orlando (see Figure 8).[48]

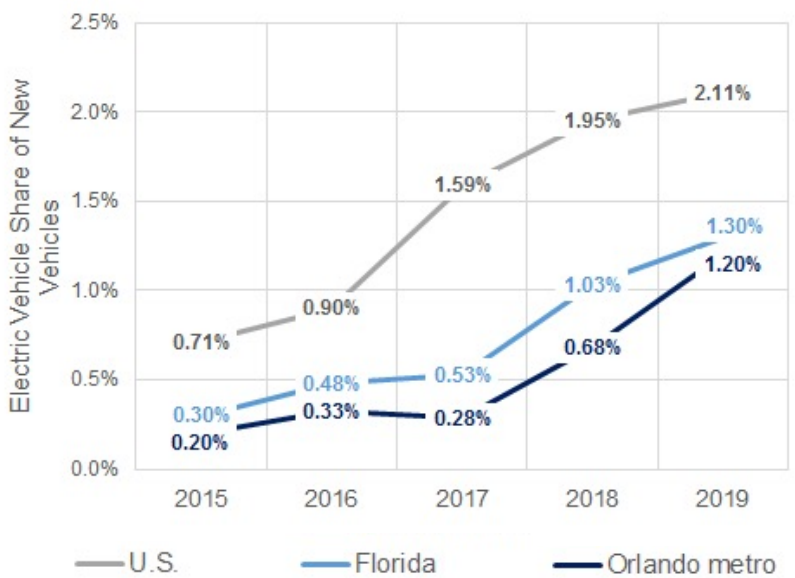


Figure 7: Electric Vehicle Share of New Vehicles Purchased, 2015–2019 [45,46]

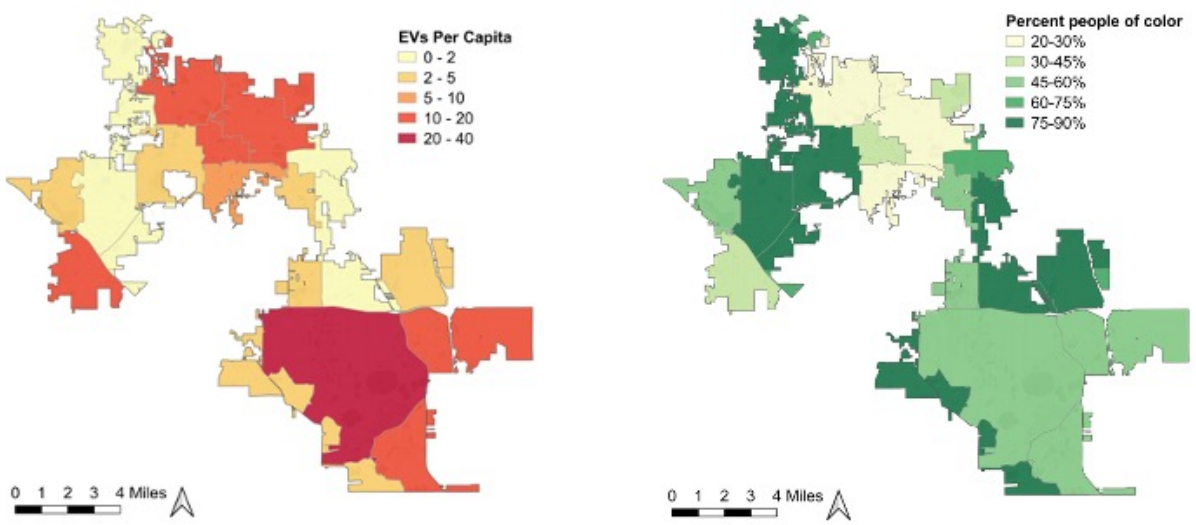


Figure 8: EVs registered per capita by zip code in Orlando compared with percentage of people of color by zip code (Source data: OUC/Department of Motor Vehicles, American Community Survey)

PUBLIC EV CHARGING AVAILABILITY

As of April 2021, there were more than 300 publicly accessible EV charging ports in the City of Orlando (see Table 2).

- **City Owned Public Charging**: The City of Orlando provides public access to Level 2 charging stations throughout the city, with a total of 35 locations and 99 dedicated EV spaces (there are also 29 dedicated EV charging spaces across 11 locations for city fleet vehicles and employees only). The public ports resulted from a major expansion in March 2021.[49]
- **Privately Owned Public Charging**: There are 144 privately owned, publicly accessible Level 2 EV ports usable by any EV, and 64 Level 2 ports usable only by Tesla vehicles. Additionally, there are 11 DCFC ports, some of which were still under construction as of April 2021.
- **Projects in Development**: There are also projects in different phases of planning, including a charging hub downtown — funded by a grant from the Florida Department of Environmental Protection — being developed by OUC in partnership with the city. The charging hub will add as many as 22 DC fast charging ports to the city.

Figure 9 shows all publicly listed EV charging stations in the city as of April 2021, both those owned by the city and those owned by private site hosts.

TYPES OF PUBLIC CHARGING	LEVEL 2	DCFC
City-owned public	99	0
Privately owned public: any EV	144	11
Privately owned public: Tesla only	64	0
Total	307	11

Table 2: Number and types of public EV charging ports in the City of Orlando, April 2021

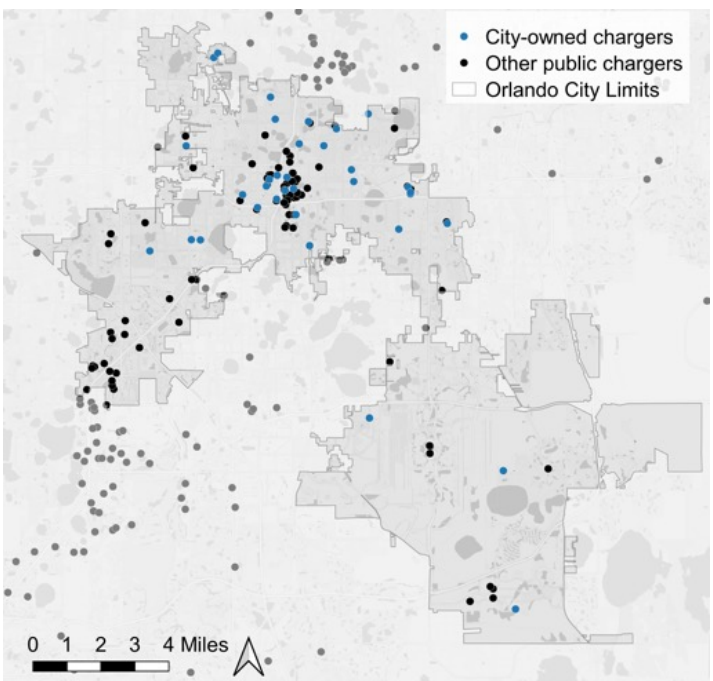


Figure 9: Publicly listed EV charging stations in the City of Orlando, April 2021 [50]

OTHER ELECTRIC MOBILITY OPTIONS IN ORLANDO

In addition to light-duty personal vehicles, Orlando has an increasing number of alternative electric mobility options, including:

- **Electric bikes and scooters**: In 2018, the city began piloting electric and regular bike sharing and scooter sharing by permitting companies to operate under certain conditions.[51] As of August 31, 2021, Orlando hosted over 1,396,000 trips for a total of more than 1,320,500 miles using shared micromobility in the City.
- **Electric buses**: LYNX is working to electrify its entire downtown circulator fleet, LYMMO, by 2022. The first all-electric LYMMO bus hit the streets in October 2020.
- **Car sharing and for-hire vehicles**: The City of Orlando collaborated with the Florida Department of Transportation (FDOT), the City of Winter Park, and Zipcar to bring car sharing to the city, though so far no electric vehicles are available.[52] The city also regulates for-hire vehicles such as taxis, limousines, shuttles, and ride-hailing companies like Uber and Lyft.[53] Notably, Uber and Lyft have set goals to completely electrify their fleets by 2030.
- **Electric rental cars**: Drive Electric Orlando has developed partnerships with area rental car companies to offer travelers incentives for testing out an electric vehicle on their trip.[54]
- **AAM eVTOL**: Advanced Air Mobility using electric vertical take-off and landing vehicles is coming to Orlando. German eVTOL maker, Lilium, has chosen Orlando to establish its first U.S. vertiport for its electric aircraft as a regional commuter hub.

EXISTING ELECTRIC MOBILITY INITIATIVES

Orlando and partners in the region have been pursuing a variety of strategies to support electrification, though there is room to accelerate progress: in 2020, the Orlando region ranked 36th among the largest 50 metropolitan areas in the United States in electric vehicle promotion actions across state, city, and utility scales, according to the International Council on Clean Transportation.[55] This roadmap seeks to complement and build on Orlando's existing initiatives as well as the long-term visions and planning efforts from key transportation partners, summarized in the following tables.

PARTNER	INITIATIVES
City of Orlando	• **EV Readiness Code**: As of January 1, 2022, this land use development code requires new construction to include EV charging stations and "EV capable" elements to meet current and future charging demand. • **Public EV Charging Infrastructure**: The city provides EV charging stations at public facilities and requires all new city facility construction to include EV charging stations. • **City Fleet**: Aiming for 100% alternative fuel vehicles by 2030, the city has converted roughly 10% of its light-duty fleet to EVs. Along with fleet vehicles, the city deploys fleet EV charging stations that are not publicly accessible. • **Fleet Solar Canopy Pilot**: The Fleet and Facilities service station will be equipped with 32 Level 2 charging stations and 1 DC fast charger powered by a 277 kW solar array that is designed to provide about 56% of the facility's electric consumption.
MetroPlan Orlando	• **EV Charging Station Master Plan (FY22–23)**: This will build on current statewide efforts and optimize electric vehicle supply equipment (EVSE) placement in the region. Planners will undertake a study that includes an assessment of existing conditions, policies, and regulations related to EVs; various analyses related to charging infrastructure implementation; financial/cost analysis of future infrastructure investments; and a stakeholder engagement process. The information gathered during the assessments and outreach will inform an EVSE prioritization methodology that may be used to recommend future EV charging site locations and a rollout framework. Ultimately, the study will identify the issues for regional EVSE deployment and make recommendations for regional/local jurisdictions to consider in designing and implementing programs to facilitate adoption of EVs. The information from this study will assist in competing for possible electric vehicle implementation funding.
Orange County	• **Walk, Ride, Thrive**: This pedestrian safety initiative will establish and maintain a coordinated, comprehensive, and consistent response to Orange County's pedestrian and bicycle safety issues. • **EV Ready Development Program**: A voluntary recognition program for multifamily and commercial buildings will accelerate community-wide EV charging infrastructure for future charging demands. • **County Fleet**: With more than 4,900 fleet vehicles, the country is pursuing a goal to convert 100% of its light-duty vehicles (Class 1 and 2) to electric, hybrid, or alternative by 2030, accompanied by EV charging infrastructure. • **Public EV Charging Infrastructure**: The county provides EV charging stations at public facilities and requires all new county facilities construction to be EV ready. Its goal is to double EV charging infrastructure at its facilities by 2025.

PARTNER	INITIATIVES
OUC	• **Electrified Dealership Program**: OUC partners with area auto dealerships to improve the EV shopping experience by certifying dealers and training dealership staff. • **OUC Charge-It Program**: OUC owns, installs, and maintains charging stations. Customers can obtain electric vehicle charging services from OUC for a fixed monthly fee over a contracted period of time. The fee is based on specific characteristics of the site and the equipment type. • **OUC Own-It Program**: OUC designs, procures, and installs charging stations. Customers pay for the equipment and installation that OUC provides, then owns it immediately. • **EV Rebate**: OUC customers are eligible to receive a $200 rebate after purchasing or leasing a plug-in electric vehicle. • **EV Test Drive Incentive**: Shoppers who test-drive an EV at a participating dealership receive a $50 Visa gift card. • **EV Ride-Along Video Series**: This is a collection of fun, educational videos about EVs. They include personal experiences from EV owners and insight on how OUC and the City of Orlando are working to make central Florida a hub for electrification. • **Buyer's Guide and EV Charging 101 Guide**: OUC offers educational resources for consumers on the basics of EVs.
LYNX	• **First electric bus in Orlando's downtown LYMMO service**: The bus was deployed in October 2020. By the end of 2022, it is anticipated that all 14 LYMMO buses will be electric. • LYNX has made a commitment to transition its entire bus fleet to electric and alternative fuel vehicles by 2030. Currently, there are 129 CNG buses in service with another 5 coming in 2022, bringing the fleet halfway to the goal.
CFX	• **ASPIRE Center Partnership**: CFX is taking an active role in programs of the ASPIRE Center, with CFX Executive Director Laura Kelley serving on the Executive Advisory Board. ASPIRE looks to advance sustainability through powered infrastructure for roadway electrification and has an established vision for "widespread electrification of all vehicle classes, improved air quality, and public infrastructure that provides an inexpensive, seamless charging experience." CFX is looking to advance that vision in the Central Florida region through development of an in-lane charging pilot project.

Table 3: Key existing local and regional e-mobility strategies

PARTNER	INITIATIVES
State of Florida	• **Department of Transportation EV Master Plan (draft) (2021)**: State legislation requires FDOT to develop a master plan for the expansion of electric vehicle charging station infrastructure along the state highway system, with the goals of supporting short-range and long-range electric vehicle travel, encouraging the expansion of electric vehicle use in the state, and adequately serving evacuation routes throughout Florida. • **Department of Agriculture and Consumer Services Electric Vehicle Roadmap (2020)**: The Florida EV Roadmap is the first comprehensive investigation into the status and needs of EV charging infrastructure in the state. Also included in the report is a map with recommended sites for charging infrastructure, as well as planning recommendations that address various topics such as permitting, emergency evacuation needs, and education.
MetroPlan Orlando	• **Metropolitan Transportation Plan 2045**: This plan establishes the vision of central Florida's entire transportation system for Orange, Osceola, and Seminole Counties. The $27.9 billion plan identifies current and future transportation needs through 2045. Projects must be included in the plan to receive federal and state funding. The plan is updated every five years to reflect the changing dynamics of the region. • **CAV Readiness Study**: In June 2020, MetroPlan Orlando completed a study that aimed to provide a thorough evaluation of the current preparedness of local counties and cities for the emergence of connected and automated vehicles (CAVs), as well as to recommend next steps to proactively enhance their preparation. One of the recommendations is to "perform an assessment of the deployment and infrastructure requirements related to electric vehicle (EV) charging stations." MetroPlan Orlando looks to pursue this recommendation through an upcoming study and regional planning effort that will include an evaluation of the current and future demand for EV charging stations throughout the three-county planning area.

Orange County	• **Vision 2050**: **A smart, healthy, thriving region**: The population of Orange County is expected to increase by 700,000 — exceeding 2 million residents — by 2050. The Vision 2050 plan will guide how and where growth will occur through a new land development code. New objectives and elements include energy infrastructure, connected/automated vehicles, and enhanced mobility options that prioritize electrification.
	• **2030 Sustainable Operations and Resilience Action Plan**: This plan focuses on internal operations, procedures, and assets and identifies goals specific to mobility, including:
	  • Optimize vehicle fleet performance through onboard technology and a 50% reduction of petroleum-based fuel by 2030.
	  • Deploy EV-ready infrastructure and convert 100% of light-duty County fleet to electric or alternative by 2030.
	  • Improve vehicle, bicycle, and pedestrian roadway safety, resilience, and interoperability through traffic technology retrofits at 300 intersections by 2025.

PARTNER	INITIATIVES

City of Orlando	• **Green Works Community Action Plan**: This plan contains transportation goals for 2040, including:
	  • Ensure the majority of trips are made by foot, bike, carpool, or transit.
	  • Achieve a Gold ranking from the League of American Bicyclists for the city's Bicycle Friendly Community Score.
	  • Increase miles of safe, sustainable transportation infrastructure (bike lanes and paths, transit lines, and sidewalks).
	  • Double the street miles within the city that meet "complete streets" criteria.
	  • Eliminate pedestrian and bike fatalities.
	  • Increase the use of electric vehicles and alternative fuel vehicles throughout the city.
	• **Orlando Future Ready City Master Plan**: This initiative looks to "leverage innovation and collaboration to enhance our services and investments." It identifies mobility strategy priorities such as a unified fare collection platform that would enable payment by EBT, a marketing and education campaign to increase transit ridership, and alignment of engineering standards to better connect rights of way with surrounding land uses.
	• **Vision Zero Orlando Action Plan**: The goal of this plan is to eliminate traffic deaths and serious injuries by 2040 via the "six E's": education, engineering, enforcement, equity, evaluation, and economics.

OUC	• **Energy Integrated Resource Plan (2021)**: A $45 million investment in innovative electrification infrastructure, incentives, and programs will result in more than 100,000 EVs traveling central Florida roadways, resulting in a reduction of 450,000 tons of CO2 by 2030.
LYNX	• **Transit Development Plan 2020 (TDP)**: This is a 10-year needs-based evaluation required by the Florida DOT to qualify for state Public Transit Block Grant Program funding. The document includes an assessment of existing services offered by the Central Florida Transportation Authority, as well as anticipated demand for services based on social and economic trends, the political environment, and development patterns and forecasts. • **Vision 2030**: This long-range strategic planning process is designed to identify how public transportation can develop over the next 20 years to meet the community's needs. The study focuses on 22 corridors intended to grow into high-capacity service areas with premium transit services such as bus rapid transit, express bus, and light rail/streetcar.
CFX	• **CFX 2045 Master Plan**: Launched to identify potential transportation projects over the next 25 years, this initiative is currently in the first phase of the planning process. CFX is seeking input from government leaders, transportation planners, and community members. • **CFX Sustainability Plan**: Adopted by its board of directors in 2019, the plan sets out a path toward improving the sustainability of the CFX roadway system. Initiatives detailed in the plan include installation of traditional and elevated pond photovoltaic (PV) arrays to offset power consumption, exploration of floating PV applications, retro-commissioning of key buildings to improve energy efficiency, deployment of EV charging stations at CFX headquarters and other key buildings, electrification of fleet vehicles, and exploration of opportunities to improve both landscape and roadway sustainability. • **CFX Environmental Stewardship Committee**: The committee will evaluate projects and programs to ensure that they are designed to support the responsible use and protection of the natural environment through conservation and sustainable practices. It will then make recommendations to the CFX Board.

Table 4: Long-term e-mobility visions from key transportation planning partners

SCALING ELECTRIC MOBILITY ADOPTION IN ORLANDO

ESTIMATED EV ADOPTION SCENARIOS

To understand and prepare for a range of potential personal electric vehicle adoption trajectories in Orlando, this analysis adapts scenarios developed by the National Renewable Energy Laboratory (NREL) for each U.S. state to Orlando's estimated current baseline.[56]

REFERENCE	MEDIUM	HIGH
- Business-as-usual outlook, only incremental changes with respect to electrification occur - Excludes potential of dramatic societal, technological, or behavioral shifts - Relies on EIA Annual Energy Outlook (AEO) projections of EV adoption	- Intended to reflect an electrification future that is plausible but not transformational - Assumes gasoline and electricity fuel price projections from EIA AEO - Assumes battery cost reduction trajectory reaching $135/kWh by 2050	- Assumes a more favorable set of conditions for electrification – including a combination of technology breakthroughs, policy support, and underlying societal and behavioral shifts - Intended to represent a scenario enabling Orlando to reach its climate goal of reducing GHG emissions 80% by 2050

Figure 11: NREL EV adoption scenarios

We applied NREL's three scenarios to Orlando's estimated EV registration baseline results in the reference, medium, and high EV adoption scenarios of Figure 11. In the high scenario, EV registrations reach 32% by 2030 and top 80% of total vehicles by 2050 (see Figure 12), which would support Orlando's GHG emissions reduction goals if the city is also able to significantly increase its share of clean energy in the same period.

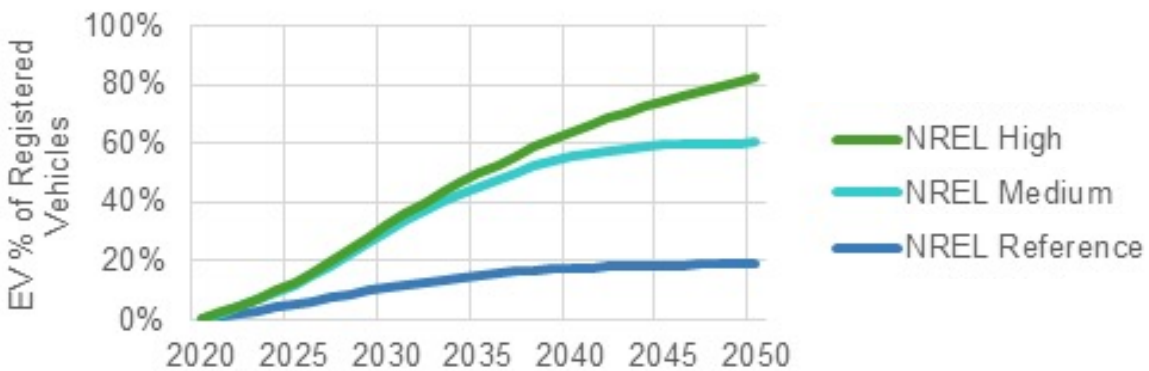


Figure 12: Percentage of registered vehicles in Orlando that are electric (PHEV and BEV) by scenario, 2020–2050

American Community Survey data indicates that there were an estimated 164,000 personal vehicles in Orlando in 2018. At a wider range, EV registrations have been tracked at city, county, and state levels by the city and partners, showing a rising trend of registrations over time (Table 5). Assuming this prediction holds true, Orlando can expect to see between 17,640 and 52,940 personal electric vehicles registered in the city by 2030 (Table 6).

	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021
Orlando	1,713	1,699	2,088	2,262	2,366	2,420	2,769	3,535	3,852
Orange County	2,275	4,239	4,580	4,976	5,273	5,466	6,301	8,001	8,679
Osceola County	359	340	585	628	673	733	915	1,158	1,318
Florida	42,441	50,368	54,005	55,420	60,840	63,079	76,500	97,935	99,420

Table 5: Electric vehicle registrations in Orlando, Orange County, Osceola County, and Florida, 2019–2021

A note on EV adoption scenarios: The medium and high scenarios considered here anticipate substantially accelerated adoption compared with those relied on by FDOT and the Florida Department of Agriculture and Consumer Services (FDACS) in their state-level EV plans. The FDACS plan relies on the Energy Information Administration's Annual Energy Outlook for 2020, which offers the lowest projection out of all the common scenarios depicted in Figure 13. The Annual Energy Outlook relies on outdated battery cost projections and has repeatedly predicted lower adoption rates of clean technologies than have materialized.[57,58] This roadmap looks at more accelerated yet feasible adoption scenarios modeled by the National Renewable Energy Laboratory that would better enable the city to reach its ambitious climate goals.

SCENARIO	2025	2030
Reference	8,420	17,640
Medium	19,660	49,410
High	21,060	52,940

Table 6: Estimated number of electric vehicles in Orlando by scenario, 2020–2030

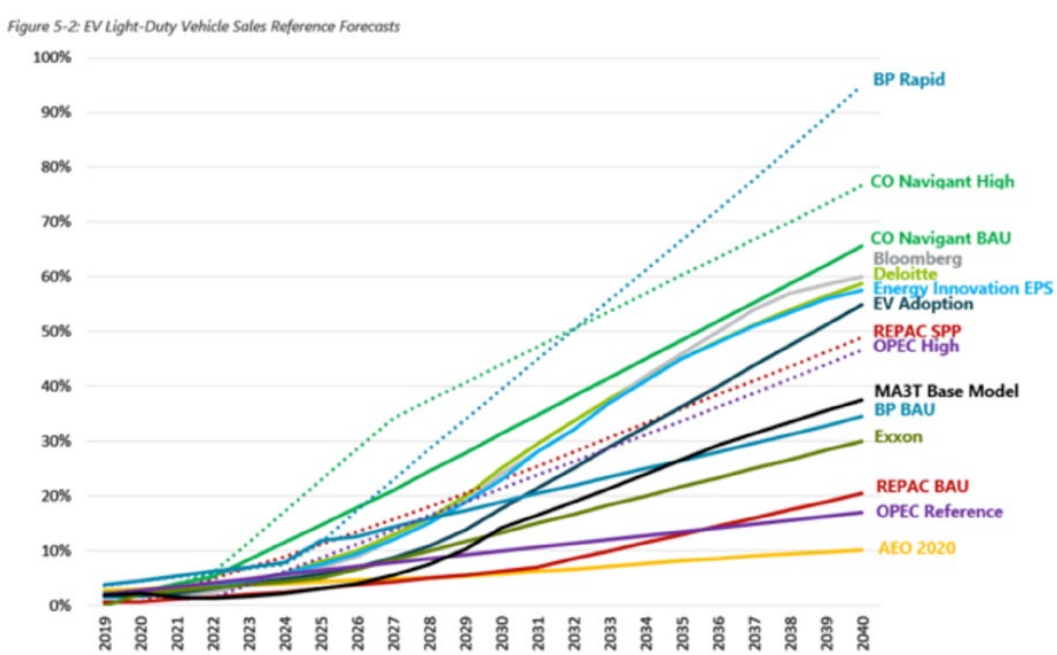


Figure 13: Common EV market share projections [59]

ESTIMATED PUBLIC EV CHARGING PORTS NEEDED TO SUPPORT EV ADOPTION SCENARIOS

To estimate the number of public EV charging ports needed in the future to support the growing EV market in Orlando, this analysis utilizes NREL's EVI-Pro Lite online tool.[60] The EVI-Pro Lite model assumes drivers charge at home whenever possible.[61] However, many Orlando households lack access to off-street parking or occupy rental units, and therefore may be unable to install a charger or access an outlet. This analysis assumes 75% of Orlando households would have access to some form of home charging. The following table summarizes the EVI-Pro Lite estimated range of Level 2 workplace and public ports and DC fast charging ports needed by 2030 to support the EV adoption scenarios described previously.

EV CHARGING TYPE	REFERENCE	MEDIUM	HIGH
Workplace Level 2 Charging Ports	1,460	4,080	4,375
Public Level 2 Charging Ports	460	1,295	1,385
DC Fast Charging Ports	85	245	260
Total	2,005	5,620	6,020

Table 7: Estimated number of total public EV charging plugs needed in Orlando by 2030

Note, however, that these figures could shift based on technology developments and other trends, such as:

- **Population and employment growth**: The analysis does not account for potential growth in population and employment between now and 2030.
- **Shared mobility and autonomy**: While autonomous vehicles are not yet commercially ready, shared mobility options have become widely available and are already reshaping how city residents get around. If more travel shifts to shared mobility, the city may need to consider additional DC fast charging plugs while lessening its plans for Level 2 chargers, which better serve personal vehicles.
- **Vehicle ownership and mode share**: The city is striving to increase biking, walking, and transit mode share, and vehicle ownership among younger people has been declining. If the rates of vehicle ownership and single-occupant vehicle travel decrease substantially over the next 10 years, the charging needs estimated in this analysis could decrease.
- **EV technology advancements**: Changes in charging and vehicle technology — for example longer ranges and faster charging speeds — could impact the number and type of chargers needed.

PUBLIC EV CHARGING COVERAGE

In addition to having enough public charging stations to serve electric vehicles in the city, it is critical to ensure that their distribution enables convenient and equitable access citywide, particularly for those who face barriers to charging access at home, such as multifamily residents and renters. Many cities, including Orlando, currently have "charging deserts" where public charging access is lacking, and this will be important to address to facilitate EV adoption in all communities. The maps below show current access levels citywide. For Level 2 stations, convenient access is considered a 10-minute walking distance, given the longer charge times required and the need for access within a short distance to home or work. For DC Fast Chargers, convenient access is considered a 10-minute drive, based on research indicating this to be the longest time that people are willing to drive to a gas station.[62]

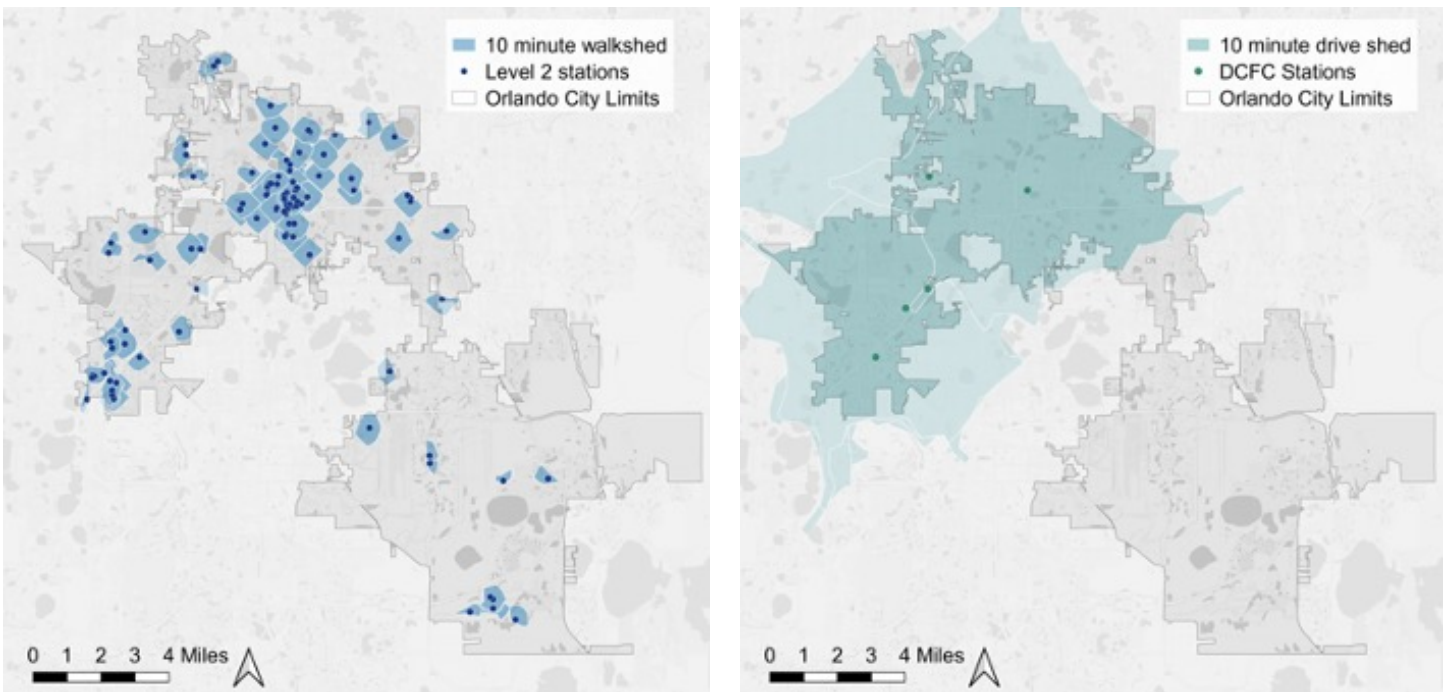


Figure 14: 10-minute walking distance from Level 2 EV charging stations in Orlando (left), and 10-minute driving distance from DCFC stations in Orlando (right)

SHAPING ORLANDO'S ELECTRIC MOBILITY FUTURE: ROADMAP TARGETS, INDICATORS, AND STRATEGIES

OVERVIEW

The following sections summarize aspirational targets that the city and stakeholders will aim to meet, indicators they will use to track progress, and strategies they will pursue to achieve the roadmap's vision and goals. Targets, indicators, and strategies are organized by roadmap goal. The strategy summary tables include information about the estimated timetable for implementation and key stakeholders to be engaged.

WHAT ARE TARGETS, INDICATORS, AND STRATEGIES?

Targets: Time-bound goals that we are working to reach.

Indicators: Data by which we measure progress toward our goals.

Strategies: Policies, programs, or other initiatives designed to make progress toward our goals.

STRATEGY KEY

- Time frame: Near = 1 year, Medium = 2–5 years, Long = 5+ years
- Role players: This includes key stakeholders that will lead or support implementation

GOAL 1: PROVIDE EQUITABLE AND AFFORDABLE ACCESS TO E-MOBILITY

TARGETS AND INDICATORS

The table below summarizes the targets and indicators to measure progress toward the goal of providing equitable and affordable access to e-mobility. Note: Targets, indicators and strategies that are closely related to equity, but are categorized in another goal (2-4) are marked with an asterisk.

NUMBER	TARGET/INDICATOR	DATA SOURCE(S)
Targets		
1.1	100% of Orlando residents live within 10-minute walk of a Level 2 public charging station or a 10-minute drive of a DCFC by 2030	AFDC, Census
1.2	Proportion of e-mobility adoption and use by demographics match city demographics (race, income) by 2030	Survey, Census
1.3	100% of disadvantaged communities are served by electric buses by 2030	LYNX, Census
Indicators		
1.4	**Engagement**: Number of low- and moderate-income and BIPOC community members who are engaged through EV education and awareness programs	Survey, City of Orlando and partners
1.5	**Affordability**: Cost range and average public charging station fees, benchmarked to base OUC price of electricity	OUC, AFDC, PlugShare

Table 8: Goal 1 targets and indicators summary

STRATEGIES

The table below highlights key strategies identified to achieve the goal of equitable and affordable access to e-mobility; these strategies focus primarily on education and inclusive engagement. More equity-focused strategies are included in the strategy tables for the other three goals, denoted with an asterisk (*).

NUMBER	STRATEGY	TIME FRAME	ROLE PLAYERS
1.1	Develop robust, ongoing engagement, feedback, and evaluation with disadvantaged communities to guide e-mobility initiatives, including EV charger siting and micromobility strategies	Near	City of Orlando, Community partners
1.2	Conduct outreach and education with disadvantaged communities by trusted messengers on the full spectrum of e-mobility benefits and receive input on tailoring e-mobility policy and programs	Medium	OUC, City of Orlando, Community partners
2.3*	Offer technical assistance to electrify fleets, with a focus on supporting fleets that work with disadvantaged communities	Medium	Central Florida Clean Cities Coalition, OUC, Electrification Coalition (EC)
2.4*	Develop program to support used EV adoption that includes incentives and financing targeting low- and moderate-income residents	Medium	OUC, City of Orlando, Orange County, Community partners
3.5*	Pilot EV charging station incentive programs for new and existing low- and moderate-income multifamily housing	Medium	OUC, City of Orlando
3.6*	Expand “Right to Charge” legislation to include rental properties	Medium	City of Orlando, Orange County, Community partners
3.7*	Launch equitable workforce development program to support EV charging installation certification	Medium	City of Orlando
4.1*	Pursue additional charging hubs in partnership with LYNX, OUC, and others with DCFC, micromobility charging, and other technologies, with an emphasis on underserved communities	Near	City of Orlando, LYNX, OUC, shared mobility providers
4.2*	Partner with Orange County Public Schools (OCPS) and LYNX to support electrification of school and transit bus fleets, prioritizing deployment in disadvantaged communities	Near	OCPS, LYNX, OUC, City of Orlando
4.3*	Pilot a low- and moderate-income car-sharing service or other electrified shared mobility service	Medium	City of Orlando
4.4*	Support development of integrated apps / platforms to enable more seamless use of multiple modes and charging options and inclusive payment methods by encouraging open data standards and utilization of the FDOT SunStore.	Medium	City, LYNX, MetroPlan
4.6*	Pilot e-bike incentive program for low- and moderate-income residents	Long	City of Orlando

Table 9: Goal 1 strategies summary

GOAL 2: ACCELERATE EV ADOPTION IN MULTIPLE TRANSPORTATION SECTORS

TARGETS AND INDICATORS

NUMBER	TARGET/INDICATOR	DATA SOURCE(S)
Targets		
2.1	30% of all light-duty registered vehicles in City of Orlando are electric by 2030, and 80% by 2050	DMV, OUC
2.2	City and OUC establish 100% light-duty fleet procurement policy by 2025; perform a medium- and heavy-duty transition analysis by 2025	City of Orlando, OUC
2.3	30% of goods deliveries are zero emission by 2030	To be determined
Indicators		
2.4	% of registrations that are electric (light-, medium- and heavy-duty)	DMV, OUC
2.5	Increase in e-mobility awareness, education, and engagement among residents	Survey

Table 10: Goal 2 targets and indicators summary

STRATEGIES

NUMBER	STRATEGY	TIME FRAME	ROLE PLAYERS
2.1	Establish an EV bulk purchase program	Near	EC, City of Orlando, OUC
2.2	Create a fleet electrification plan and procurement policy designed to reach targets	Near	City of Orlando, OUC, Lynx
2.3*	Offer technical assistance to electrify fleets, with a focus on supporting fleets that work with disadvantaged communities	Medium	Central Florida Clean Cities Coalition, OUC, EC
2.4*	Develop program to support used EV adoption that includes incentives and financing targeting low- and moderate-income residents	Medium	OUC, City of Orlando, Orange County, community-based organizations
2.5	Pilot freight electrification program in partnership with OUC and a company with an ambitious electrification commitment	Medium	OUC, EC, Central Florida Clean Cities Coalition
2.6	Create an e-mobility education and experience center	Medium	OUC, City of Orlando, Central Florida Clean Cities Coalition
2.7	Establish a portion of driver's ed curriculum on EVs	Long	OCPS, Orange County, City of Orlando
2.8	Explore introducing zero-emission zones for deliveries or all trips in select locations	Long	City of Orlando

Table 11: Goal 2 strategies summary

GOAL 3: DEVELOP A ROBUST CHARGING ECOSYSTEM

TARGETS AND INDICATORS

NUMBER	TARGET/INDICATOR	DATA SOURCE(S)
Targets		
3.1	1,400 Level 2 public ports and 250 DCFC public ports by 2030	AFDC
3.2	200 city-owned Level 2 public ports and 40 DCFC public ports by 2030	City of Orlando, OUC
Indicators		
3.3	Number of EVSE installation permits for residential and commercial properties	City of Orlando
3.4	Number of EV-capable and EVSE installed spaces created through EV ready ordinance	City of Orlando
3.5	EVITP-trained EV charging installers (including % women and people of color)	City of Orlando, Orange County

Table 12: Goal 3 targets and indicators summary

STRATEGIES

NUMBER	STRATEGY	TIME FRAME	ROLE PLAYERS
3.1	Pass EV readiness land development code to increase current and future charging access in multifamily and commercial (nonresidential) properties.	Near	City of Orlando
3.2	Establish coordinated funding and financing strategy for EV charging, including by pursuing grants, forming public–private partnerships, collecting revenue, etc.	Near	City of Orlando, OUC, LYNX, MetroPlan, Orange County
3.3	Expand solar charging canopies to additional city facilities for fleet, employee, and public charging	Medium	City of Orlando
3.4	Expand OUC EV fast-charging hub pilot to reach eight total hubs	Medium	OUC
3.5*	Pilot EV charging station incentive programs for new and existing low- and moderate-income multifamily housing	Medium	OUC, City of Orlando
3.6*	Expand "Right to Charge" legislation to include rental properties	Medium	City of Orlando, Orange County, community partners
3.7*	Launch equitable workforce development program to support EV charging installation certification	Medium	City of Orlando, IBEW
3.8	Pilot managed charging and charging plus storage with commercial fleets	Medium	OUC
3.9	Incentivize new development to include e-mobility access (EV charging, EV car sharing, e-bike sharing or charging, etc.) beyond EV readiness code	Long	City of Orlando
3.10	Partner with business community networks and leaders to educate about and encourage workplace charging	Long	Chamber of Commerce, Orlando Economic Partnership

Table 13: Goal 3 strategies summary

GOAL 4: ADVANCE MULTIMODAL E-MOBILITY OPTIONS

TARGETS AND INDICATORS

NUMBER	TARGET/INDICATOR	DATA SOURCE(S)
Targets		
4.1	Establish all-electric transit and school bus fleets by 2040	LYNX, OCPS, SunRail
4.2	75% of commute trips are zero emission (walking, biking, electrified transit or shared mobility, EV, or avoided) by 2030	US Census, City of Orlando, Google Environmental Information Explorer (EIE), other data partners
Indicators		
4.3	Percentage of residents within a 10-minute walk of electric car sharing, bike sharing, transit stops, or docks	Census, LYNX, shared mobility providers
4.4	Number of shared e-mobility options available in the city (e.g., car sharing, bike sharing, scooters, transport network companies, taxis) and ridership	City of Orlando, shared mobility providers

Table 14: Goal 4 targets and indicators summary

STRATEGIES

NUMBER	STRATEGY	TIME FRAME	ROLE PLAYERS
4.1*	Pursue additional charging hubs in partnership with LYNX, OUC, and others with DCFC, micromobility charging, and other technologies, with an emphasis on underserved communities	Near	City of Orlando, LYNX, OUC, shared mobility providers
4.2*	Partner with OCPS and LYNX to support electrification of school and transit bus fleets, prioritizing deployment in disadvantaged communities	Near	OCPS, LYNX, OUC, City of Orlando, CALSTART
4.3*	Pilot a low- and moderate-income car-sharing service or other electrified shared mobility service	Medium	City of Orlando
4.4*	Support development of integrated apps / platforms to enable more seamless use of multiple modes and charging options and inclusive payment methods by encouraging open data standards and utilization of the FDOT SunStore.	Medium	City of Orlando, LYNX, MetroPlan
4.5	Work with the city's for-hire vehicle permitting and local companies to support acceleration of electrified ride hailing and other for-hire vehicles, such as taxis, limos, and shuttles	Medium	City of Orlando, shared mobility providers/TNCs
4.6*	Pilot e-bike incentive program for low- and moderate-income residents	Long	City of Orlando
4.7	Pilot e-cargo bikes for deliveries in areas experiencing delivery congestion	Long	City of Orlando
4.8	Convert rail transit and freight to all-electric		SunRail, others

Table 15: Goal 4 strategies summary

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