Arapahoe County Regional Electric Vehicle Action Plan

May 2024

Adopted by the Board of County Commissioners on May 14, 2024 - Resolution No. 24-137

ACKNOWLEDGEMENTS

Thank you to the following individuals who contributed many hours of service to developing this Regional Electric Vehicle Action Plan.

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This Regional Electric Vehicle Action Plan was funded by and developed in collaboration with Xcel Energy's Partners in Energy. Partners in Energy shall not be responsible for any content, analysis, or results if Arapahoe County partners have made modifications to the plan.


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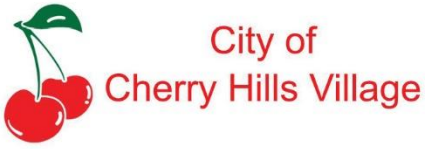
City of
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Englewood
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Littleton
Colorado


CITY OF
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Founded in 1890


GREENWOOD VILLAGE
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Deer Trail Colorado
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About This Plan

Plug-in electric vehicle, both battery electric and plug-in hybrid vehicle, adoption is increasing across Colorado including Arapahoe County for several reasons. The State of Colorado has established aggressive goals to shift to a zero-tailpipe emission transportation sector including electric vehicles (EVs). Both the State and Federal governments are offering incentives and developing programs to encourage the EV market because EVs reduce air pollution and greenhouse gas emissions because they have no tail-pipe emissions. EVs may also benefit EV drivers with lower operating costs.

To prepare and coordinate for the increase in EVs and needed charging infrastructure, representatives from Arapahoe County and local governments in Arapahoe County came together with key stakeholders, including regional organizations, state agencies, nonprofit organizations, CORE Electric Cooperative, and Xcel Energy over the course of 12 months during 2022 and 2023, to develop a strategic plan for the region. This plan builds on regional transportation planning to show that close collaboration is needed to support transportation electrification.

A regional approach was taken because transportation systems are large, complex, and dynamic. The movement of people and goods is inherently regional, crossing boundaries and connecting the communities where we live and work. Further, air quality impacts from transportation do not abide by jurisdictional boundaries and are felt across the region. Arapahoe County communities recognize that EVs must be thoughtfully approached to be implemented. Taking a collaborative, regional approach to EV planning will maximize Arapahoe County communities' collective ability to leverage funding, avoid duplication of effort, and support the effective design and implementation of transportation solutions that work for everyone across the region.

Vision

To help guide the planning process and plan implementation, the Planning Team developed the following vision statement.

Arapahoe County and communities will partner to support safe, reliable, innovative, affordable, and equitable electric transportation options that improve air quality.

Arapahoe County's EV baseline and projections

As of the end of 2021, Arapahoe County had 5,461 registered light-duty EVs or about 1% of total registered light-duty vehicles in the county. As of September 2023, Arapahoe County had 317 public Level 2 charging ports and 61 public DC fast charging ports for a total of 378 total ports in operation.

The State of Colorado developed 2030 projections for EV adoption statewide. According to state projections, by 2030, the county could expect to see 60,000 to 86,000 light-duty EVs on the road or between 10 and 15% of total registered light-duty vehicles. Increased EV adoption will be supported by and drive demand for EV charging infrastructure. Most charging will continue to take place at home and at work. There is also a need for public charging for those that may not have access to home or workplace charging and along travel corridors for longer trips. By 2030, the county could need up to 2,470 public Level 2 and 630 public DC fast charging ports to serve the increased number of EVs.

Focus areas/Summary/Strategies

To achieve the vision, the Arapahoe County Regional EV Action Plan identifies strategies within four focus areas for implementation.

Focus Areas	Summary	Strategies
 **Outreach & Education**	Educating residents, businesses, and first and second responders about EVs.	• EO-1: Conduct communitywide EV outreach. • EO-2: Conduct annual community surveys to understand existing barriers to EV adoption. • EO-3: Support EV training opportunities for first and second responders.
 **Charging Infrastructure**	Supporting the development of convenient and accessible charging infrastructure.	• CI-1: Map potential locations for public charging stations. • CI-2: Develop EV charging outreach materials for developers. • CI-3: Increase public charging infrastructure through installations at public sites and promoting funding opportunities and resources.
 **Fleet Electrification**	Supporting the decision process to purchase or lease plug-in electric vehicles for public and private sector fleets.	• FE-1: Encourage public fleets to conduct fleet analyses to recommend opportunities for electrification. • FE-2: Develop fleet electrification resources and conduct outreach to engage regional and local fleets. • FE-3: Support EV training opportunities for mechanics and technicians.
 **Electric Multimodal Transportation**	Ensuring expanding electric transportation options such as transit and micromobility.	• MT-1: Incorporate electric multimodal considerations into multimodal network planning. • MT-2: Work with regional entities to support electric multimodal options. • MT-3: Coordinate countywide adoption of consistent electric multimodal policies.

INTRODUCTION

In September 2022, representatives from Arapahoe County government (County) and local governments within Arapahoe County came together with key stakeholders, including regional organizations, state agencies, nonprofit organizations, CORE Electric Cooperative and Xcel Energy to develop a strategic plan for the region to coordinate and prepare for increasing an electrified transportation system. After the plan is adopted by Arapahoe County, these key stakeholders will continue to collaborate, and invite additional implementation partners as needed to participate. The strategies identified in this plan will be brought to life over the next 18 months and beyond. This effort builds on regional transportation planning to show that close collaboration is needed to support an equitable transportation electrification.

What is a Regional Electric Vehicle (EV) Action Plan?

This Regional EV Action Plan (Plan) is a strategic roadmap to guide Arapahoe County, its communities, and their partners toward a shared and cohesive regional vision for supporting plug-in electric vehicles in a growing region.

While simply switching gas- and diesel-powered vehicles to plug-in EVs will not reduce the number of vehicle miles traveled, the vehicle hours traveled, and traffic congestion, encouraging the switch to transportation modes such as transit and micromobility do provide an opportunity to reduce single occupancy vehicle trips and increase travel choices. Supporting the electrification of these transportation modes also offers the benefits that zero-tail pipe emission vehicles provide.

The Plan directly supports actions identified in the Arapahoe County Transportation Master Plan which identified building and supporting EV charging infrastructure as one way Arapahoe County can facilitate the transition to EVs. While the Plan sets a common vision for the region, it can also be used to inform community-level workplans (**Figure 1**).

This plan was developed collaboratively with a group of stakeholders, through four planning workshops conducted between January 2023 and July 2023. Stakeholders included representatives from nine local governments, two state agencies, two special districts, two non-profits, one council of governments, one regional transit service, one library service, one higher education institution, one business association and five businesses, CORE Electric Cooperative, and Xcel Energy, which provides electricity service to ten of the communities represented. See **Acknowledgements** for a complete list of individuals who participated. Xcel Energy Partners in Energy facilitated this group of

stakeholders (EV Action Team) throughout the process to help determine the components of this plan and shared resources and information to identify potential opportunities for implementation. **Appendix F** summarizes the public process that was involved to gather feedback to shape the draft plan.

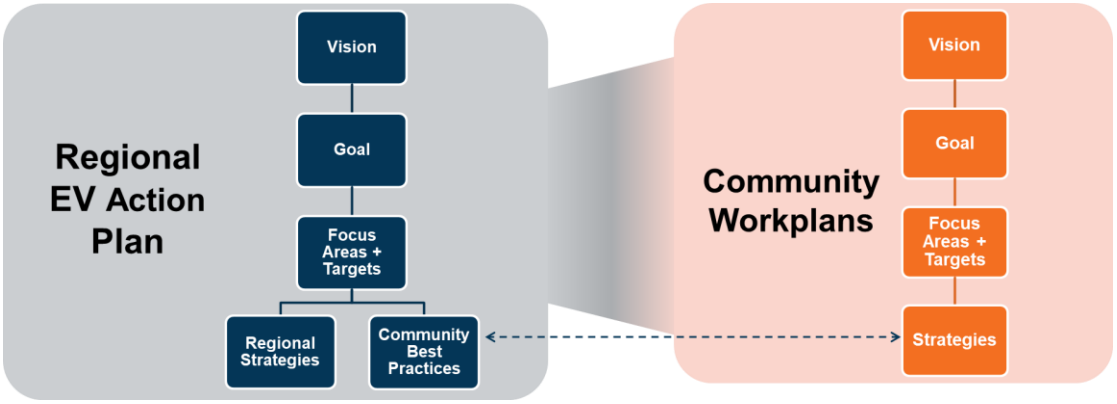


Figure 1. Regional and Community Plan Relationships

The Arapahoe County region joined more than 35 other Colorado communities that have developed EV and energy action plans through Xcel Energy's Partners in Energy, an offering that provides resources for community energy planning. Partners in Energy also supports 18 months of plan implementation, including marketing and communications, data tracking and analysis, program expertise, and project management to occur after the plan is formally adopted by Arapahoe County.

The components of the Regional EV Action Plan include:

- **Introduction:** A look at Arapahoe County communities' motivations for developing a Regional EV Action Plan.
- **Where We Are Now:** Relevant characteristics of the region's current EV landscape.
- **Where We Are Going:** Plan vision, projections, and focus areas.
- **How We Are Going to Get There:** Provides the list of strategies, organized by focus areas, a key for required resources, and context for the focus areas.
- **How We Stay On Course:** How the region will track progress toward the plan vision, and how it will adapt to a changing landscape in upcoming years.
- **Appendices:** Strategy details, additional information about EVs and charging infrastructure, available EV programs, EV adoption in the County, Supplemental Report from Arapahoe County, and information on the public feedback process.

Why a Regional EV Action Plan?

Each of the communities that participated in this planning process is interested and engaged in improving their community's transportation options. Preparing for plug-in EVs is a key component of these efforts because of state policy and goals, auto manufactures' commitments to transitioning to EVs, the myriad of federal, state, and utility funding opportunities. Another key factor is associated environmental and financial benefits, including greenhouse gas (GHG) emission reductions, air quality improvements, and in most cases, lower fuel and maintenance costs. The cost of EV ownership is not always less expensive than owning a similar gas power vehicle. Additional information about the Sustainability of EVs is in **Appendix B: Electric Vehicles 101 and Appendix E: Arapahoe County EV Supplemental Report**.

Prepare for Increased EV Adoption and Leverage Funding Opportunities

Plug-in EV adoption is increasing across Colorado including Arapahoe County. In 2019, Colorado adopted the Zero Emission Vehicle rule that requires automakers to sell a growing share of zero-emission vehicles each year and includes incentives to bring electric vehicles to Colorado (Colorado Energy Office, n.d.). In 2021 Colorado Department of Transportation (CDOT) approved the GHG Transportation Planning Standard that will require CDOT and the five metropolitan planning organizations to estimate the total greenhouse gas emissions expected from the transportation projects in their plans and ensure that their approved plans achieve individually set GHG reduction levels at four different time periods - 2025, 2030, 2040, and 2050 (Colorado Department of Transportation, n.d.). In June 2023, Colorado's Energy Code Board released model electric ready code with EV ready requirements, directed by the Building Greenhouse Gas Emissions bill (HB22-1362). More details are provided in **Related Planning Efforts.** Preparing for plug-in EVs is a key component for increasing transportation option efforts. More information can be found on current and projected future EV adoption in the **Where We Are Now** and **Where We Are Going** sections of this document plan.

Local governments are required to adopt and enforce a code that meets or exceeds the 2021 International Energy Conservation Code (IECC) and the state's model electric ready and solar ready code when updating any other building code after July 1, 2023, and the state's low energy and carbon code when updating any building code after July 1, 2026.

Significant funding is currently available for transportation electrification in support of federal, state, and utility GHG and EV goals. This plan identifies potentially applicable funding programs and will ensure that Arapahoe County and its partners are poised to leverage opportunities and prepare the County and its communities to maximize the local benefits of increased EV adoption. These funding sources should be considered in the cost of owning an EV vehicle.

Xcel Energy Grid Capacity and Electrification

Just as Arapahoe County is developing a Regional Electric Vehicle Action Plan to prepare and support the county for increased EV adoption, Xcel Energy is preparing the electric grid for anticipated future change. Every two years or so, Xcel Energy files an Electric Resources Plan with the Colorado Public Utilities Commission that outlines anticipated growth and load changes along with how the utility will accommodate that load. Xcel Energy looks at EV growth in Colorado as part of a comprehensive plan to transition the grid, including achievement of net zero carbon emissions by 2050 while keeping service reliable and customer bills low (Aguayo, 2023).

Reduce Greenhouse Gas Emissions

EVs can significantly decrease GHG emissions associated with on-road transportation, which overtook electricity generation as the largest source of GHG emissions in the U.S. in 2017 (Environmental Protection Agency, 2019). In Colorado in 2020, transportation displaced electricity generation as the largest source of pollution (State of Colorado, 2021). An Argonne National Laboratory analysis taking a holistic view of EVs, considered everything from raw material extraction to vehicle scrappage and the lifecycle GHG emissions from a small 2020 SUV had 48% fewer GHG emissions than a gasoline equivalent (Argonne National Laboratory, 2022). The amount of emissions reduced depends on the electricity generation fuel mix of the local electricity grid. National trends suggest that electric utilities are improving the emissions from electricity generation at a faster rate than fuel economy is improving in gas-powered vehicles. EV charging can be paired with solar and energy storage directly and through residential roof-top solar, commercial solar parking structures, and community solar to further reduce associated GHG emissions. In 2022, the energy

generated by the industry in Colorado was 36% renewable and 64% coal and gas. Xcel Energy has goals to reduce carbon emissions 80% by 2030 and to be carbon free by 2050 (Xcel Energy, 2023). By transitioning to cleaner energy sources, Xcel Energy is supporting its customers in reaching its customers' community goals of achieving carbon neutrality.

GHG emissions associated with electricity use in Xcel Energy's service territory will decrease in the future, further increasing the emissions gap between EVs and gas-powered vehicles. Today, Xcel Energy serves its Colorado customers with electricity that is 42% carbon-free and the utility has a goal to enable all vehicles to run on 100% carbon-free electricity by 2050 (Xcel Energy, 2023).

Xcel Energy Carbon-Free Electricity

Transportation electrification has the potential to significantly reduce greenhouse gas emissions. In 2022, 42% of Xcel Energy's Colorado electricity supply was generated from renewable resources (Xcel Energy, 2023) and that percentage is increasing. Research by the Union of Concerned Scientists showed that even in 2015, in every U.S. state, EVs resulted in lower lifecycle GHG emissions than did new gas- and diesel-powered vehicles (Union of Concerned Scientists, 2015). Xcel Energy's Carbon Reduction Plan establishes a commitment to reduce carbon emissions from electricity supplied to Colorado by 85% from 2005 levels by 2030, supplying 80% of electricity from carbon-free sources. This is anticipated to cut nearly five million tons of carbon emissions across 1.5 million electric vehicles (Xcel Energy, 2023).

CORE Electric Generation Goals

In addition to Xcel Energy, portions of Arapahoe County receive electric service from CORE Electric Cooperative. CORE (formerly Intermountain Rural Electric Association) provides electricity to over 300,000 customers in Colorado and has made a commitment to exceed the state's goal of reducing carbon emissions by 80% by 2030 (CORE, 2023). In 2021, the grid-supplied power provided by CORE was classified as 25% renewable (CORE, 2023).

Improve Air Quality

In addition to contributing a significant portion of greenhouse gas emissions, the transportation sector also produces pollutants such as particulate matter, nitrogen oxides, carbon monoxide, and volatile organic compounds which are harmful to respiratory health. According to the American Lung Association, the cumulative national public health benefits of transitioning to a nationwide electric transportation system by 2050 would save approximately 89,300 lives and avoid 2.2 million asthma attacks and 10.7 million lost workdays (American Lung Association, 2023). All-electric vehicles produce zero tailpipe emissions and plug-in hybrids (PHEVs) produce no tailpipe emissions when operating in all-electric mode (Office of Energy Efficiency & Renewable Energy, 2020). As the fuel mix for electricity continues to decarbonize, the magnitude of air quality benefits associated with electrifying transportation will increase.

Environmental Impacts

While there are positive environmental benefits due to the EVs, there are also negative impacts on the environment that are also a reality. These impacts can be found and persist in the generation of electricity, mining of rare earth materials used in batteries, manufacturing of batteries, battery disposal, and tire wear increase due to vehicle weight. There has been progress in minimizing the impacts of these items, however, not all of these impacts can be removed (**Appendix E**).

Potential for Lower Fuel & Maintenance Costs

While the average U.S. household spends about 13% of their annual income on transportation costs, that percentage is approximately 20% for the average Arapahoe County resident (Institute for Transportation and Development Policy, 2019) (Center for Neighborhood Technology, 2023).

Although cost savings vary based on vehicle type, driving patterns, and geographic region, the average driver spends about 60% less each year in fuel costs by driving an EV compared to a gas-powered vehicle (Consumer Reports, 2020). The transition to EVs would result in significant savings for the individual consumers and fleet operators. Over its lifetime, an EV tends to cost 50% less to maintain and operate as compared to a gas-powered counterpart (Consumer Reports, 2020). Though the retail price of many EVs is still higher, $4,600 more than the median gas-powered vehicle, this gap is expected to decrease as production of EVs scales up and the used EV market develops (The Washington Post, 2023). Additionally, federal, state, and utility incentives are available and can help to bring down the cost of EV purchase or lease below comparable gas-powered cars for some buyers.

Taking a Regional Approach to Electric Vehicles

Transportation systems are large, complex, and dynamic. The movement of people and goods is inherently regional, crossing boundaries and connecting the communities where we live and work. Further, air quality impacts from transportation do not abide by jurisdictional boundaries and are felt across the region. Arapahoe County communities recognize that electric vehicles must be thoughtfully approached to be implemented. Taking a collaborative, regional approach to electric vehicle planning will maximize Arapahoe County communities' collective ability to leverage funding, avoid duplication of effort, and support the effective design and implementation of transportation solutions that work for everyone across the region.

WHERE WE ARE NOW

To better understand the opportunities for electric vehicles in Arapahoe County, basic community characteristics are outlined below. Factors such as population growth, demographics, housing, and area employers help contextualize current and future opportunities for targeted outreach and partnerships.

Community Characteristics

Geography & Demographics

Arapahoe County is located along the Colorado Front Range and as part of the Denver metro region is one of the most heavily populated counties in the state. As of 2021, it is home to over 655,000 residents. The population has grown on average by approximately 1% annually since 2014 and has a total land area of nearly 800 square miles (U.S. Census Bureau, 2023). Land use varies significantly throughout the county with the west portion primarily considered an urban and suburban area and the east portion considered rural. Continued growth is expected to increase density in the current urban and suburban parts of the county and expanded development in more rural places on the east side. Running north-south in the east portion of the county is Interstate 25, an urban business corridor creating a major economic center and supports business development and expansion. Between 2020 and 2040, the number of households is expected to grow by 31% and employment by 39% (Arapahoe County, 2021). Travel demand is expected to accompany this growth with miles traveled in congestion to represent a 4% increase from 2020 to 2040 (Arapahoe County, 2021). Vehicle hours of travel (VHT) will also increase as congestion increases.

The County has critical transportation corridors including major highways (I-25, I-70, I-225, E-470, and numerous U.S. and state highways) and the Regional Transportation District (RTD) light rail system (D, E, H, R Lines). These land use and critical transportation characteristics of the county can influence EV-specific baseline data, such as EV ownership and infrastructure. Some key considerations by land use areas relevant to EVs are summarized in Table 1.

Table 1. EV Land Use Considerations

LAND USE	CONSIDERATIONS	EV IMPACTS
Urban	• Multifamily Housing & On-street Parking Considerations • Proximity to Public & Workplace Charging • Codes, Standards, Zoning & Permitting	• Potential for barrier to cost effective home charging • Lack of access to home charging may require more public and workplace charging • Communities may need to amend policies to allow public charging
Suburban	• Home Ownership & Parking Arrangements • Age of Home • Commute • Retail Areas	• Potentially easier access to home charging • Newer homes may not need electrical upgrades for charging equipment • Residents may have a longer commute • May have fewer but more dense retail areas with larger parking lots for public EV charging
Rural	• Limited Infrastructure & Geographic Distribution • Utility Infrastructure Needs • Utility Rates • EV Technology & Cost • Travel Corridors	• Open space with limited amenities may mean less opportunities for EV charging sites • Electrical capacity may be more limited requiring more electrical upgrades • With limited infrastructure electricity rates may be higher than denser population areas • More of a focus on pass through travel requiring fast charge stations • Generally rural residents or employees may have longer average trip lengths

Equitable Access

The median household income for the county was just over $84,000, which is approximately 2.6% higher than the state median. While the additional upfront cost of EVs remains a primary barrier, as battery prices continue to decline, so will the retail price of EVs. The price of most light-duty EVs (e.g., sedans, SUVs, and small trucks) is expected to be like that of gas-powered vehicles by the mid-2020s. As more first and second generation EVs enter into the nascent secondary market, access to EVs will increase. Dealer education and solutions to verify battery health for used EVs are a couple challenges that are being addressed. Arapahoe County's median household income presents an opportunity to leverage strategies aimed at reducing the upfront cost of EVs. These strategies may include connecting consumers to additional rebates and incentives such as the federal used clean vehicle credit, as well as providing them with information about the total cost of EV ownership.

Historically, access to EVs has not been equitably distributed across socioeconomic demographics. Many factors, including housing, commuting, and transportation characteristics covered below, can impact individual and community access to EVs. While many vehicle manufacturers are beginning to release lower-cost electric models, EVs and heavier-duty work vehicles typically have a higher price tag compared to some gas- and diesel-powered equivalents. Paired with additional up-front costs associated with electrical upgrades to support home charging, along with a limited used EV market, this means that for many people cost is still a significant barrier to purchasing an EV. Early adoption has thus predominantly been associated with more affluent demographics **(Appendix E)**.

In 2023, Colorado updated its definition of disproportionately impacted communities at the census block group scale. Disproportionately impacted communities include a variety of factors such as

income, race, housing costs, language, and historic marginalization, where multiple factors may contribute to persistent environmental health disparities, tribal lands, and mobile home locations.[1]

Figure 2 shows Colorado state defined disproportionately impacted communities and Xcel Energy designated Higher Emissions Communities (HEC) in Arapahoe County. HECs are characterized as being disproportionately affected by vehicle emissions-related air quality concerns and impacted by income inequality. These regions are also where enhanced incentives may be available to residents and businesses for EV infrastructure.

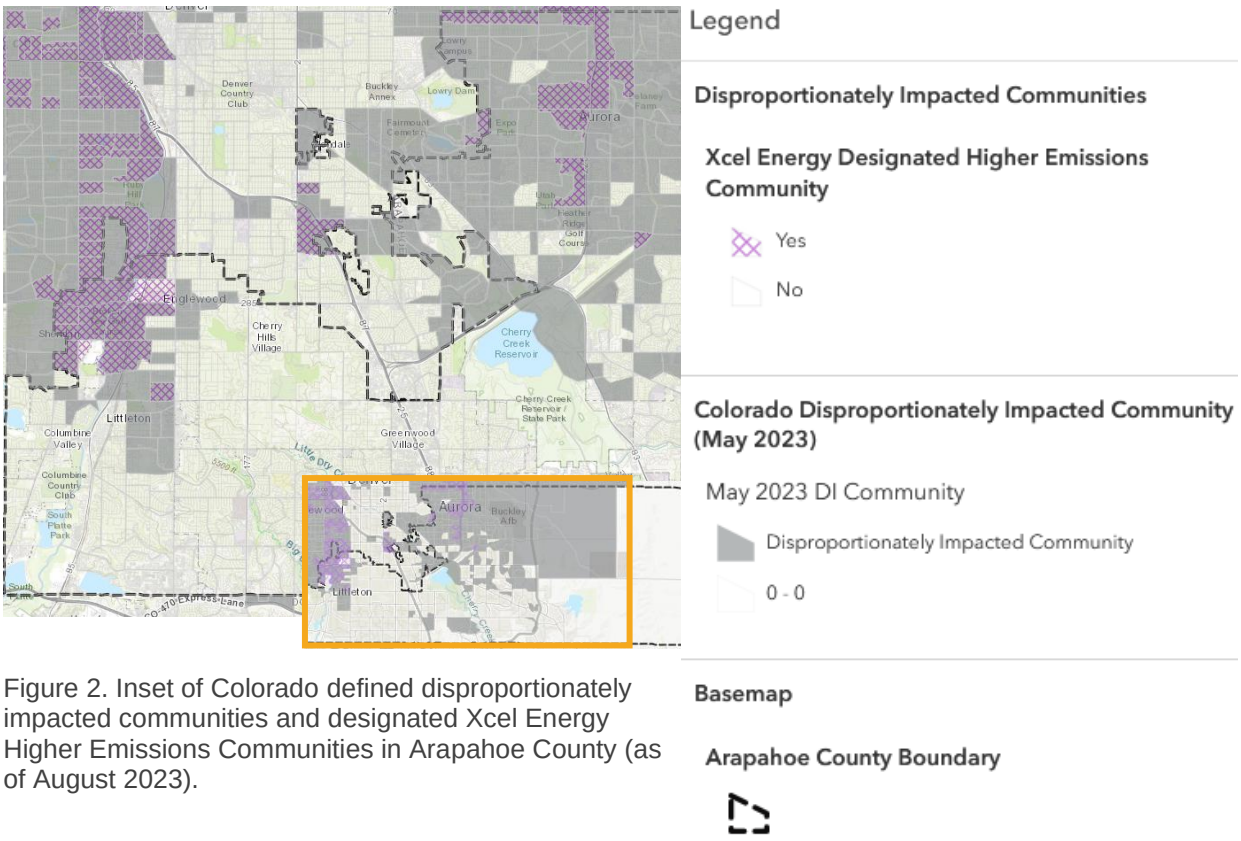


Figure 2. Inset of Colorado defined disproportionately impacted communities and designated Xcel Energy Higher Emissions Communities in Arapahoe County (as of August 2023).

Housing Characteristics

Two major housing factors facilitate a resident's ability to convert their personal vehicle to an EV: home ownership and parking access. Single family and townhome owners are more able to install EV charging than condominium and apartment owners or renters because they do not need to seek permission from another property owner to do so. Additionally, the investment in infrastructure will likely increase the value of their property. A 2021 U.K. study indicated that homes with a Level 2 charger sold for about 13% more than comparable homes (Riverdale Leasing, 2021). Conversely, renters of houses or apartments and condominium owners may not have permission from the property owner or homeowners association to install charging infrastructure and may be reluctant to invest in improving property they do not own. Some renters do not directly hold and pay for electric utility accounts and are therefore less able to take advantage of utility incentives for home charging. In addition, property owners may be slower to install charging infrastructure for tenants, although

[1] Complete information about the updated definition, factors, and the changes can be found at https://cdphe.colorado.gov/enviroscreen.

installing a charger may attract tenants as demand from renters grows. Single-family residences are likely to have parking access with personal garage space or carports to facilitate installation of charging stations, compared to multifamily residences which often rely on charging stations in shared parking facilities or public charging sites.

In Arapahoe County, 65% of homes are owner-occupied and 67% of homes are single-family residences. While this indicates that many households are likely to have access to charging at home, there is still a significant portion of the population who rent or live in multifamily housing and will have to overcome barriers to conveniently access charging. Additionally, those who live in single-family residences may still not have a garage or carport.

Every home is not immediately ready to charge an EV. Existing homes and multifamily buildings may require electrical upgrades for additional electrical capacity. Over 80% of homes in Arapahoe County are over 30 years old and may not have a grounded outlet in their garage, which is necessary for charging in their garage or carport and will require electrical upgrades (U.S. Census Bureau, 2023).

Commuting Characteristics

According to 2020 inflow and outflow census data, 67% of workers employed in Arapahoe County lived outside the county while 33% of the workers employed in Arapahoe County also lived in the county, as shown in **Figure 3** (U.S. Census Bureau, 2020). Additionally, the average commute for a resident in Arapahoe County was 26 minutes with 62% of workers driving alone. Nearly 26% of the population worked from home and approximately 12% of workers either carpooled, utilized other forms of transportation, or walked (U.S. Census Bureau, 2020). These commuting trends are generally aligned with means of transportation noted for the state (U.S. Census Bureau, 2023).

These reported commuting patterns have been impacted by the COVID-19 global pandemic, which significantly altered traditional workplace utilization. Updated data should be referenced once available as these changes may have a significant impact. Commuting patterns highlight the importance of providing access to charging infrastructure throughout the county, especially workplace charging stations, to support worker commuting and reduce the associated air pollution and greenhouse gas emissions.

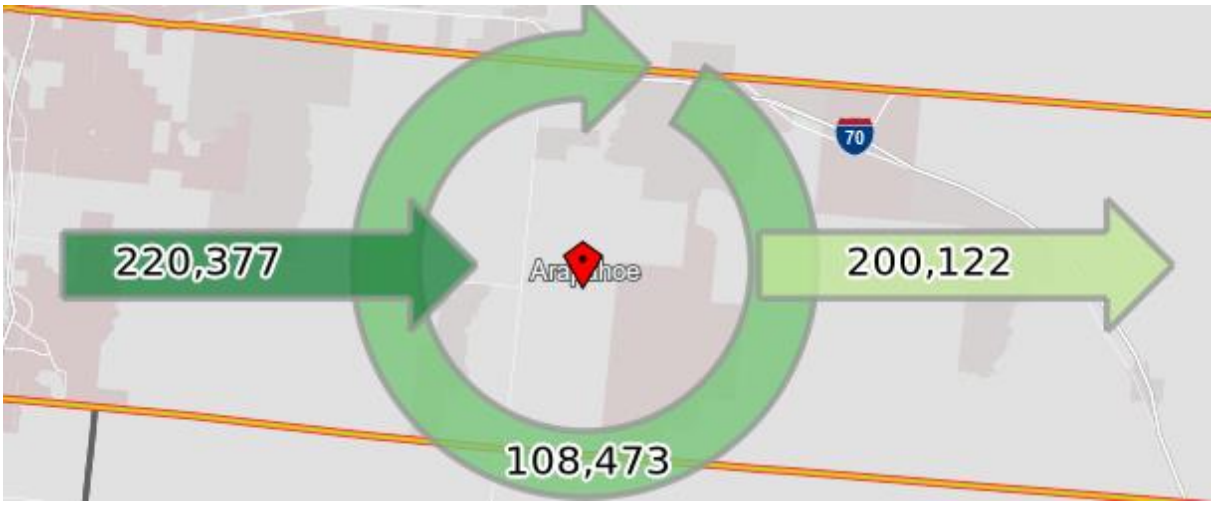


Figure 3. Inflow and outflow analysis for Arapahoe County.

Transportation and Housing Costs

Typically, homes are considered affordable when household costs, including mortgage and rental payments, property insurance, and utilities and fuels total less than 30% of a household's income. According to the Center for Neighborhood Technology, Arapahoe County households spend 26% of their annual income on housing costs (Center for Neighborhood Technology, 2023). According to the Housing and Transportation Affordability Index, in 2023 Arapahoe County households' average annual transportation costs total over $14,000 or 18% of their annual income. When combined with housing costs, Arapahoe County households spent an average of 44% of their annual income on housing and transportation (Center for Neighborhood Technology, 2023). If the higher upfront cost of an EV can be offset, the fuel savings and reduced maintenance costs present an opportunity to reduce a household's monthly costs and increase affordability.

Related Planning Efforts

This plan is supported by planning efforts at the state and local levels, as described below.

Colorado EV Plan 2023

The 2023 Colorado EV Plan is an update to the State's 2018 and 2020 plans and continues to accelerate adoption of EVs of all types in Colorado. The plan reinforces the state's existing goal of 940,000 light-duty EVs on the road by 2030 and establishes a new goal of 2.1 million on the road by 2035. These interim goals support a vision for 100% electric light-duty vehicles and 100% zero-emissions medium-duty vehicles. The plan identifies policies and programs by which to achieve these goals. It also includes a focus on personal and shared electric mobility along with cross-cutting initiatives that affect multiple parts of the transportation system.

Colorado National EV Infrastructure (NEVI) Plan

Beginning in 2022, each state is required to annually develop an EV Infrastructure Development Plan for approval by the Federal Highway Administration to receive the National Electric Vehicle (NEVI) Formula Program funds.

The Plan outlines the state's strategy for utilizing the NEVI formula program funding, which is expected to provide Colorado with $57 million over five years to deploy EV chargers along highway corridors with minimum standards such as compliant stations meeting number of charger and power requirements and corridors with charging stations at a maximum of 50 miles apart. It addresses the establishment and evaluation of build-out goals, the role of contracting with third parties, public engagement, equity for rural and disadvantaged communities, workforce considerations, and cybersecurity concerns. The corridors identified in Arapahoe County include Interstate 70, Interstate 25, and U.S. 285 and are shown in **Figure 4.**

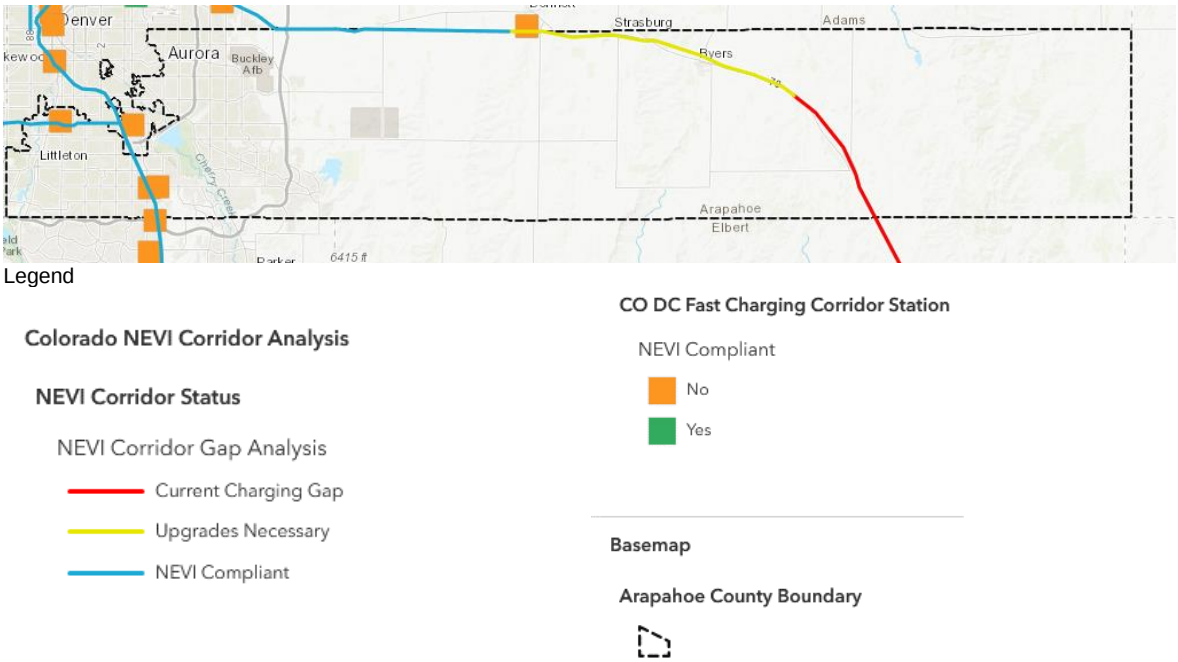


Figure 4. Designated Alternative Fuel Corridors in Arapahoe County are I-70, I-25, and US 285 as of June 2023.

Colorado Energy Code

In June 2022, the Energy Codes Board published the final Model Electric Ready and Solar Electric Ready Code. It specifies EV ready requirements for new residential, commercial, and multifamily properties (Colorado Energy Office, 2023)[2].

This package must be adopted by cities and counties with building codes when they update other building codes to the 2021 International Energy Conservation Code (IECC) between July 1, 2023 and July 1, 2026. Arapahoe County adopted the IECC in 2021; it became effective April 1, 2022.

In 2023, the state legislature passed legislation (HB23-1233) requiring, along with other EV parking requirements, that multifamily EV ready requirements from the Model Electric Ready Package go into effect statewide beginning March 1, 2024 (Colorado General Assembly, 2023).

Other related state planning efforts include the following listed below and can be referenced during implementation to help targeted efforts around medium- and heavy-duty vehicles. Also included are those who are disproportionately impacted by emissions from gas-powered vehicles and other environmental burdens.

- The **EV Equity Study** by the Colorado Energy Office (CEO) identifies barriers to EV access and addresses opportunities for a more equity-centered approach to transportation electrification and stakeholder engagement in Colorado. The study measures and maps

[2] The final Model Electric Ready and Solar Electric Ready package which includes the final code language, an explanatory version with annotated notes for various sections of the code, and a final code report that outlines the statutory requirements for the code and an overview of the process and discussions of the Energy Code Board, can be found at https://energyoffice.colorado.gov/climate-energy/energy-policy/building-energy-codes/energy-code-board. Accessed on June 1, 2023.

current electric vehicle registration, accessibility, and vehicle emission impacts in Colorado communities, and it also provides tools that will support the State in implementing recommended equity-centered practices.

- The Colorado Department of Public Health and Environment (CDPHE) developed a **Climate Equity Framework** to ensure that Colorado's response to climate change is guided by principles of racial equity and economic justice. This framework is used across state agencies, including CEO, to ensure that programs and policies in place include racial equity and economic justice considerations.
- The **2022 Colorado Clean Truck Strategy** is a joint effort of CEO, CDPHE, and the Colorado Department of Transportation (CDOT). The strategy includes a vision statement, goals, and actions designed to accelerate the adoption of clean medium- and heavy-duty vehicles, such as semi-trucks, school buses, snowplows, and others.
- The **CDOT 2021 Transit Zero Emission Vehicle Roadmap** is an adaptable guide for transit agencies, key stakeholders, and the State of Colorado to implement transit strategies contained within the 2020 Colorado Electric Vehicle Plan.

Community Planning Efforts

This plan can interact with existing community plans that address climate, mobility, affordability, and equity issues. More directly, this plan reinforces the following plans that directly support transportation and electrification.

- **Arapahoe County 2040 Transportation Master Plan (2021):** Provides a framework to help meet and manage the county's multimodal transportation system with the increase in population. It includes goals that promote efficient travel and continued coordination and management of the transportation system.
- **Arapahoe County 2035 Transportation Plan (2010):** This plan provides a baseline for connecting unincorporated Arapahoe County into the transportation network. It also provides context for past planning efforts.
- **Arapahoe County Energy Action Plan (EAP) (2020):** This is focused on identifying energy action goals for Arapahoe County facilities and developing actionable strategies. To ensure leadership, the EAP brought awareness, encouragement, and education to the Arapahoe County employees.
- **Aurora Places Comprehensive Plan (2018):** Aurora's comprehensive plan serves as a foundation for decision-making related to growth and development in Aurora. Goals include: a strong economy; a healthy community; easy mobility and active transportation; a diverse and equitable city, a thriving environment; housing for all; and an authentic Aurora.
- **Aurora Northeast Area Transportation Study (NEATS) (2018):** This area transportation plan extends across northeast Aurora, which includes portions of Arapahoe County north of Jewell Avenue. This plan provides a framework for the multimodal transportation network in this rapidly developing part of Aurora and forms the baseline for Aurora's pending Multimodal Transportation Master Plan that kicked off in late 2023.
- **City of Aurora Partners in Energy Plan (2021):** The Energy Action Plan is focused on equitably supporting the economic recovery and resilience of businesses, institutions, multifamily, and nonprofit organizations. Strategies include connecting Aurora's community members with information and resources to help reduce energy use and drive down operating costs. Aurora also tracks progress in environment goals in regularly published "Environment Aurora" reports.

- **Centennial 2040 Comprehensive Plan (2018):** This plan identifies Centennial as a community that stays ahead of new technologies, including transportation technologies like EVs.
- **Centennial Electric Vehicle (EV) Action Plan (2020):** Provides a roadmap for Centennial to increase EV ownership and use. Goals and strategies were identified for private adoption, municipal fleet, public charging, and EV-ready development.
- **Centennial Energy Action Plan (2018):** Outlines the next steps for Centennial to reach their energy efficiency and resiliency goals. Goals include increasing engagement and participation in Xcel Energy programs and conducting energy audits.
- **Cherry Hills Village Master Plan (2022):** This plan sets goals and strategies for the Village's land use, character, open space, transportation, City Center, infrastructure, and community services.
- **Englewood Energy Action Plan (2017):** Provides a roadmap for the city of Englewood to reduce total energy use annually in the municipal, commercial, and housing sectors.
- **Englewood Strategic Plan 2022- 2025 (2020):** This plan provides metrics for the following areas governance, community wellbeing, infrastructure and transportation, safety, economy, neighborhoods, and sustainability. By tracking progress, the city will continue to work towards each area's individual goals.
- **Englewood Electric Vehicle Action Plan (2023):** Provides a community-wide commitment to transportation electrification. Goals and strategies were identified for the municipal fleet, public charging, public EV adoption, and EV-ready codes for development.
- **Greenwood Village Comprehensive Plan (2018):** Guides land use and other decisions in Greenwood Village. Overall goals aim to promote and maintain high quality built and natural environment mitigating impacts from the built environment to the natural environment and to have a well-planned transportation system consistent with community values.
- **Littleton Energy Action Plan (2016):** This plan outlines what strategies Littleton has identified as priority to implement in municipal facilities, as well as lead by example when it comes to energy efficiency by type of equipment selected.
- **Littleton Comprehensive Plan (2019):** Provides a long-range vision for the city to apply sustainable solutions for the growth of Littleton. This includes programs and incentives that promote charging infrastructure.
- **Littleton Transportation Master Plan (2019):** Completed in October 2019, this plan helps to strategically address the challenges of facilitating mobility.
- **City of Sheridan Sustainability Plan (2023):** Identifies strategies for the City to equitably support sustainable practices throughout the organization and broader community.
- **Southeast Mobility Hubs Action Plan (2021):** Identifies strategies for enhancing mobility and sustainability in the areas around Yale, Southmoor, and Belleview Station along the City and County of Denver's southeast transit corridor. The study area included the stations as well as the surrounding communities within a one-mile buffer. The study primarily took place in Denver but included parts of Arapahoe County as well.

Electric Vehicle Baseline

Electric Vehicle Adoption Rates

Battery electric vehicle (BEV) and plug-in hybrid electric vehicle (PHEV) data were reviewed for this plan.

- A BEV is powered by an electric motor and does not require gasoline. These vehicles are fueled by plugging into a charging station and energy is stored in the battery.

- A PHEV contains both an electric motor and a gasoline engine. A PHEV will utilize the electric motor until the battery charge runs out and then will use the gasoline tank to support continued operation.
- To learn more about EVs, review **Appendix B: Electric Vehicles 101**.

At the end of 2021, there were nearly 5,500 EVs on the road in Arapahoe County, accounting for approximately 1% of all registered vehicles (Arapahoe County Department of Motor Vehicles, 2023). This adoption percentage is consistent with state of Colorado trends (U.S. Department of Energy, 2023). **Table 2** shows the split between BEVs and PHEVs in Arapahoe County. The municipalities within the county that contributed the most in total to the on-road EV count are Aurora (39%), Centennial (23%), as well as Englewood and Littleton (both at 10%). The communities with the highest total percent of EVs when compared to registered vehicles were Cherry Hills Village (5%), Bow Mar (3%), and Greenwood Village (3%). This represents an opportunity for communities to identify and understand current adoption patterns and incentivize siting of public charging stations to keep pace with adoption trends. **Appendix D: Aprapahoe County EV Baseline Detail** additional details on total EV adoption by community.

Table 2. Arapahoe County vehicle registration totals.

EV Registration Data	Total (received 4/2023)
Battery EVs	3,899
Plug-in hybrid EVs	1,562
Total EVs	**5,461**
Total registered vehicles in Arapahoe County	*559,129*
Total EVs as a percent of registered vehicles	***1%***

Electric Vehicle Charging Ports

A public charging station is any EV charging station that is accessible to the public whether that is owned or operated by a private entity or government or on private or government property. These play a key role in helping residents feel confident that charging infrastructure is available to support their EV. Further, although most EV owners tend to rely heavily on their home as their primary charging location, homeowners of older homes and renters are more likely to rely on public charging stations. Public charging also addresses equity concerns by providing access to residents who live in multifamily homes, use on-street parking, or choose not to charge their vehicles at home.

There are three primary types of EV chargers: Level 1, Level 2, and DC fast charging (DCFC). Level 1 & 2 chargers require lower voltage and cost less to install but take longer to recharge a battery. According to Xcel Energy's 2021-2023 Transportation Electrification Plan Semi-Annual Report, average residential Level 2 charger and installation costs are about $800, while average wiring costs are about $1,500 (Xcel Energy, 2023, p. 9). The same report notes that for both assigned and shared parking for multifamily properties, the average cost of completed installed projects is approximately $30,000 per Level 2 port and includes both the EV supply infrastructure (EVSI) and charging equipment (Xcel Energy, 2023, p. 16). And finally for commercial installations, completed projects averages are a little over $28,000 per Level 2 port and again includes EVSI and charging equipment (Xcel Energy, 2023, p. 18). These costs are before any incentives to reduce the cost. DC fast chargers will quickly charge a battery but are significantly more expensive. Consistently using a

higher than necessary charger may negatively impact a battery's lifespan, which may make some charger types unsuitable for different users. To learn more about the types of chargers available, review **Appendix B: Electric Vehicles 101**.

There are 317 public Level 2 charging ports and 61 public DC fast charging ports in operation in Arapahoe County including Glendale as of September 2023 (U.S. Department of Energy, 2023) (**Figure 5**).

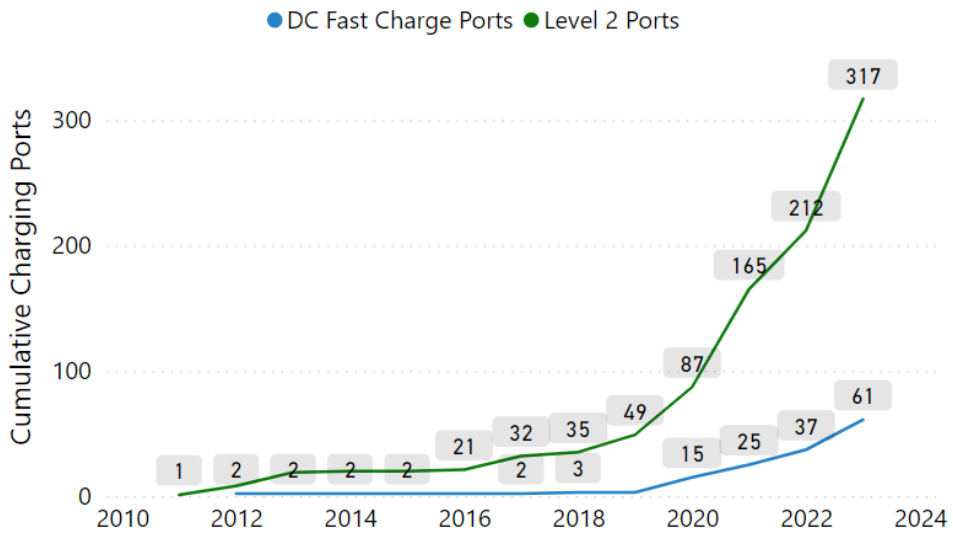


Figure 5. Cumulative Charging Ports in Arapahoe County, September 2023 (Atlas Public Policy, 2023).

A map of current EV charging stations within Arapahoe County, including Glendale, is shown in **Figure 6**. The map indicates gaps in public charging in the eastern rural areas and along key corridors including E-470 and I-70 and in more densely populated communties.

Figure 6. Arapahoe County EV charging locations.

The reliability of charging stations is an important aspect to EV adoption and EV ownership, but there have been overall customer satisfaction issues with existing charging stations. The documented issues of charging stations being unavailable range from cellular connections issued to credit card readers failures (**Appendix E**).

WHERE WE ARE GOING

Our Vision Statement

To help guide the planning process and plan implementation, the Planning Team developed the following vision statement.

Arapahoe County and communities will partner to support safe, reliable, innovative, affordable, and equitable electric transportation options that improve air quality.

Future EV Adoption in Arapahoe County

In support of Colorado's EV goals – and considering emerging policies, programs, and technologies – the Colorado Energy Office developed scenarios projecting the number of electric vehicles anticipated on Colorado's roads by 2025 and 2030 (Colorado Energy Office, 2019). Based on the scenarios in this EV growth analysis, scaled for population and vehicle ownership rates, Arapahoe County could expect to see increased EV adoption, as shown in **Figure 7**. The County will monitor EV adoption throughout the implementation of this Regional EV Action Plan to understand the impact of plan strategies and adjust as needed. The key metric of the percent of total registered light-duty vehicles that are EVs in Arapahoe County referenced in **Table 6** of the **Tracking and Reporting Progress** section later in the Plan, will be used to determine future County involvement in EV adoption in the region.

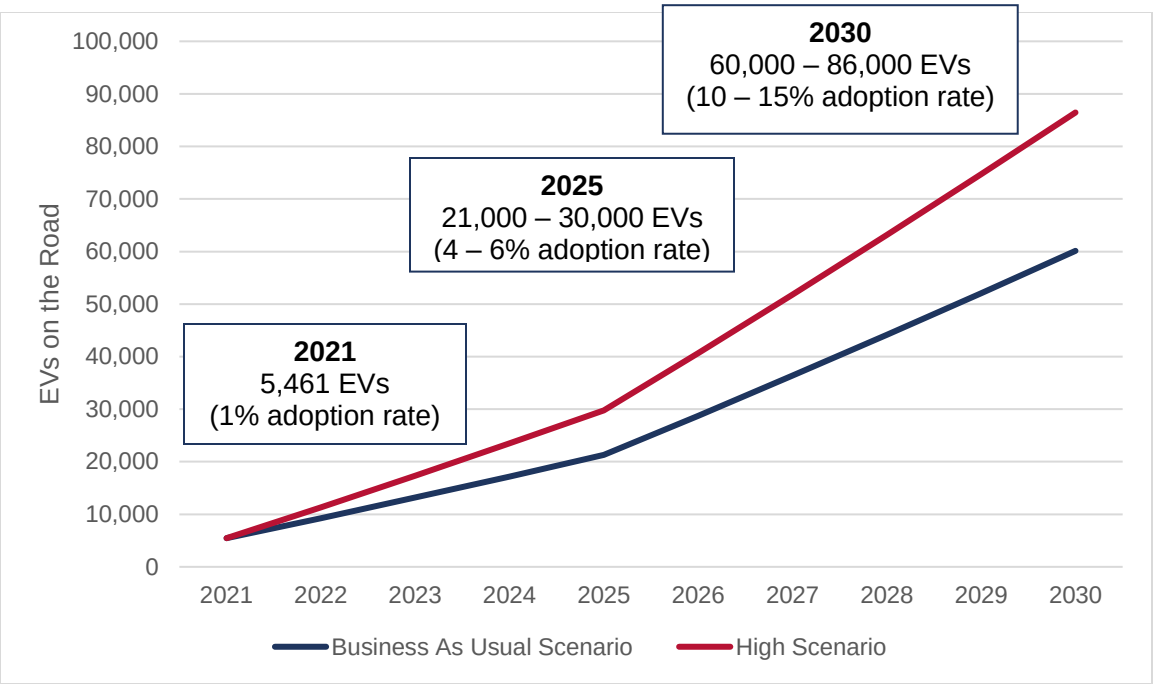


Figure 7. Projected EVs on the Road in Arapahoe County based on Colorado Energy Office Business as Usual and High scenarios scaled to Arapahoe County zip codes (Colorado Energy Office, 2019).

EV adoption includes both battery electric and plug-in hybrid light-duty vehicles. The strategies in this plan support the State of Colorado's EV Plan 2030 goal and overall address different facets of EV planning, infrastructure, and education. It is important to note that current EV ownership is not equitably distributed, and skews toward higher-income residents in more urban and suburban areas. This plan also prepares for EVs in rural areas and works toward a scenario where the benefits of electrified transportation are accessible and enjoyed by all Arapahoe County residents.

EV charging installations must keep pace with EV adoption. According to a 2021 study completed by the International Council on Clean Transportation (ICCT) for the Colorado Energy Office, it is estimated that Arapahoe County will need to significantly increase the number of available charging ports to meet projected EV adoption by 2030 (International Council on Clean Transportation, 2021).

The total number of ports includes public Level 2 ports as well as corridor- and non-corridor DCFC ports (**Table 3**), but does not include home (single-family or multifamily residences), workplace, or fleet charging stations that are not listed as open to the public. **Table 3** also shows the number of additional EV chargers needed by 2030 above 2023 counts. To contribute to equitable access to EV adoption, charging ports will also need to be equitably distributed across Arapahoe County, increasing charging ports for residents in multifamily residences to access, in rural communities, and in disproportionately impacted communities. The County will monitor EV charger installations throughout the implementation of this Regional EV Action Plan to understand the impact of plan strategies and will be reassessed in 2028. Through the assessment the County will have a better understanding of the need for more local government involvement in the establishment of charging stations. At this time, the County is taking a wait and see approach and this Action Plan does not commit the County to fund current and future charging stations.

Table 3. Arapahoe County EV existing, projected and additionally needed charging port numbers.

Year	Public Level 2	DC fast non-corridor	NEVI DC fast corridor	Total
Sept 2023	317	53	8	**378**
2030 (projected need)	2,470	604	26	**3,100**
2030 (additional charging ports needed)	2,153	551	18	**2,722**

Focus Areas

The Planning Team identified the following focus areas to help organize and prioritize strategies (**Figure 8**).

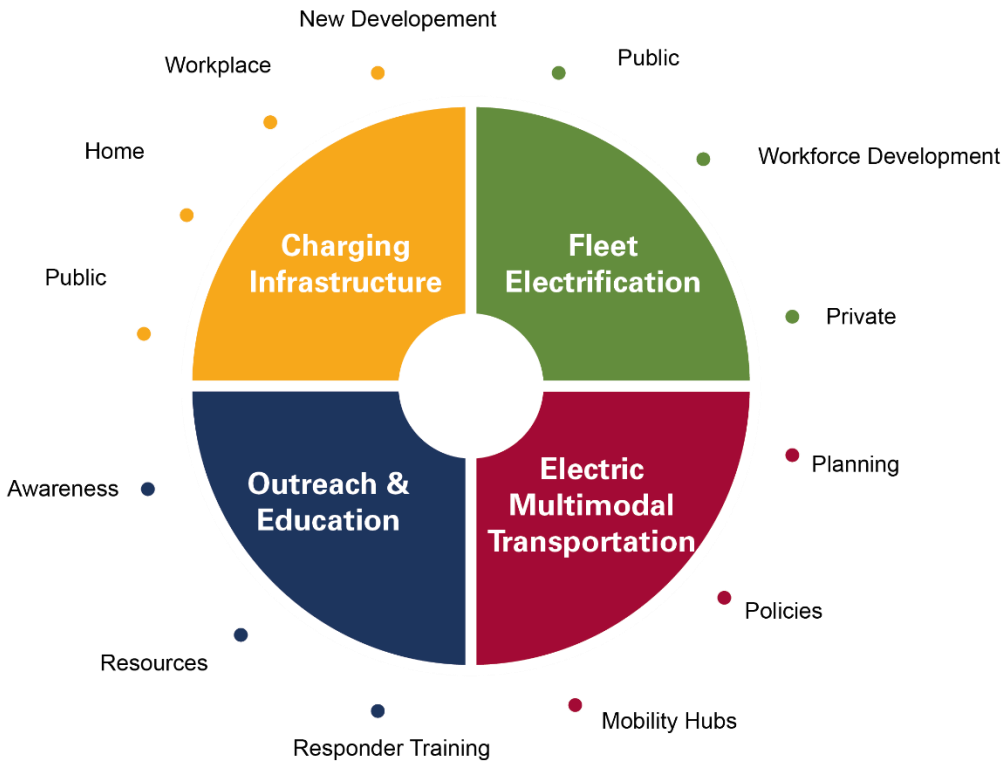


Figure 8. Focus Areas and the Topics Covered.

These focus areas help organize the plan strategies to help achieve the plan vision and prepare the County for increased EV adoption.

- **Outreach and Education:** Educating residents, businesses, and first and second responders about EVs.
- **Charging Infrastructure:** Supporting the development of convenient and accessible charging infrastructure.
- **Fleet Electrification:** Supporting the decision process to purchase or lease plug-in electric vehicles for public and private sector fleets.
- **Electric Multimodal Transportation:** Ensuring expanding electric transportation options such as transit and micromobility.

HOW WE ARE GOING TO GET THERE

For each focus area, the Planning Team identified the following strategies to implement for 2024 and beyond to work toward the vision of a large-scale and equitable transition to zero-emission vehicles (**Table 4**). Detailed action plans were developed for short- and medium-term strategies and can be found in **Appendix A: Strategy Details**.

Table 4. Priority Strategies

Focus Area	Strategies
Outreach and Education	**Short- and Medium-Term Strategies** • EO-1: Conduct communitywide EV outreach. • EO-2: Conduct annual community surveys to understand existing barriers to EV adoption. • EO-3: Support EV training opportunities for first and second responders. **Longer-Term Strategies** • Partner with dealerships to promote consistent EV education during the sale process. • Host educational events for specific audiences (e.g., offices and rural residents). • Partner with motor vehicle services to share EV resources, including during the vehicle registration process.
Charging Infrastructure	**Short- and Medium-Term Strategies** • CI-1: Map potential locations for public charging stations. • CI-2: Develop EV charging outreach materials for developers. • CI-3: Increase public charging infrastructure through installations at public sites and promoting funding opportunities and resources. **Longer-Term Strategies** • Require or incentivize large parking facilities to install charging stations. • Coordinate countywide adoption of consistent EV requirements for new developments and existing buildings.

	▸ Compile and share best practices for design standards and fee structures for charging stations
Fleet Electrification 	**Short- and Medium-Term Strategies** ▸ FE-1: Encourage public fleets to conduct fleet analyses to recommend opportunities for electrification. ▸ FE-2: Develop fleet electrification resources and conduct outreach to engage regional and local fleets. ▸ FE-3: Support EV training opportunities for mechanics and technicians. **Longer-Term Strategies** ▸ Partner with business organizations to support business fleet electrification. ▸ Coordinate installation of fleet charging infrastructure across municipalities. ▸ Develop zoning code about where fleets and facilities may house large quantities of batteries (e.g., vehicles and EV repair shops).
Electric Multimodal Transportation 	**Short- and Medium-Term Strategies** ▸ MT-1: Incorporate electric multimodal considerations into multimodal network planning. ▸ MT-2: Work with regional entities to support electric multimodal options. ▸ MT-3: Coordinate countywide adoption of consistent electric multimodal policies. **Longer-Term Strategies** ▸ Research electric multimodal options to identify associated benefits challenges and infrastructure needs. ▸ Expand electric micromobility infrastructure (e.g., charging ports and e-bike lockers at mobility hubs). ▸ Explore opportunities to develop a micromobility battery swap program.

Required Resources

To help the County plan for these strategies, the estimated County financial costs and County staff time commitments for each strategy are included in the full strategy tables (**Appendix A**) based on the key below. The Action Plan is a high-level plan and has categorized the implementation costs at a high level. These costs will vary depending on the details that are to be determined and that are not known at this time.

Resource Table Icon Key

Implementation Costs	
$	From existing budget.
$$	Moderate impact to operations and/or modest capital project.
$$$	High impact to operations and/or larger capital project.

Staff Time Required	
	Can be supported with existing staffing, minimal effort.
	Requires moderate staff time, temporary or part-time resources.
	Requires new staff to be hired or contracted to implement/maintain.

Focus Area: Outreach and Education

This focus area aims to increase awareness of and training about EVs and EV charging to support those who live, work, and visit Arapahoe County to make informed decisions about sustainable transportation options. Addressing questions and concerns from Arapahoe County and its communities will ensure relevant and accurate information. Additionally, emergency responders in the County need to be trained in advanced technology vehicles and infrastructure to respond to instances in a safe and appropriate manner. Strategies include community outreach, input into barriers and concerns through a community survey, and support for training emergency responders.

Outreach and Education Context

Despite progress made toward electrifying vehicles across Colorado, many barriers to EV adoption still exist. Some of the most common barriers to adoption of EVs include lack of familiarity with products and technology, lack of knowledge of available incentives, higher up-front cost of electric vehicles, and range anxiety (National Renewable Energy Laboratory, 2017). In a 2020 Colorado study, 66% of respondents who drive EVs indicated they have a fear of running out of EV charge before reaching their destinations, even though the typical daily commute for most (80%) is 30 miles or less per day – well within the typical EV charge range (E Source, 2020). Education about EVs and promotion of tools to identify EV charging locations paired with outreach about state and federal programs can support more adoption of electrified transportation.

Outreach and Education Strategies

The following strategies were identified as short- and medium-term strategies and detailed action plans were developed. Additional strategy details, including the audience, targets, required resources, key activities and timeline of action steps, roles and responsibilities, and available resources and longer-term strategies, are outlined in **Appendix A: Strategy Details**. Longer-term strategy details will need to be developed during a plan update.

Strategy EO-2: Conduct communitywide EV outreach.

Strategy EO-1: Conduct annual community surveys to understand existing barriers to EV adoption.

Strategy EO-3: Support EV training opportunities for first and second responders.

Focus Area: Charging Infrastructure

This focus area aims to increase the number of publicly available charging stations and awareness of options for and accessibility to EV charging at workplaces and home. Strategies include mapping favorable charging station locations and outreach efforts with resources to inform about how to reduce charging installation costs for local governments, businesses, and developers.

Charging Infrastructure Context

Access to convienent and affordable EV charging infrastructure is a critical component to supporting EV adoption across the region. The most convenient and cost-effective charging is at home and workplaces and therefore an important priority (**Figure 9**). Charging at home is easiest for homeowners and single-family home residents, while those living in multifamily housing developments or those without off-street parking, frequently face additional barriers to charging at home. Average EV charger installation costs are noted perviously in the section **Electric Vehicle Charging Ports**. Education and outreach tailored to these different scenarios can encourage more drivers to switch to EVs. Workplace charging supports employees charging at their workplace and supports those who may not have access to home charging.

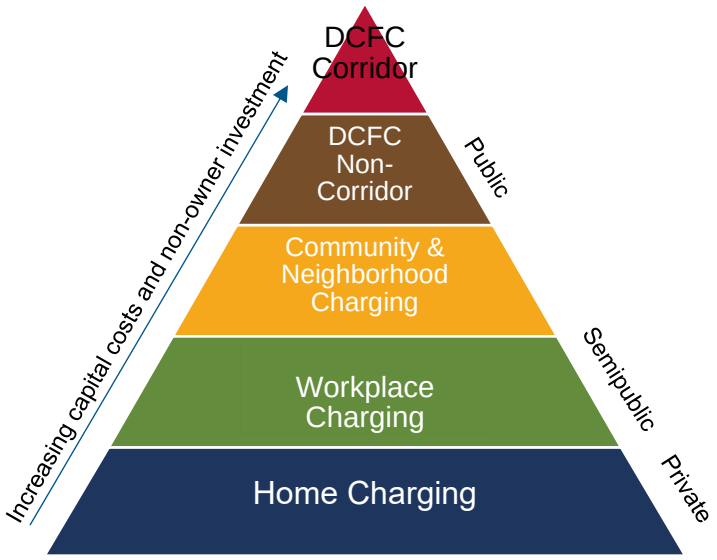


Figure 9. EV Charging Infrastructure Categories and Priorities (Winn, 2019).

Public charging stations, charging stations available to the public, are critical to ensuring charging access for longer-distance commuters, visitors, those without access to home charging, and transportation services (e.g., ride hailing and delivery fleets). Similar to gas stations, they provide convenient options for those who need to recharge on their route. They are a visible indicator of a community's EV commitment and may reduce range anxiety by assuring those interested in purchasing an EV that charging is easily available.

The Colorado State Legislature passed the Building Energy Codes law (HB22-1362 Building Greenhouse Gas Emissions) in May of 2022 and directed the Energy Code Board to develop model electric ready code. The legislation directs that cities and counties with building codes must adopt at least the 2021 International Energy Conservation Code when they update other building codes between July 1, 2023 and July 1, 2026. This adoption must include the electric and solar ready provisions in the model electric ready and solar ready code. The EV readiness code establishes minimum requirements for new residential, commercial, and multifamily developments (Colorado Energy Office, 2023).

Regional Highlights

- CORE received a Charge Ahead Colorado grant to install eight EV charging stations including one DC fast charger in the Town of Deer Trail.
- The City of Englewood set a goal where 100% of multifamily properties with 30 units or more will have public charging within a quarter mile by 2030.

Charging Infrastructure Strategies

The following strategies were identified as short- and medium-term strategies and detailed action plans were developed. Additional strategy details, including the audience, targets, required

resources, key activities and timeline of action steps, roles and responsibilities, and available resources and longer-term strategies, are outlined in **Appendix A: Strategy Details**. Longer-term strategy details will need to be developed during a plan update.

Strategy CI-1: Map potential locations for public charging stations

Strategy CI-2: Develop EV charging outreach materials for developers.

Strategy CI-3: Increase public charging infrastructure through installations at public sites and promoting funding opportunities and resources.

Focus Area: Fleet Electrification

This focus area aims to support fleets as they begin to consider and plan to transition their fleet vehicles to electric (light-, medium-, and heavy-duty) including the planning needed for vehicle replacement, infrastructure planning and installation, maintenance facilities, and retraining the fleet's service and maintenance staff and vehicle operators. Priority strategies for this focus area include promoting advisory resources and other resources, conducting fleet outreach, creating partnerships, for outreach and infrastructure development, and determining codes and policies related to EVs.

Fleet Electrification Context

Fleets are diverse in their purpose, operations, and in the geographic area they traverse. Based on these characteristics, some fleets provide a great opportunity for electrification, such as public fleets, high-milage fleets, and fleets that operate with a central depot. Public fleets are setting targets and goals to increase the number of EVs in their fleets. For example, the City of Centennial has taken action to prepare for an electric fleet, and the City of Englewood set a goal in its EV Action Plan by 2030, 20% of the light-duty fleet will be electric.

EVs are a rapidly evolving technology, and many fleet operators are unaware of the options, the funding opportunities, and don't know how to electrify their fleets. Education and outreach need to be paired with solutions that support fleet operators in their electric transition. Fleet managers want to see evidence of cost savings and operational reliability along with support with infrastructure, maintenance and service and staff training or retraining to confidently switch their fleet.

Regional Highlights

- Arapahoe County, the City of Englewood, and the City of Littleton have participated in fleet analyses that have guided them in preparing and transitioning their fleet to electric.

Fleet Electrification Strategies

The following strategies were identified as short- and medium-term strategies and detailed action plans were developed. Additional strategy details, including the audience, targets, required resources, key activities and timeline of action steps, roles and responsibilities, and available resources and longer-term strategies, are outlined in **Appendix A: Strategy Details**. Longer-term strategy details will need to be developed during a plan update.

Strategy FE-1: Encourage public fleets to conduct fleet analyses to recommend opportunities for electrification.

Strategy FE-2: Develop fleet electrification resources and conduct outreach to engage regional and local fleets.

Strategy FE-3: Support EV training opportunities for mechanics and technicians.

Focus Area: Electric Multimodal Transportation

This focus area aims to increase transportation solutions and to integrate them into a more holistic transportation system that is accessible to all residents and abilities through planning, policies, and partnerships. Strategies include adding charging infrastructure at transit stops, incorporating electric mobility options into transportation planning, and developing consistent policies for electric mobility.

Electric Multimodal Transportation Context

Electrified transportation is more than just transitioning gas-powered vehicles to EVs. Electrified transportation solutions also include electrifying transit and micromobility such as e-bikes and e-scooters. Colorado communities have and are continuing to encourage alternative transportation solutions. Since people and goods commonly move at a regional level, creating regionwide infrastructure, plans, and policies will help build safe and consistent transportation solutions for those traveling across the region. Partnerships with regional transportation and planning entities and will be foundational for successful progress in mobility options.

Regional Highlights

- The vision and goals of the Arapahoe County 2040 Transportation Master Plan include promoting alternative transportation solutions and improving bicycle path infrastructure and transit services.
- The City of Englewood's Downtown Development Authority conducted a Multimodal and Parking Study to identify opportunities for supporting micromobility in the study area.

Electric Multimodal Transportation Strategies

The following strategies were identified as short- and medium-term strategies and detailed action plans were developed. Additional strategy details, including the audience, targets, required resources, key activities and timeline of action steps, roles and responsibilities, and available resources and longer-term strategies, are outlined in **Appendix A: Strategy Details**. Longer-term strategy details will need to be developed during a plan update.

Strategy MT-1: Incorporate electric multimodal considerations into multimodal network planning.

Strategy MT-2: Work with regional entities to support electric multimodal options.

Strategy MT-3: Coordinate countywide adoption of consistent electric multimodal policies.

HOW WE STAY ON COURSE

Implementation Approach

An effective plan is cyclical in nature (**Figure 10**) and requires flexibility and course adjustment to be successful and to sustain progress. It will be important that strategies are evaluated and updated throughout implementation to reflect advancements and new offerings from the transportation industry and Xcel Energy.

Participating local governments in the County can also use this Plan taking a variety of actions that can include formally adopting or recognizing the plan, using the plan to inform local government leaders and their community, or to develop city staff work plans.

Figure 10. Actions and Tracking.

To facilitate this adaptive implementation approach, two teams will be formed:

1. A **Project Management (PM) Team** will meet monthly. The PM Team will be comprised of a County staff member and two or three municipality staff members, with support from Xcel Energy Partners in Energy. The role of the PM Team will be to coordinate tracking and meetings with the larger Implementation Team. The PM Team will also oversee progress tracking and provide cross-pollination and supporting resources to ensure regional efforts are all working toward the plan vision and preparing for increasing EV adoption.
2. An **Implementation Team** will be formed to carry out the action steps identified for each strategy. Recognizing capacity limitations, this group will divide into subgroups that may be organized by focus area. Specific roles for Arapahoe County communities and other

partners will be defined for each strategy based on leadership and influence, expertise, interest, and capacity. Each subgroup will identify deliverables and report progress out to the larger group during quarterly (or other regular interval) Implementation Team meetings. Sequencing of the strategies the subgroups will work on is illustrated in **Table 5.**

Table 5. Anticipated Strategy Timeline (preliminary and subject to change)

	Q2 2024	Q3 2024	Q4 2024	Q1-Q2 2025	Beyond
STRATEGY BY FOCUS AREA					
EO-1: Conduct communitywide EV outreach.					
EO-2: Conduct annual community surveys to understand existing barriers to EV adoption.					
EO-3: Support EV training opportunities for first and second responders.					
CI-1: Map potential locations for public charging stations.					
CI-2: Develop EV charging outreach materials for developers.					
CI-3: Increase public charging infrastructure through installations at public sites and promoting funding opportunities and resources.					
FE-1: Encourage public fleets to conduct fleet analyses to recommend opportunities for electrification.					
FE-2: Develop fleet electrification resources and conduct outreach to engage regional and local fleets.					
FE-3: Support EV training opportunities for mechanics and technicians.					
MT-1: Incorporate electric multimodal considerations into multimodal network planning.					
MT-2: Work with regional entities to support electric multimodal options.					
MT-3: Coordinate countywide adoption of consistent electric multimodal policies.					

Tracking and Reporting Progress

To ensure this plan remains on track, the Project Management team will track progress and report key metrics identified in this plan on an annual basis.

Tracking the key metrics in **Table 6** will provide an understanding of strategy impact. Additionally, these metrics will provide insight into the development of Arapahoe County's EV landscape and be used to inform adjustments, if needed. The results may also be shared with the Arapahoe County Board of County Commissioners and the wider community to provide transparency around the implementation process and recognize the collaborative efforts of those involved.

Table 6. Key EV adoption and charging metrics.

Metric	Baseline	Data Source
Percent of total registered light-duty vehicles that are EVs in Arapahoe County	1% (5,461 registered EVs at the end of 2021)	Arapahoe County Department of Motor Vehicles (DMV), 2023
Charging ports by type and location within Arapahoe County	378 (317 level 2 and 61 DCFC in September 2023)	Atlas Policy EValuateCO, 2023

Beyond the Plan Horizon

Looking beyond the plan implementation horizon, it is recommended that the plan stakeholders periodically reassess the strategy targets and successes achieved over the implementation period. Based on lessons learned and new resources (e.g., anticipated state and federal EV programs), the plan should be updated with any necessary projection adjustments and new strategies that reflect available technologies and other advancements. The Xcel Energy Partners in Energy EV Toolkit can be a good resource for identifying new strategies to address unexpected barriers that may come up.

APPENDIX A: STRATEGY DETAILS

This appendix includes implementation details for each proposed strategy, including the audience, targets, required resources, key activities and timeline of action steps, roles and responsibilities, and available resources.

Outreach and Education Strategy Details

Strategy EO-1: Conduct communitywide EV outreach.

Leverage Colorado Energy Office (CEO) education and outreach materials to launch municipal and County marketing to promote EVs and related resources that are segmented to address the needs and interests of different demographics. Include outreach in English and Spanish.

Audience

- Residents
- Commuters
- Visitors

Target

- Conduct four outreach activities in disproportionately impacted communities, defined by the state, and four outreach activities in other areas of the county by end of strategy timeline. Include specific outreach to non-English speakers at community events.
- Determine and track metrics for each outreach activity (e.g., attendance and impressions) by end of strategy timeline.

Required County Resources

Budget	Staff Time
$ From existing budget.	Requires moderate staff time, temporary or part-time resources.

Key Activities and Timeline

Action Steps	Timeline
1. Leverage State of Colorado and Drive Clean Colorado EV outreach resources to debunk common myths related to EVs, purchase/lease opportunities, available incentives, cost of ownership, information about qualified installers for chargers charging infrastructure for home and where public stations are, and electric micromobility options.	Q2 2024
2. Build outreach plan: a. Develop key messages for diverse audiences (e.g., pros and cons of EVs, tips on buying a used EV, tips for renters asking their landlords for charging, how to plan your EV road trip). b. Determine which outreach channels to use to reach diverse audiences (e.g., County Fair, farmers markets, food pantries, GED or citizenship classes, houses of worship, social media, billboards, and virtual meetings). c. Confirm roles for content creation and distribution. 3. Develop timeline for distribution.	Q3 2024
4. Develop a county project webpage to act as a landing page for all outreach materials and activities.	Q4 2024
5. Implement outreach plan.	Q4 2024 – Q2 2025

6. Evaluate outreach plan successes and lessons learned, to inform future plans, including outreach to workforce development programs.	Q3 2025

Roles and Responsibilities

- **Arapahoe County:** Develop project webpage and support distribution of outreach materials and support collaboration with community-based organizations to ensure messaging, materials, and communication channels will serve diverse community groups.
- **County Partners:** Support development of the outreach plan and distribution of outreach materials, as well as collaboration with community-based organizations to ensure messaging, materials, and communication channels will serve diverse community groups.
- **Xcel Energy Partners in Energy:** Support outreach material development and distribution.
- **State Agencies:** Share customizable outreach resources from the EV CO campaign and other programs.
- **Drive Clean Colorado:** Lead development of outreach materials and support distribution.
- **Chambers of Commerce in Arapahoe County:** Support distribution of outreach materials.
- **Other Potential Partners:** community-based organizations, dealerships, and volunteers who drive EVs, Colorado Auto Dealers Association.

Available Resources

- State EV CO campaign materials.
- DCC EV resources.
- Colorado Department of Transportation (CDOT) E-Mobility Education and Awareness Grant.

Strategy EO-2: Conduct annual community surveys to understand existing barriers to EV adoption.

Develop and conduct a community- and fleet-focused survey to identify and understand current existing barriers to EV adoption for different segments of the population and track how those barriers change over time to determine strategies to address the barriers.

Audience

- Community members.

Target

- Conduct a community survey with a minimum response rate of 10% by end of strategy timeline.

Required County Resources

Budget	Staff Time
$ From existing budget.	Can be supported with existing staffing, minimal effort.

Key Activities and Timeline

Action Steps	Timeline
1. Determine survey method and outreach plan for an annual survey (e.g., through vehicle registration process).	Q2 2024
2. Develop survey focused on identifying and understanding current existing barriers to EV adoption for community members.	Q2 2024 – Q3 2024

a. Include education context into survey tool. b. Can include questions related to i. Single-family and multifamily charging challenges. ii. Demand and concerns related to used EV. c. Include an option for respondents to opt-in to receive EV resources. d. Translate survey into other languages. e. Determine if focus group(s) with key communities beneficial as part of survey.	
3. Conduct the survey and analyze results. a. Conduct survey as determined in Step 1 possibly via vehicle registration process or community and organization outreach (e.g., newsletters, social media, and events).	Q4 2024 and ongoing
Roles and Responsibilities	
• **Arapahoe County:** Lead hosting/administering survey and outreach plan. • **County Communities:** Support promotion/distribution of the survey and consider incorporating key questions into existing citizen surveys. • **Xcel Energy Partners in Energy:** Lead development of survey questions. • **State Agencies:** Support development of survey. • **Drive Clean Colorado:** Support development and promotion of the survey. • **Arapahoe Community College:** Distribute the survey to students and employees. • **REAP:** Distribute survey to service area. • **Other Potential Partners:** CORE, Clerk and Recorder Office, Denver South, Arapahoe County Health Department.	
Available Resources	
• Existing community focused surveys from other communities.	

Strategy EO-3: Support EV training opportunities for first and second responders.

Work with first responders (police, fire, emergency medical personnel, road maintenance personnel) and second responders (worker who supports first responders and are involved in preparing, managing, returning services, and cleaning up sites during and after an event requiring first responders) to understand resources and training needed to safely respond to and handle emergencies involving EVs. Identify existing resources and training and explore collaboration with other regions and the State to fill training needs.

Audience	
• First Responders serving Arapahoe County (e.g., police, EMS, and volunteer fire departments). • Second responders (e.g., tow-truck operators).	
Target	
• Engage with at least ten first and second responder agencies by end of strategy timeline.	
Required County Resources	
Budget	**Staff Time**
$ From existing budget.	 Can be supported with existing staffing, minimal effort.

Key Activities and Timeline	
Action Steps	**Timeline**
1. Inventory existing training programs and survey first and second responders to understand what training they are already receiving such as fire suppression for battery chemistry.	Q4 2024
2. Based on research findings, determine what type of support the County and its partners should provide and develop a plan to implement that support.	Q1 2025
Roles and Responsibilities	
• **Arapahoe County:** Support inventory of existing sources and lead survey of first and second responders in their own communities. • **County Communities:** Support inventory of existing sources and survey of first and second responders. • **Xcel Energy Partners in Energy:** Lead inventory of existing resources. • **State Agencies:** Support inventory of existing resources. • **Drive Clean Colorado:** Support inventory of existing resources and surveying. • **Arapahoe Community College:** Work with administration to reach out to large first and second responders to understand existing training related to EVs and their desire for increased training. • **E-470:** Support inventory of existing resources and survey of first and second responders. • **Other Potential Partners:** South Metro Fire District, State Patrol.	
Available Resources	
• National Transportation Safety Board recommendations. • Existing first responder training examples such as National Fire Protection Association (NFPA) and General Motors EV First Responder Training program. • NFPA database of emergency response guides for alternative fuel vehicles.	

Longer-Term Strategies

- **Partner with dealerships to promote consistent EV education during the sale process.**
- **Host educational events for specific audiences (e.g., offices and rural residents).**
- **Partner with motor vehicle services to share EV resources, including during the vehicle registration process.**

Charging Infrastructure Strategy Details

Strategy CI-1: Develop EV charging outreach materials for developers.

To facilitate access to resources, to aid in electric vehicle adoption in the community, a summarized guide of utility, state, federal, and other resources will be created to help developers and contractors more easily navigate what is available for new development and redevelopment projects. Resources can be adapted from the strategy CI-2: Promote public charging funding opportunities and resources.

Audience
• Developers and contractors serving Arapahoe County.
Target
• Increase public charging ports by 25 at new development by 2025.
Required County Resources

Budget	Staff Time
$ From existing budget.	Can be supported with existing staffing, minimal effort.

Key Activities and Timeline

Action Steps	Timeline
1. Build outreach plan: a. Inventory existing community building codes to help inform messaging for developers on EV readiness requirements, especially considering requirements for multifamily developments in HB23-1233. b. Develop key messages (e.g., How are you being sustainable? Do you know about these resources? Outline the business benefits of adding public charging.) c. Identify opportunities to collect feedback and share information through the development review process (e.g., initial consultation, planning, and building departments). d. Determine other outreach channels for direct outreach (e.g., Chambers of Commerce in Arapahoe County, economic development organizations, and one-on-one interviews). e. Develop timeline for implementation.	Q2 2024
2. Develop materials targeted to developers and contractors based on outreach plan. a. Resources can be adapted from CI-2: Promote public charging funding opportunities and resources.	Q3 2024
3. Implement outreach strategy and use results to inform outreach with developers and builders.	Ongoing

Roles and Responsibilities

- **Arapahoe County:** Support development of resources, hosting materials, and distribution to local businesses and organizations.
  - Connect with Building and Planning Divisions to provide input on what resources would be helpful.
- **County Communities:** Lead distribution to local developers and contractors.
- **Xcel Energy Partners in Energy:** Develop outreach strategy and materials that can be easily updated as new resources become available.
- **Xcel Energy:** Provide support in resource development.
- **Other Potential Partners:** CORE, Colorado Association of Homebuilders.

Available Resources

- Examples of related resources from other communities.
- Federal, state, and local programs and funding.

Strategy CI-2: Map potential locations for public charging stations

Review existing public charging stations including micromobility opportunities, community demographics, travel corridors, equity factors, and current best practices to identify locations where public charging would be most used and most critical for driving adoption. This mapping will also

provide opportunities to learn about what electric grid infrastructure upgrades may be needed to reach the Colorado EV goal. The map can then be used in outreach to potential host sites for public charging and/or mobility hubs. This strategy will also support other strategies identified in this plan, including identification of preferable locations for fleet charging.

Audience	
• Arapahoe County • County Communities	
Target	
• N/A	
Required County Resources	
Budget	**Staff Time**
$ From existing budget.	Can be supported with existing staffing, minimal effort.
Key Activities and Timeline	
Action Steps	**Timeline**
1. Develop site selection criteria for Level 2 and DCFC stations, such as distance from existing stations, proximity to multifamily housing, locations with dual purpose, availability of existing parking (e.g., large parking lots), safety features (e.g., lighting, cameras) availability of enhanced incentives, where infrastructure improvements are needed, land use, proximity to travel corridors. a. Leverage data from existing sites (e.g., Charge Ahead Colorado data) and studies to determine highest use charging locations and known best practices to inform criteria. b. Consider how the proportion of Level 2 and DCFC stations needed can be applied to criteria development.	Q2 2024
2. Based on selected criteria, identify key data points, and features to be included on the map. a. Key data points could include existing charging stations, Alternative Fuel Corridors and associated charging stations, publicly owned parcels (e.g., parking garages/lots), demographics (e.g., vulnerability mapping inputs), federal and state designated disadvantaged communities, transit stops/routes, business districts, housing information, current and future land use, population density and growth projections, and infrastructure availability. b. Explore opportunities to incorporate planned sites (e.g., CDOT, E470, private companies, community planning and building departments). c. Coordinate with relevant agencies to gather selected data points.	Q2 2024
3. Develop the map with relevant data sources with considerations of how the map can be updated in the future by the County and its partners. Create a layer on ArapaMap to show collected information.	Q3 2024

4. Use the map to determine locations and recommended level of charging (Level 2 or DCFC). a. The Arapahoe County Open Spaces Department is interested in placing a charging station at Arapahoe County Fair Grounds.	Q3 – Q4 2024
5. Consider local electrical infrastructure capacity or applicability for solar charging.	Q1 2025
6. Develop supportive outreach materials that summarize benefits and available incentives for installation of charging infrastructure at priority locations.	Q1 – Q3 2025
7. Share results with local communities to conduct outreach to identified properties or, if publicly owned, to facilitate installation of charging infrastructure.	Q1 – Q3 2025

Roles and Responsibilities

- **Arapahoe County:** Lead site selection criteria development and support map development by providing data to include in the map.
- **County Communities:** Support site selection criteria and map development by providing data to include in the map.
- **County Partners:** Support site selection criteria and map development by providing data to include in the map and support outreach to targeted businesses.
- **State Agencies:** Support map and site selection criteria development.
- **Drive Clean Colorado:** Support outreach to identified property owners.
- **Xcel Energy Partners in Energy:** Lead map development and updates and support site selection criteria development. Develop materials to support outreach. Discuss potential electrical grid updates. Support assessment of local electric infrastructure capacity.
- **Xcel Energy:** Support assessment of local electric infrastructure capacity.
- **Other Potential Partners:** CORE, AAA.

Available Resources

- U.S. Department of Energy charging station data.
- U.S. Department of Transportation equity mapping.
- CEO enhanced incentive for transportation programs map.
- CDOT national EV infrastructure analysis map.
- U.S. Census Bureau demographic data

Strategy CI-3: Increase public charging infrastructure through installations at public sites and promoting funding opportunities and resources.

Compile and/or create a suite of available resources on the financial and technical resources to reduce the cost of installation to share through various channels that support the County, communities, businesses, and (both public and private sectors) in installing public EV charging stations and electrified micromobility stations. This strategy will utilize CI-1 Map potential locations for public charging stations.

Audience

- County
- Communities
- Business owners
- Local organizations

Target

- Increase public charging station ports by 20 at existing County and community facilities, businesses, and other locations by 2025 to continue to meet demand by end of strategy timeline.

Required County Resources

Budget	Staff Time
$$$ High impact to operations and/or larger capital project. (For County EV charger infrastructure procurement)	 Requires moderate staff time, temporary or part-time resources. (For County owned EV chargers)

Key Activities and Timeline

Action Steps	Timeline
1. Create and implement outreach plan for businesses and organizations to learn about EV programs and electrified micromobility options. a. Develop key messages (e.g., available local, utility, state, and federal EV programs and opportunities, business case resources) by audience (e.g., businesses, organizations, public entities, and properties eligible for enhanced incentives). b. Determine which outreach channels to use (e.g., County/Drive Clean Colorado website and business association meetings). c. Confirm roles for content creation and distribution. d. Develop timeline for distribution.	Q2 2025 and beyond
2. Using the map created from Strategy CI-1 Map potential locations for public charging stations and applying for funding opportunities identified. Begin to install public charging stations at County-owned sites and community-owned sites.	Q2 2025 and beyond
3. Continue to update resources about EV programs and opportunities.	Q2 2025 and beyond

Roles and Responsibilities

- **Arapahoe County:** Support development of resources, hosting materials, and distribution to local businesses and organizations.
- **County Communities:** Lead distribution to local businesses and organizations.
- **Xcel Energy Partners in Energy:** Lead development of resources.
- **Xcel Energy:** Support development of EV resources.
- **State Agencies:** Provide information about State charging programs.
- **Drive Clean Colorado:** Support distribution of outreach materials and provide coaching support to property owners interested in hosting public charging stations.
- **Chambers of Commerce in Arapahoe County:** Support distribution of outreach materials.
- **REAP:** Support distribution of outreach materials.
- **Other Potential Partners:** CORE, business improvement districts.

Available Resources

- State EV CO campaign materials.
- DCC EV resources.
- Colorado Department of Transportation (CDOT) E-Mobility Education and Awareness Grant.

Longer-Term Strategies

- **Require or incentivize large parking facilities to install charging stations.**
- **Coordinate countywide adoption of consistent EV requirements for new developments and existing buildings.**
- **Compile and share best practices for design standards and fee structures for charging stations.**

Fleet Electrification Strategy Details

Strategy FE-1: Encourage public fleets to conduct fleet analyses to recommend opportunities for electrification.

Diversifying fleets to include EVs will take time as some fleet vehicles are operational for many years and may filter from one department to another or from one service to another. It is imperative to plan, schedule, and budget for vehicle replacement needs and the associated charging infrastructure needed to operate fleet assets.

Audience	
• Public fleet directors or fleet managers. • Budget/finance departments. • Community leadership (e.g., City Manager and elected officials). • Sustainability managers.	
Targets	
• Ten public fleets participate in a fleet analysis (e.g., county communities, school districts, and Metro District) by end of strategy timeline.	
Required County Resources	
Budget	**Staff Time**
$ From existing budget.	 Can be supported with existing staffing, minimal effort.
Key Activities and Timeline	
Action Steps	**Timeline**
1. Inventory fleet electrification advisory outreach materials to ensure it describes what the fleet analysis does and does not do.	Q2 2024
2. Develop outreach materials (e.g., flyer, newsletter copy, and website copy) and a case study with public fleets within County that have completed fleet electrification (e.g., Arapahoe County and Englewood) describing the process.	Q2 2024
3. Introduce communities to fleet electrification through outreach materials and meetings. a. Fleet focused meeting or existing event (e.g., ride and drive).	Q3 2024
Roles and Responsibilities	
• **Arapahoe County:** Completed Xcel Energy's Fleet Electrification Advisory Program (FEAP) and beginning to plan to implement electrification based on the results in a separate effort. Support development of case study and share resources for fleets through appropriate outreach channels. • **County Communities:** Participate in fleet analysis programs as applicable.	

• **Xcel Energy Partners in Energy:** Support creating outreach materials informing communities and private fleets of program. Connect to Xcel Energy Clean Transportation team. • **Other Potential Partners:** CORE.
Available Resources
• Colorado Energy Office and CDPHE fleet materials. • CORE EV programs. • Drive Clean Colorado fleet advising services.

Strategy FE-2: Develop fleet electrification resources and conduct outreach to engage regional and local fleets.

Develop fleet-focused resources for regional and local fleets to support increased education and awareness of how to plan and budget for a fleet transition. Include information on available EVs, charging infrastructure, total cost of ownership analysis, and available federal, state, and local programs and funding opportunities and employee education. This includes conducting outreach to engage regional and local fleets and includes holding a ride and drive event.

Audience	
• Public fleet directors or fleet managers. • Private fleet directors or fleet managers.	
Target	
• Hold 1 regional ride and drive event by end of strategy timeline.	
Required County Resources	
Budget	**Staff Time**
$ From existing budget.	 Can be supported with existing staffing, minimal effort.
Key Activities and Timeline	
Action Steps	**Timeline**
1. Inventory regional and local fleet operators.	Q2 2025 and beyond
2. Research existing resources and best practices for fleet transition and identify gaps in fleet-focused resources (e.g., one pager of resources, fleet transition planning process, cost comparison information, resource of available and suitable EVs for fleet needs. Include State bid options and charging infrastructure, charging services information, and staff training).	Q2 2025 and beyond
3. Coordinate and convene regional and local fleets to understand: a. Existing regional fleet EV adoption and charging practices. b. Barriers to expanded EV adoption and charging. c. Interest in distributed and/or centralized shared charging location(s).	Q2 2025 and beyond
4. Develop and compile fleet electrification and employee education resources to share with fleets.	Q2 2025 and beyond
5. Develop an outreach plan targeting local fleets.	Q2 2025 and beyond

a. Potential outreach could include sharing resources and funding opportunities through email/newsletter lists and social media and hosting a fleet electrification workshop.	
6. Hold a ride and drive event.	Q2 2025 and beyond
7. Conduct outreach through communities' channels and partnerships with local entities. a. Hold peer-to-peer learning opportunity.	Q2 2025 and beyond

Roles and Responsibilities

- **Arapahoe County:** Support resource development and lead outreach plan.
- **County Communities:** Support fleet identification, resource development, and outreach plan.
- **Drive Clean Colorado (DCC):** Support resource development and ride and drive event. Provide fleet coaching for those that are interested.
- **REAP:** Support resource development and outreach efforts.
- **Xcel Energy Partners in Energy:** Lead development and compiling of fleet resources and support outreach plan development.
- **Xcel Energy:** Support engagement of local fleets and provide support for Xcel Energy program engagement.
- **Denver South:** Support fleet outreach efforts.
- **Other Potential Partners:** CORE, Chamber of Commerce in Arapahoe County and economic development organizations.

Available Resources

- DCC EV resources.
- Colorado Department of Transportation (CDOT) E-Mobility Education and Awareness Grant.
- Inflation Reduction Act programs.
  - Tax credits.
  - Vehicle grants.
- State programs targeted to entities with fleets.
  - Colorado Department of Public Health and Environment (CDPHE) Clean Fleet Enterprise.
  - Colorado Energy Office (CEO) Charge Ahead Colorado.
  - CEO Fleet Zero-Emission Resource Opportunity.

Strategy FE-3: Support EV training opportunities for mechanics and technicians.

Promote existing EV training workforce development offerings and support the development of new offerings as needed. This may include offerings for mechanics, technicians, and electricians that want training in EVs and charging infrastructure. It may also benefit disadvantaged workers, who often have trouble accessing workforce pipelines, and/or workers from local, under-resourced, and underemployed communities.

Audience

- Auto mechanics and technicians.
- Potential new workers to EVs and associated infrastructure.

Target

- Contact one to two technical colleges or schools and one to two existing workforce development programs to find out what EV programs they offer or what needs are of interest by end of strategy timeline.

Required County Resources	
Budget	**Staff Time**
$$ Moderate impact to operations and/or modest capital project.	Requires moderate staff time, temporary or part-time resources.

Key Activities and Timeline	
Action Steps	**Timeline**
1. Identify and promote Arapahoe Community College programs and any other community colleges and trade schools along the Front Range and across the state that are already offering workforce training related to EVs.	Q2 2025 and beyond
2. Identify ways to support other existing workforce development efforts through other regional partners such as: a. CDOT's Zero Emission Vehicle (ZEV) Workforce Development program awardees. b. Drive Clean Colorado EV education efforts. c. Other regions in the state such as Boulder County. d. Efforts from unions, companies, and fleets.	Q2 2025 and beyond
3. Identify and reach out to other existing workforce development programs for opportunities to incorporate EV offerings. a. Start with solar, weatherization, and other synergistic workforce development programs. b. Partner with community colleges, school districts, Arapahoe/Douglas Works Workforce Center, Colorado Clean Tech Industries Association (CCIA), She's in Power, and others.	Q2 2025 and beyond
4. If additional new workforce development programs are needed, research EV workforce programs in other communities to determine best practices to inform the development of new programs in Arapahoe County. a. Align with funding opportunity through CDOT's ZEV Workforce Development program.	Q2 2025 and beyond

Roles and Responsibilities

- **Arapahoe County:** Support and promote existing, new, or expanded workforce development programs within the County. Develop or expand workforce development programs.
- **County Communities:** Lead outreach to existing local workforce development programs to understand existing EV offerings and/or opportunities to incorporate EV offerings. Promote existing, new, or expanded workforce development programs within the community.
- **State Agencies:** Support development of new or expanded workforce development programs.
- **Drive Clean Colorado:** Continue to lead education efforts and support development of new or expanded workforce development programs.
- **Arapahoe Community College:** Continue to lead education programs and support development of new or expanded workforce development programs.
- **Chambers of Commerce in Arapahoe County:** Promote existing, new, or expanded workforce development programs within the County. Support development of new or expanded workforce development programs.

• **Xcel Energy Partners in Energy:** Lead research on workforce development programs in other communities. • **Other Potential Partners:** Community Resources Department (Arapahoe/Douglas Works!), Workforce development organizations, Auto dealers, and high school programs (e.g., Cherry Creek Innovation, Epic High School, etc.).
Available Resources

• CDOT ZEV Workforce Development Grant.
• State Programs - CDPHE Clean Fleet Enterprise – Workforce Development
• Federal Programs
  ○ Clean Heavy-Duty Vehicle Program
  ○ Grants for Buses and Bus Facilities Program
  ○ Low or No Emission Vehicle Program

Longer-Term Strategies

- **Partner with business organizations to support business fleet electrification.**
- **Coordinate installation of fleet charging infrastructure across municipalities.**
- **Develop zoning code about where fleets and facilities may house large quantities of batteries (e.g., vehicles, EV repair shops).**

Electric Multimodal Transportation Strategy Details

Strategy MT-1: Incorporate electric multimodal considerations into multimodal network planning.

Coordinate with the Arapahoe County Transportation Master Plan and Arapahoe County Transit and Micromobility Study to explore micromobility and transit options. Include investigating technology options, cost implications, and funding resources for local community transit vehicles and associated infrastructure and distinct electric micromobility infrastructure needs.

Audience	
• Arapahoe County • County communities and community development authorities • RTD • TMAs	
Target	
• Determine feasibility for regional and community opportunities for electric micromobility and transit options and vehicle transitions by end of strategy timeline.	
Required County Resources	
Budget	**Staff Time**
$ From existing budget.	Requires moderate staff time, temporary or part-time resources.
Key Activities and Timeline	
Action Steps	**Timeline**
1. Identify interested community partners for transit and micromobility options.	Q3 2024
2. Research examples of the types of electrification and electric micromobility options and best practices.	Q3 – Q4 2024

3. Explore what communities are interested in and what funding may be available for these initiatives.	Q4 2024
4. Gather estimates for vehicles/equipment.	Q4 2024
5. Estimate infrastructure needs and associated costs.	Q4 2024
6. Develop feasibility report with recommendations for next steps based on findings, as appropriate.	Q1 2025

Roles and Responsibilities

- **Arapahoe County:** Lead convening of interested partners.
- **County Communities:** Support community interests.
- **RTD:** Support research of electrification and electric micromobility interests and feasibility study.
- **Xcel Energy Partners in Energy:** Support research of electrification and electric micromobility interests and feasibility report.
- **State Agencies:** Support research of electrification, electric micromobility interests, and best practices.
- **Drive Clean Colorado:** Support research of electrification interests.
- **Other Potential Partners:** Micromobility service providers, TMAs, disability organizations and advocates, surrounding counties/communities.

Available Resources

- Grants for buses and bus facilities.
- Low-no emissions vehicle program.
- State E-bike rebate program.
- State EV readiness planning.

Strategy MT-2: Work with regional entities to support electric multimodal options.

Identify with RTD, South Suburban, and other regional organizations, using the Arapahoe County Transit and Micromobility Study outcomes, to install charging infrastructure at transit sites such as park and rides, include electric micromobility infrastructure, and overall further electric mobility options at transit locations. This strategy will be supported by CI-1 Mapping Public Charging Station Locations.

Audience

- RTD
- Arapahoe County
- County Communities

Target

- N/A

Required County Resources

Budget	Staff Time
$$ Moderate impact to operations and/or modest capital project.	 Requires moderate staff time, temporary or part-time resources.

Key Activities and Timeline

Action Steps	Timeline
1. Using the Arapahoe County Transit and Micromobility Study outcomes, coordinate and with relevant communities and determine interest, share potential options and address	Q2 2025 and beyond

questions/concerns about EV charging and electric micromobility infrastructure at transit locations.	
2. Work with RTD, express interest and determine feasibility of installing EV chargers (determine need for parking structure analysis for weight) and electric micromobility infrastructure at transit locations.	Q2 2025 and beyond
3. Using the map from CI-1, determine with RTD and County communities potential siting locations for electric mobility infrastructure at park and rides and light rail stations within Arapahoe County.	Q2 2025 and beyond
4. County, communities, RTD and Xcel Energy align on capacity and funding opportunities.	Q2 2025 and beyond
5. Install EV chargers as determined by project.	Q2 2025 and beyond

Roles and Responsibilities

- **RTD:** Support County and communities in siting and planning for EV charger installation at park and rides in Arapahoe County.
- **Arapahoe County:** Co-lead siting and planning for EV charger installation at park and rides in Arapahoe County.
- **County Communities:** Co-lead siting and planning for EV charger installation at park and rides in own community.
- **State Agencies:** Support RTD in developing plan for EV chargers at park and rides.
- **Drive Clean Colorado:** Support RTD in developing plan for EV chargers at park and rides.
- **Xcel Energy Partners in Energy:** Support RTD in developing plan for EV chargers at park and rides.
- **Xcel Energy:** Support EV charger installation.
- **Other Potential Partners:** Transportation Management Associations (e.g., Denver South TMA), disability organizations and advocates.

Available Resources

- Xcel Energy public charging programs.
- Charge Ahead Colorado.
- Federal Charging and Fueling Infrastructure Discretionary Grant.

Strategy MT-3: Coordinate countywide adoption of consistent electric multimodal policies.

Arapahoe County and communities to explore and develop best practices for consistent policies for electric mobility options. This might include aligning rules on where micromobility vehicles, such as electric bikes and scooters, can ride, defining mobility hubs, how public charging stations are used, charging station design, curbside management, and e-bike education.

Audience

- Arapahoe County
- County Communities
- Recreation Districts

Target

- Develop consistent policy for electric multimodal mobility options by end of strategy timeline.

Required County Resources

Budget	Staff Time
$ From existing budget.	Requires moderate staff time, temporary or part-time resources.

Key Activities and Timeline	
Action Steps	**Timeline**
1. Identify policies the County and communities would like to see.	Q2 2025 and beyond
2. Research best practices and what other local communities are doing.	Q2 2025 and beyond
3. Develop best practices and/or policies for the County and communities.	Q2 2025 and beyond
4. Adopt and evaluate how best practices and policies are impacting adoption of electrified mobility.	Q2 2025 and beyond

Roles and Responsibilities

- **Arapahoe County:** Lead identification of policies needed and lead development of best practices or policies.
- **County Communities:** Lead identification of policies needed and support development**.**
- **Xcel Energy Partners in Energy:** Support development of policies based on best practices and expertise.
- **State Agencies:** Share best practices and support development of policies.
- **Drive Clean Colorado:** Support development of policies based on best practices and expertise.
- **Other Potential Partners:** County Open Spaces, DRCOG, South Suburban, other communities in Colorado that have implemented such policies, disability organizations and advocates.

Available Resources

- Grants for buses and bus facilities.
- Low-no emissions vehicle program.
- State E-bike rebate program.

Longer-Term Strategies

- **Research electric multimodal options to identify associated benefits challenges and infrastructure needs.**
- **Expand electric micromobility infrastructure (e.g., charging ports and e-bike lockers at mobility hubs).**
- **Explore opportunities to develop a micromobility battery swap program.**

APPENDIX B: ELECTRIC VEHICLES 101

Note, this document was last updated in August 2023 and may not reflect the latest technologies and information.

Since plug-in electric vehicles are an emerging technology that is rapidly changing, it is important to ensure that everyone has a common understanding of the technology and terminology involved. This section explains the basics of current available types of vehicles and charging stations and the associated uses, barriers, and benefits. Note, while electric options are available for medium- and heavy-duty vehicles, the descriptions provided in this section apply primarily to light-duty vehicles, which make up most of the electric vehicle market today.

Electric Vehicle Basics

Plug-in EVs refer to a vehicle that uses an electric motor and can utilize an external source of electricity to store electrical energy within its onboard rechargeable battery packs. A plug-in EV can have a fully electric motor or can contain an internal combustion engine (ICE) that supports the electric motor. The travel range of each type are outlined in **Table 7** and are described in more detail in the following sections.

Table 7. Comparison of Types of Plug-in Electric Vehicles.

Electric Vehicle Type	Power Source	Travel Range
Battery Electric Vehicle (BEV)	Electric Motor	200 – 520 miles
Plug-in Hybrid Electric Vehicle (PHEV)	Electric Motor + Gasoline Engine	315 – 660 miles

Battery Electric Vehicle (BEV)

A BEV is an all-electric vehicle that does not require gasoline and, thus, has no tailpipe emissions. BEVs are fueled by plugging into charging stations. Energy is stored in the battery to be used when the car is running. Distances that a BEV can travel on a single charge range from 200 to 520 miles with longer distances promised in the future through continual advancements in battery technology. Recharging can take anywhere between 20 minutes to 12 hours depending on the type of charger, size of the battery, and level of depletion in the battery (Drive Change. Drive Electric., 2023).

Plug-In Hybrid Electric Vehicle (PHEV)

A PHEV provides a combination of both an electric motor and a gasoline engine and produces less tailpipe emissions than an internal combustion engine (ICE). PHEVs use energy from the electric motor until the battery charge is fully depleted, which can occur between 15 to 60 miles, at which point, the gasoline engine takes over. The distance that a PHEV can travel on a single charge and full tank of gasoline ranges between 315 and 660 miles. The battery is charged similarly to the BEV through a plug, and the fuel tank is filled by traditional gas station (Drive Change. Drive Electric., 2023).

Charging Stations

EV charging stations are separated into three categories based on the speed at which the vehicle is charged: Levels 1, 2, and 3. Level 3 chargers are also known as DC fast chargers (DCFC) and the sections below detail the appropriate application for each charger type.

Residential Charging Stations

Residents have the following two options for charging at home. Level 1 chargers use standard 120-volt AC outlets and can take 8 to 12 hours to fully charge a depleted battery. Level 2 chargers require a 240-volt AC outlet and can fully charge a depleted battery in 4 to 6 hours. Residents can charge during off-peak hours to reduce the impact on the grid. **Table 8** provides a brief explanation along with the pros and cons of both types and currently available EVs can use either charger type.

Table 8. Residential Electric Vehicle Charging Types.

	LEVEL 1	LEVEL 2
		
Electric Current (AC)	120 volts; 20 amps	208/240 volt; 30 amps
Charging Rate (miles range per hour of charging)	4 to 6	20 to 45
Benefits	• Uses standard residential wall outlet • Little to no investment in infrastructure required	• Quicker charging • Some models have available Wi-Fi controls to allow residents to take advantage of time-of-day electric rates • In the case of multifamily housing, the controls could be managed by a property manager.
Drawbacks	Slower charging rate, but usually sufficient for residents who charge overnight	• Requires 240 Volt outlet or hardwired charger • Electrician likely required to install • Higher infrastructure cost investment
Estimated Installation Costs	Low to no cost	$500 to $2,000 (U.S. Department of Energy, 2019)

Commercial Charging Stations

Commercial Level 2 and Level 3 chargers are most appropriate for commercial applications since those EVs are generally parked for shorter periods of time than residential applications. Level 2 chargers are the same as the residential chargers, providing a full charge in 4-6 hours, and often have the option to include two charging ports at one station. Level 3, or DC fast, chargers require an industrial DC outlet of 480 volts and can charge batteries in 20 to 30 minutes. Many commercial chargers also come equipped with software that allows the user to control when vehicles are charging and may facilitate payment in public applications. **Table 9** shows the advantages and disadvantages of Level 2 and Level 3 chargers.

Table 9. Levels 2 and 3 Charging Infrastructure

	LEVEL 2	LEVEL 3 (DC Fast Charger)
		
Electric Current	208/240 volt; 30 amps (AC)	480 volts DC
Charging Rate (miles range per hour of charging)	20 to 45	200 to 400+
Benefits	• More economical than Level 3 • Safe for long-term use	• Fastest charging option available
Drawbacks	• Slower charging	• Very expensive to purchase and install • Can cause degradation to EV batteries with frequent use
Use Case	Example locations include workplaces, recreation centers, libraries, movie theatres, transit centers, and parking lots.	Example locations include grocery stores, rest stops, gas stations, and urban parking lots.
Estimated Infrastructure Costs	$2,500 to $6,000 (ICF, 2022)	$20,000 to $150,000 (ICF, 2022)

Benefits and Considerations of EVs

Electric vehicles can provide benefits and there are considerations. Benefits of EVs are both environmental and economical and by replacing ICE vehicles with EVs, transportation related GHG emissions are significantly reduced, and air quality is improved. As the need for imported petroleum to support transportation is decreased through the integration of EVs, domestically available fuel sources can shift into focus, which will result in energy independence and domestically regulated fuel prices. Furthermore, the individual consumer can experience lower fuel and maintenance costs with the transition to EVs and continued advancements in battery and charging technologies. The sections below provide additional details regarding EVs.

Energy Independence and Cost Stability

Over 65% of the petroleum imported to the U.S. in 2018 was used for transportation fuel. Transitioning to EVs shifts the fuel source to more domestically available sources such as coal, nuclear, natural gas, and renewable energy. Avoiding dependence on foreign oil could reduce U.S. financial support going to countries with human rights violations and war crime records. Integration of EVs is an important strategy for reducing dependence on fuel imports and isolates transportation costs from the volatile petroleum market, as evidenced by the sharp increase in gas prices in 2022 partially caused by the conflict in Ukraine. **Figure 11** illustrates the fluctuations in gasoline and diesel prices compared to electricity prices from 2011 to 2022.

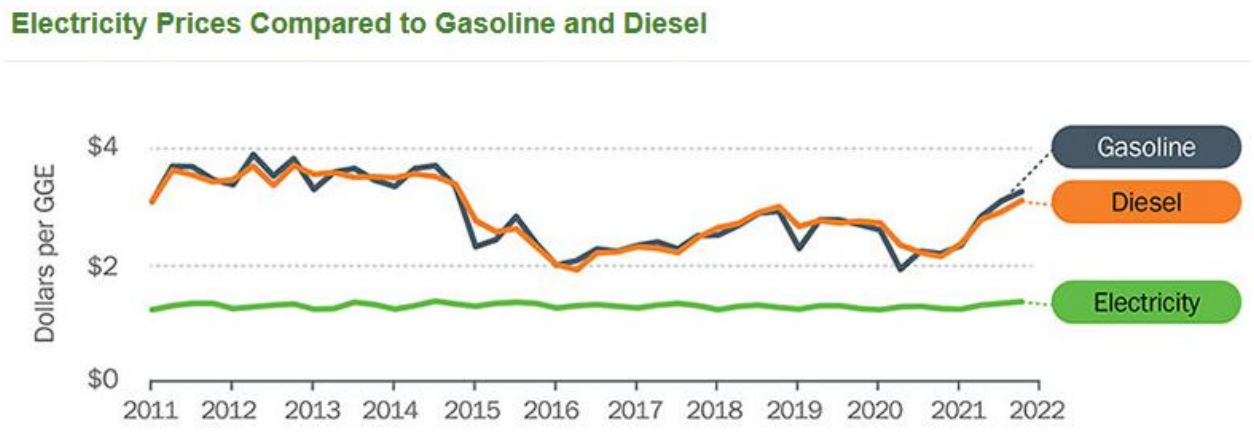


Figure 11. The average retail fuel prices in the United States illustrate that electricity prices are not only lower but much more stable than those of gasoline or diesel fuel. (U.S. Department of Energy, 2023)

Quieter Ride

Due to fewer moving parts and lack of a gas engine, EVs are quieter than ICE vehicles and at low speeds can be almost fully silent. Some EVs come with artificial engine noise that can be turned on to mimic the acceleration sound and alert pedestrians to the vehicle's presence.

EV Safety

All commercially available vehicles, including electric-drive vehicles, must meet the Federal Motor Vehicle Safety Standards and all vehicles sold in the United States undergo the same rigorous safety testing (Federal Motor Vehicle Safety Standards, n.d.). EVs perform similarly to gas-powered vehicles (Insurance Institute for Highway Safety, 2015). Battery packs are encased in sealed shells and meet testing standards that subject batteries to conditions such as overcharge, vibration, extreme temperatures, short circuit, humidity, fire, collision, and water immersion (U.S. Department of Transportation, n.d.). EVs are designed with additional safety features that shut down the electrical system when they detect a collision or short circuit (U.S. Department of Energy, n.d.).

The risk of a fire is significantly lower in an electric car than in a gas car. EVs are about 60 times less likely to catch fire than gas- and diesel-powered vehicles (Bodine, 2022); however, battery fires behave differently than gasoline fires and tend to burn longer and are more difficult to put out (Popular Science, 2021). It is important for fire departments to develop protocols and training to handle fires. EV fire safety protocols and training resources are available for first responders ((National Fire Protection Association, 2023) (National Alternative Fuels Training Consortium, 2023). Continued battery research is developing next generation technology to reduce using flammable materials.

Sustainability of EV Batteries

Battery Production Emissions

Differences in battery materials and production techniques, including the location and the energy mix for production, affect the overall sustainability of EV batteries. A battery produced using coal-fired electricity, for example, will have significantly higher emissions than one produced using cleaner power. Acknowledging that emissions can vary, estimates show that even with emissions from battery production, an EV's lifecycle emissions are significantly less than a gas-powered car (**Figure 12**).

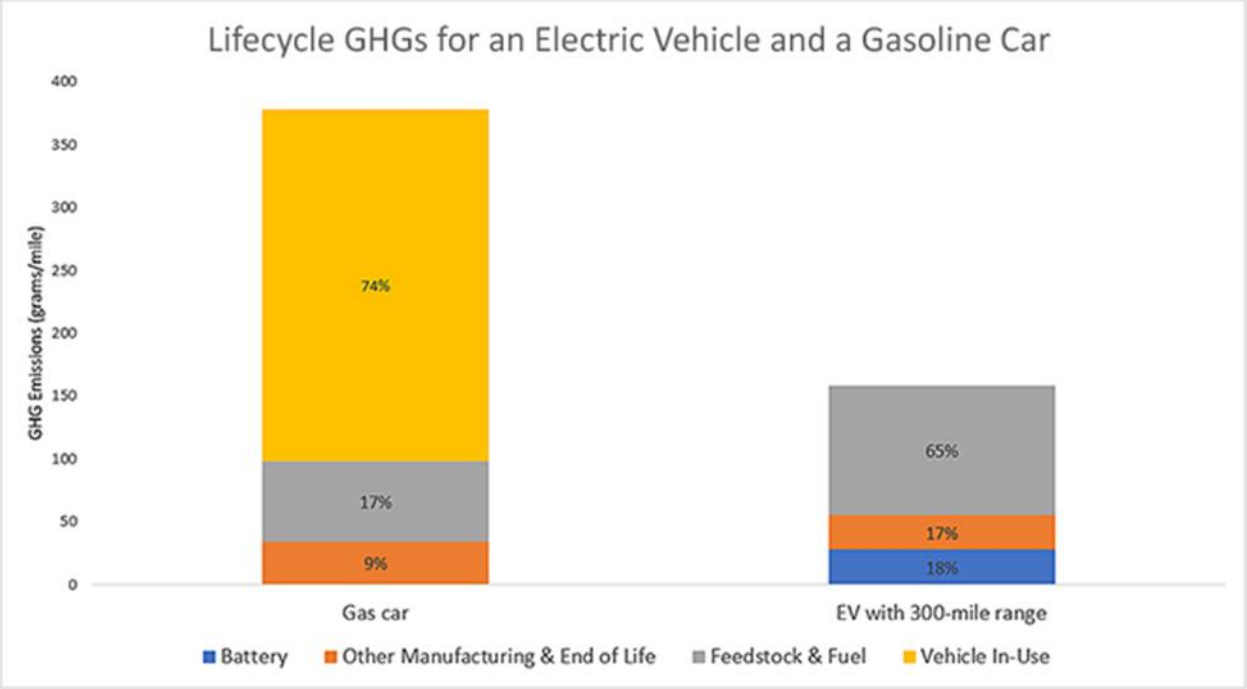


Figure 12. Lifecycle Emissions for an EV and a Gas-Powered Car. (U.S. Environmental Protection Agency, 2021)

As the overall electrical grid is becoming less carbon intensive, battery emissions will reduce and widen the gap between total emissions of EVs and gas-powered vehicles.

Battery Production Social Impacts

Certain challenges are particularly connected with mining for minerals, such as cobalt, used in EV batteries. Unregulated cobalt mining in the Democratic Republic of Congo, which produces more than half of all mined cobalt, is linked to regular risk of injury and death due to mine collapse, lung disease from particle inhalation, and child labor concerns (Baumann-Pauly, 2020). It is important to note that fossil fuel exploration and extraction has also been associated with similar human rights abuse, conflict, and corruption. The average scores on the Resource Governance Index for oil-producing countries (47 out of 100) and mineral producing countries (48 out of 100) are virtually identical, signaling that misgovernance, specifically related to child labor, remains a challenge in both sectors (Natural Resource Governance Institute, 2021).

The U.S. is also supporting the expansion of domestic manufacturing of batteries for EVs and the electrical grid and for materials and components currently imported from other countries. Funding through the Infrastructure Investment and Jobs Act and match funding is expected to create responsible and sustainable domestic sourcing of the critical materials used to make lithium-ion

batteries—such as lithium, cobalt, nickel, and graphite. By 2030, North America EV battery manufacturing production capacity will be capable of supporting the manufacture of roughly 10 to 13 million all-electric vehicles per year (Gohlke, Zhou, Wu, & Courtney, 2022).

Battery Lifespan and Recycling

EV batteries are designed for extended life; but, as with any other rechargeable battery, they will degrade over time. Federal regulations require that every battery in an EV sold in the U.S. come with a warranty providing coverage for a minimum of eight years or 100,000 miles. However, current estimates predict that an EV battery will last 10–20 years before it needs to be replaced. EV drivers can maximize battery life by avoiding high temperatures, overcharging, completely draining the battery, and aggressive driving patterns. After the battery's first life is over, it can be reused for energy storage, telecommunications backup services, and other applications before it needs to be recycled. The U.S. is preparing now for advanced technologies and processes for EV battery recycling and reuse. For more information about EV battery recycling, visit the U.S. Department of Energy's ReCell Center.

APPENDIX C: EV FUNDING RESOURCE DETAILS

There is a wide range of existing and anticipated funding opportunities and incentives to support EVs and their infrastructure. The following sections summarize key programs, grants, tax credits, and other financial incentives available as of December 2023 through Xcel Energy, the State of Colorado, and the Federal government.

The resources and funding available are changing rapidly. Visit Drive Clean Colorado's website for up-to-date information on available incentives and grant programs.

Xcel Energy Rebates and Programs

Commercial Programs

- **EV Advisors** are available to guide businesses through a customized EV charging plan and support the identification of applicable resources and incentives.
- **Critical Peak Pricing Program** offers discounted rates for electricity used in charging electric vehicles, data insights, and monitoring.
- **Small Business Rebate** offers a $2,500 rebate for wiring costs for small businesses.
- **New Construction Rebate** offers an allowance of $2,000 per charging port to support new multifamily construction for EV ready parking spots.
- **Income-Qualified Rebates** are available for eligible organizations. Qualifications vary depending on the organization type and rebate amounts are determined by the organization type as well as the level and number of chargers installed.

Residential Programs

- **Charger and Wiring Rebate** offers $500 or for income-qualified customers, a $1,300 - $2,500 rebate for home wiring or a Level 2 charger.
- **Optimize Your Charge (OYC) Program** rewards customers for charging at times that benefit the grid.
- **EV Purchase/Lease Rebate** offers income-qualified customers rebates for a new or pre-owned EV.
- **EV Network Dealers** have information on Xcel Energy programs and can provide the EV rebate at the point of sale.

Federal Incentives

EV, Commercial Clean Vehicle, and EV Infrastructure Tax Credits

Up to a $7,500 credit for new vehicles under 14,000 pounds, and for commercial vehicles above 14,000 pounds (up to $40,000). EV chargers are eligible for a tax credit of up to 30% of the cost, or 6% in the case of property subject to depreciation (not to exceed $100,000). Individuals who purchase qualified residential fueling equipment may receive a tax credit of up to $1,000.

Clean Heavy-Duty Vehicles Grants and Rebates

One billion dollars in funding, including replacing heavy duty vehicles with EVs and associated charging infrastructure.

Diesel Emissions Reduction

Fund grants and rebates that protect human health and improve air quality by reducing harmful emissions from diesel engines.

Low or No Emission Vehicle Program
The low or no emission competitive program provides funding to state and local governmental authorities for the purchase or lease of zero-emission and low-emission transit buses as well as the acquisition, construction, and leasing of required supporting facilities.

Carbon Reduction Program
This program will fund a wide range of projects designed to reduce carbon dioxide emissions from on-road highway sources. This includes installing infrastructure to support the electrification of freight vehicles or personal cars, constructing Bus Rapid Transit corridors, and facilitating micromobility and biking.

Charging and Fueling Infrastructure (CFI) Discretionary Grant Program
A competitive grant program distributing $2.5 billion over five years to strategically deploy EV charging infrastructure and other alternative fueling infrastructure projects in urban and rural communities in publicly accessible locations, including downtown areas and local neighborhoods, focusing on underserved and disadvantaged communities.

Rebuilding American Infrastructure with Sustainability and Equity (RAISE)
To build and repair critical pieces of our freight and passenger road, rail, transit, and port transportation networks. Criteria for innovation include electric vehicles.

State Incentives and Programs

Colorado EV Tax Credit
Up to a $5,000 credit for purchase or lease (minimum two-years initial term) new vehicles with a manufacturer's suggested retail price (MSRP) up to $80,000. The tax credit amount begins to decrease on January 1, 2025. Beginning January 1, 2024, Coloradans purchasing an EV with an MSRP up to $35,000 will be eligible for an additional $2,500 tax credit.

Charge Ahead Colorado
A competitive grant program that provides grant funding for community-based Level 2 (L2) and Direct Current Fast-Charging (DCFC) electric vehicle (EV) charging stations. Maximum amounts vary by the power level. Enhanced incentives increase funding support for income qualified multifamily housing and for qualifying entities located in a disproportionately impacted community.

Direct Current Fast Charging (DCFC) Plazas
A competitive grant program designed to increase access to high-speed charging in communities and along highway corridors across Colorado. The program offers enhanced incentives for projects located in disproportionately impacted communities, sites incorporating battery storage and for applicants proposing three or more stations along Federal Highway Administration designated EV corridors.

Community Access to Electric Bicycles Grant Program
The Colorado Energy Office provides grants to non-profit organizations, local governments, tribal governments, and other community-based organizations to create e-bike programs that give e-bikes to low- and moderate-income Coloradans.

Community-Accelerated Mobility Project
Develop community-led mobility solutions that meet needs specific to local communities, including flexible funding that includes electric carshare, electric vanpool, community e-bike share, community charging infrastructure, and others.

Vehicle Exchange Colorado
State rebate program to encourage income-qualified Coloradans to replace high-emitting vehicles with EVs and other low-emitting mobility options. $6,000 for eligible Colorado residents for purchase or lease of a new electric or plug-in hybrid vehicle, $4,000 for purchase or lease of a used electric or plug-in hybrid vehicle.

Clean Fleet Vehicle and Technology Grant Program
Created to incentivize and support the use of electric motor vehicles and other clean fleet technologies by owners and operators of motor vehicle fleets. Includes a portfolio to provide training and development of a clean transportation workforce to support the adoption of clean fleet vehicles for use in motor vehicle fleets.

Fleet ZERO
Colorado's Fleet-ZERO is a competitive grant that supports charging for fleet owners and operators seeking to electrify their vehicles, as well as public and semi-public fleet charging sites and providers offering EV charging-as-a-service to fleets. The program prioritizes investments in disproportionately impacted communities and enhanced incentives for qualifying entities.

E-Mobility Education and Awareness
This CDOT grant is designed to expand public awareness and education around EVs and increase public understanding of their benefits, capabilities, and availability.

ZEV Workforce Development Grant
This Colorado Department of Transportation (CDOT) grant addresses multiple challenges that Colorado and the wider mobility and electrification industry are facing including talent shortages, gaps in new skillsets, and the growing need for training due to technological advances.

I-Codes Technical Assistance
The Colorado Energy Office (CEO) offers free technical assistance for jurisdictions adopting 2021 I-Codes. Questions about building I-codes, how to review or inspect for a measure, how I-codes interact, or how to comply, can be submitted to CEO's free code helpline.

APPENDIX D: ARAPAHOE COUNTY EV BASELINE DETAIL

Community EV Adoption

Table 10. Total EV Adoption by Community (Arapahoe County Department of Motor Vehicles, 2023)

Community	2020	2021	2022	Avg Year Over Year % Change
Aurora	1,367	2,113	3,371	57%
Bennett	10	14	20	41%
Bow Mar	23	24	32	19%
Byers	5	7	8	27%
Centennial	824	1,236	1,818	49%
Cherry Hills Village	219	280	412	37%
Columbine Valley	22	43	52	58%
Deer Trail	3	5	8	63%
Denver	127	195	259	43%
Englewood	327	526	817	58%
Foxfield	10	12	18	35%
Glendale	6	8	23	110%
Greenwood Village	347	454	701	43%
Littleton	297	523	713	56%
Sheridan	8	11	18	51%
Strasburg	5	7	10	41%
Watkins	4	3	3	-13%
Total	**3,604**	**5,461**	**8,283**	**52%**

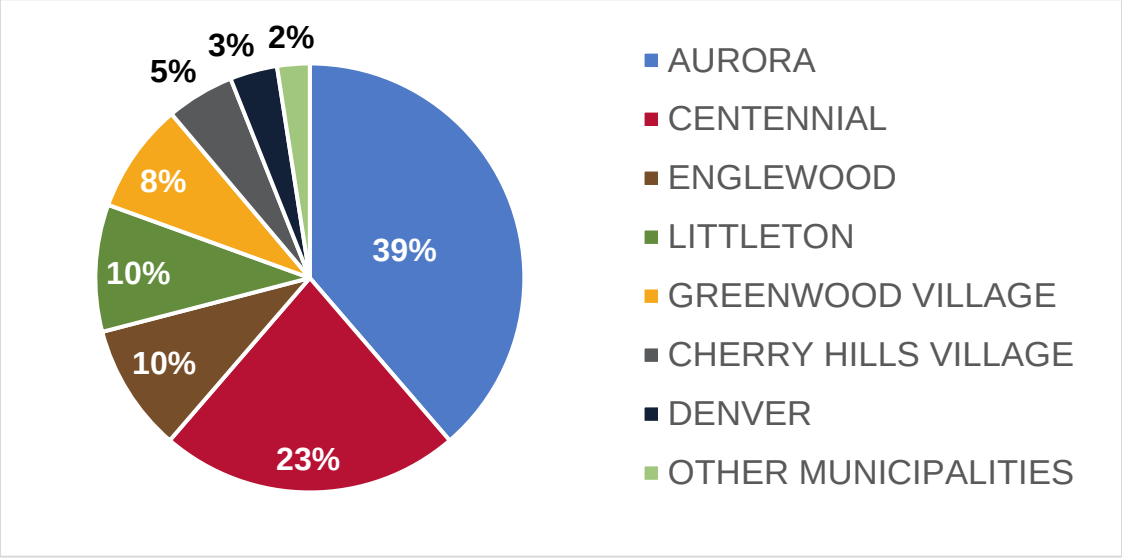


Figure 13. 2021 Baseline Total EV Contribution by Community (Arapahoe County Department of Motor Vehicles, 2023).

Table 11. EV Adoption Ranked as a % of Total Vehicle Registrations by Community (Arapahoe County Department of Motor Vehicles, 2023)

City	2020 % EV/Total	2021 % EV/Total	2022 % EV/Total
Cherry Hills Village	4%	5%	6%
Bow Mar	3%	3%	4%
Greenwood Village	2%	3%	4%
Columbine Valley	2%	3%	3%
Centennial	1%	1%	2%
Foxfield	1%	1%	2%
Littleton	1%	1%	2%
Englewood	1%	1%	2%
Denver	1%	1%	2%
Aurora	0%	1%	1%
Glendale	0%	0%	1%
Bennett	0%	0%	0%
Deer Trail	0%	0%	0%
Sheridan	0%	0%	0%
Strasburg	0%	0%	0%
Watkins	0%	0%	0%
Byers	0%	0%	0%
Total	**1%**	**1%**	**1%**

APPENDIX E: ARAPAHOE COUNTY EV SUPPLEMENTAL REPORT

Arapahoe County Public Works and Development staff, in response to questions and concerns raised by the Board of County Commissioners, prepared this Appendix with supplemental reference information to augment the EV Action Plan. This information helps provide a more complete picture of the aspects of the EV industry that were in question by the commissioners.

1. Challenges and Concerns with Electric Vehicles

While there are benefits with the conversion of vehicles to electric, there are issues, concerns, and impacts of the federal and state governments setting goals that call for the number of fleet of vehicles to be 100% electric by 2050. Just because EV technology is rapidly advancing doesn't mean it's without its flaws and challenges. This section of the action plan will discuss these impacts and identify areas in which solutions need to be found to make the conversion equitable, sustainable, fiscally sound, safe, and environmentally friendly.

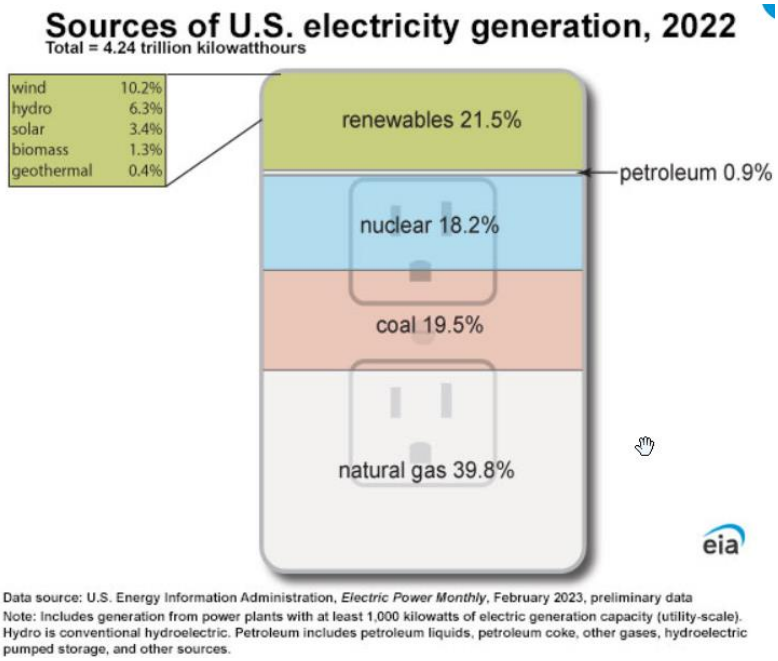
As global demand for EVs increases, these environmental impacts are likely to become even more pronounced without change to the way EVs are currently produced.

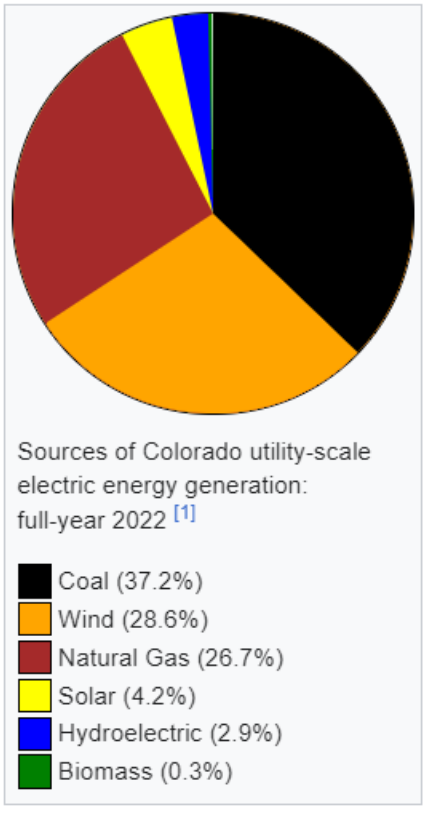
2. Environmental Concerns with EVs

a. How Energy is produced

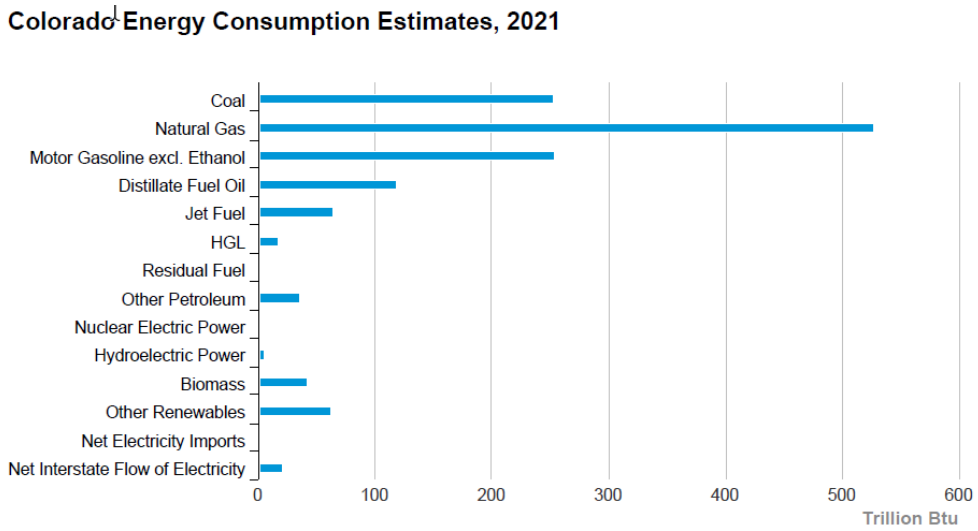
While experts generally agree that plug-in vehicles are a more climate-friendly option than traditional combustion engine vehicles, they can still have their own environmental impacts, depending on how and where the electricity is generated and delivered. Most electric cars sold today tend to produce significantly fewer -greenhouse gas emissions than most cars fueled with gasoline (Congressional Research Services). But a lot depends on how much coal is being burned to charge up those plug-in vehicles. And electric grids still need to get much, much cleaner before electric vehicles are truly emissions free.

The Massachusetts Institute of Technology, developed an interactive on line tool (https://www.carboncounter.com/#!/explore) that estimates the emissions involved in manufacturing cars and producing gasoline and diesel fuel, how much gasoline conventional cars burn, and where the electricity to charge electric vehicles comes from. According to the U.S. Energy Information Administration (https://www.eia.gov/energyexplained/electricity/electricity-in-the-us.php), natural gas was the biggest source of electricity generation in 2022, at around 40%, while coal-fired power stations produced around 18% of electricity. Nuclear power was the second biggest source, and while it doesn't produce emissions in the same way, nuclear waste has its own negative environmental impacts.

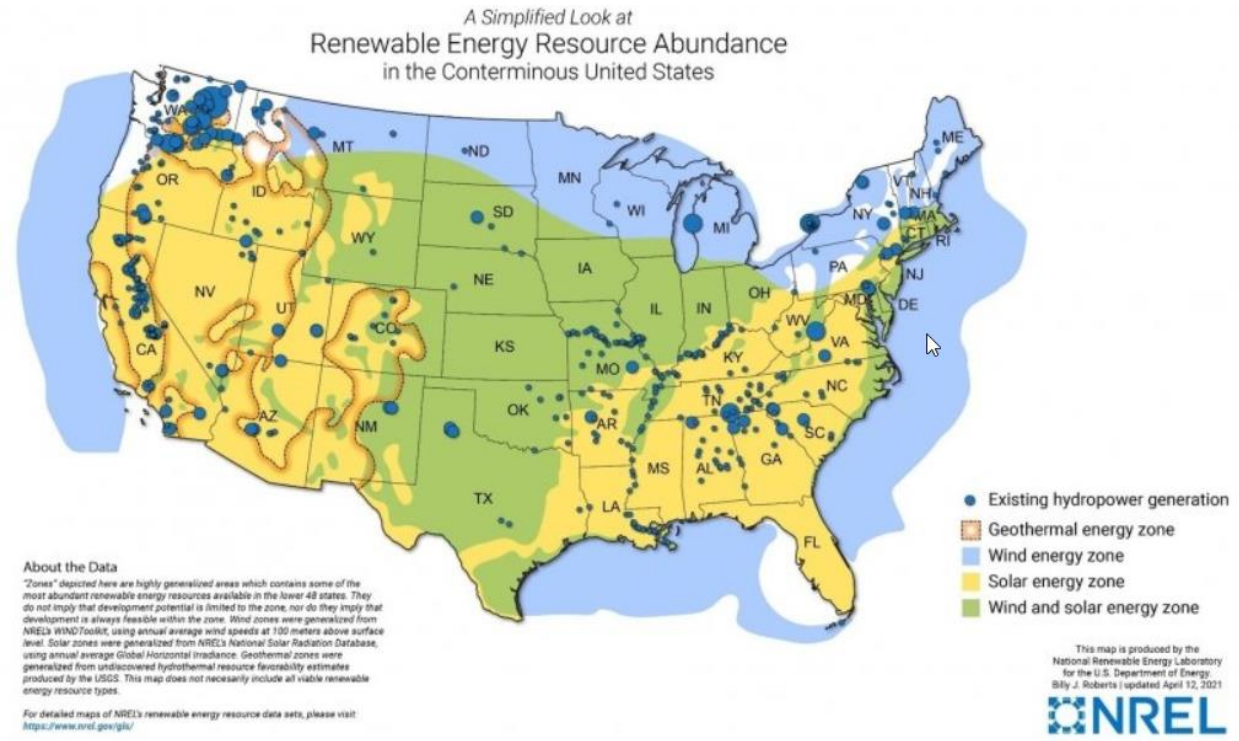




Renewable energy only made up about 22% of electricity generation has its own set of environmental impacts, meaning that the majority of electricity powering EVs was still generated through the use of non-renewable resources such as coal and gas. The Department of Energy performed an analysis (https://www.energy.gov/eere/analysis/renewable-energy-resource-assessment-information-united-states) that claimed that total renewable energy resources in America could produce 100 times the nation's annual need, but only a tiny fraction of those resources have been used so far (0.2%). The report stops short of considering the cost of implementing these renewable options, which could be cost prohibitive and reasons why we are not seeing more of these options. The map below depicts those potential resources in Colorado. Until more renewables are in place, EVs will continue to run indirectly on gas and coal power thanks to the nation's aging power infrastructure, which has an impact on greenhouse gases overall.



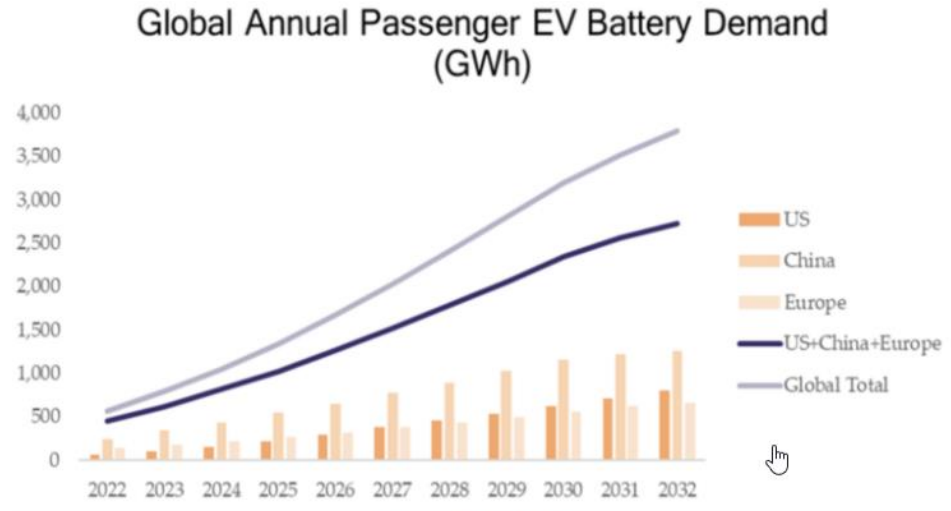
In 2022, Colorado was the fifth-largest crude oil-producing state, with 82% of production coming from Weld County. Colorado was the eighth-largest natural gas-producing state in 2022 and has the eighth-largest natural gas reserves. Since 2010, Colorado's total renewable electricity net generation has more than quadrupled and accounted for 37% of the state's total generation in 2022, with wind power accounted for almost four-fifths of the state's renewable electricity in 2022. Colorado ranks among the top 10 states in total energy production, and its per capita total energy consumption is lower than two-thirds of the states.



The EPA has identified that even accounting for these electricity generation emissions, research shows that an EV is typically responsible for lower levels of greenhouse gases (GHGs) than an average new gasoline car. To the extent that even accounting for these electricity emissions, search shows that an EV is typically responsible for lower levels of greenhouse gases (GHGs) than an average new gasoline car. EPA and Department of Energy's (DOE's) have developed a tool Beyond Tailpipe Emissions Calculator which allows analysis of the estimated the greenhouse gas emissions associated with charging and driving an EV or a plug-in hybrid electric vehicle (PHEV) based on your ZIP code. The tool allows the selection of an EV or PHEV model and type in a particular zip code to see the CO_2 emissions and how they stack up against those associated with a gasoline car.

b. EV Batteries

According to the International Energy Agency (IEA), an electric vehicle requires six times the mineral inputs of a comparable internal combustion engine vehicle (ICE). EV batteries are very heavy and are made with some exotic, expensive, toxic, and flammable materials. Electric vehicles, require lithium-ion batteries to operate. These batteries have issues and contribute to greenhouse gas emissions as a result of mining and the processing of raw materials needed. In addition, the disposal of the batteries at the end of their life cycle also creates environmental concerns. As more electric vehicles are sold, the problems inherent to mining and disposal will increase unless addressed. The graph below shows the huge increase expected in global EV battery demand. In the United States, electric vehicles are being strongly encouraged to be adopted by the public through proposed vehicle standards and purchase incentives in the Inflation Reduction Act, also known as the climate bill.



Source: CleanTechnia

Lithium-ion batteries production result in more carbon dioxide emissions than the production of gasoline-powered cars (lead). About 40 percent of the climate impact from the production of lithium-ion batteries comes from the mining and processing of the minerals needed. Mining and refining of battery materials, and manufacturing of the cells, modules and battery packs requires significant amounts of energy, which generate greenhouse gases emissions. China, which dominates the world's EV battery supply chain, gets almost 60 percent of its electricity from coal—a greenhouse gas-intensive fuel. According to the Wall Street Journal, lithium-ion battery mining and production are worse for the climate than the production of fossil fuel vehicle batteries.

A lithium-ion battery has **three main components:**

- The **cells -** which contain the active materials,
- The **battery management system,**
- The **pack,** which is the structure the cells are mounted in.

Aluminum is important for the **pack** component (for its light weight) but is a very energy-intensive material, representing **17% of the total battery's carbon footprint** (12.4 kg CO2/kWh - Figure 1).

The **cells** represent the majority of the energy and carbon footprint of the production of lithium battery. Specifically and as stated above, **40%** of the total climate impact of the battery comes from the **from mining, conversion and refining** step of the active materials of cells where **N**ickel, **M**anganese, **C**obalt (NCM) and lithium are processed into **cathode powder** (NCM Powder- 28.5 kg CO2/kWh - Figure 1).

The actual **cell production** is the second most energy-demanding activity and represents **20%** of the total CO2/kWh (14 kg CO2/kWh - Figure 1). This number is highly dependent on the plant's capacity as many of the energy-intensive activities in cell production relate to drying and heating which is taking place in large rooms where the energy used remains the same no matter if one or several thousands of cells are in production.

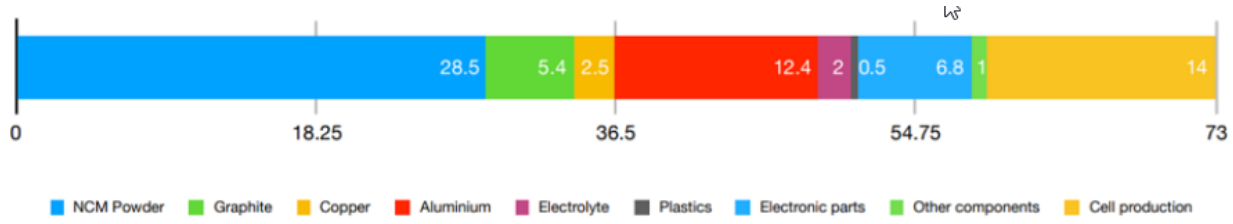


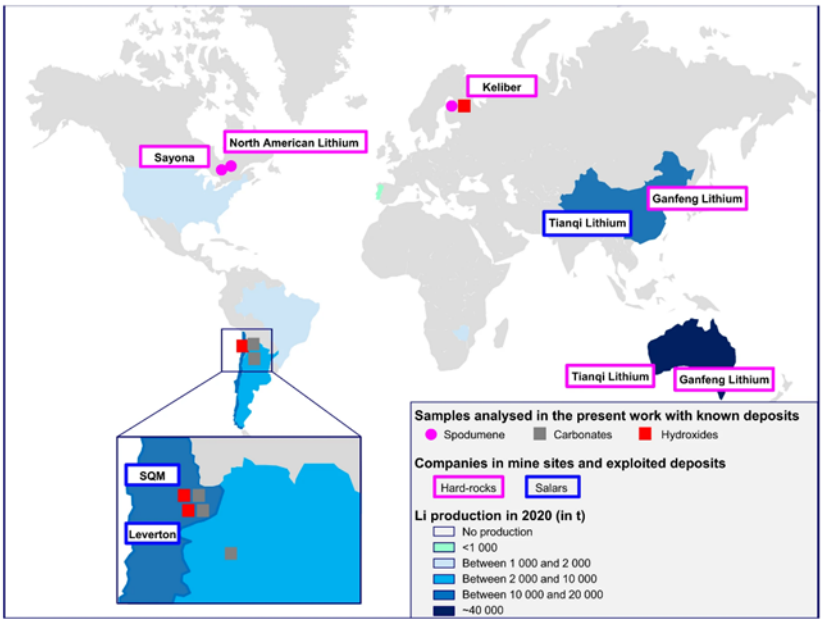
Figure 1. Carbon emissions (kg CO2e/kWh) of an NCM111 (a third of Nickel, a third of Cobalt and a third of Manganese in the cathode) battery pack. From this report. (modified from Dai et al 2019).

To extract lithium from the earth, an immense amount of water is pumped down into salt flats, bringing mineral-rich saltwater to the surface. Lithium is filtered out of the mixture left behind after the water evaporates.

This water-intensive process is problematic for several reasons, including its potential to contaminate the water supply. Further complicating the issue is the location of these mines, many of which are found in desert regions of Australia and China. More than half the planet's lithium supply, however, is in an area called the Lithium Triangle, spanning Andean Mountain sections of Argentina, Bolivia and Chile. The area is one of the driest places on the globe, and lithium mining consumes as much as 65% of the region's water, according to the **United Nations.**

Fig. 1: Map of world Li production in 2020 and location of lithium mining and refining companies studied in this work.

From: Tracing the origin of lithium in Li-ion batteries using lithium isotopes



World mine production in 2020 is from USGS (2021)[10] data, except for the United States for which the value represented is the 2018 production[16] data. Spodumene concentrates, lithium hydroxides and carbonates analysed in this study with known deposits are shown, as is the lithium carbonate produced by Alfa Aeser in Argentina.

A recently published study led by scientists at the University of Western Australia called lithium an "emerging environmental contaminant," noting that increasing levels of lithium contamination were beginning to be found both in plants and organisms, although the potential effects remain largely unknown for now. Likewise, cobalt-contaminated soil is known to pose a risk to humans, with processes to decontaminate the soil still needing further development.

Cobalt mine sites often contain sulfur, which generate sulfuric acid when exposed to air and water. This process wreaks havoc on rivers, streams and aquatic life, creating damage that can last for hundreds of years, according to the United Nations.

From a production standpoint, Because of methods required to mine for its raw materials, and their subsequent environmental effects, battery production is likely the most environmentally damaging stage in the manufacturing of electric vehicles. Research by the **International Council on Clean Transportation** (ICCT) found battery manufacturing to account for 15% to 20% of an EV's lifecycle emissions.

If you remove the lithium battery from the equation, production of electric- and gas-powered vehicles is very similar and thus, have nearly identical effects on the environment. Its inclusion, however, makes electric vehicle manufacturing slightly less environmentally friendly than that of gas-powered vehicles.

Electric and internal-combustion vehicles have drastically different environmental effects when the cars are in use. But when it comes to recycling, the situation is completely reversed. As little as 5% of the world's lithium batteries are recycled, according to the **American Chemical Society**, a stark contrast to the 99% of lead car batteries recycled here in the U.S.

The lack of recycled lithium batteries has significant economic repercussions, but it also takes a dire toll on the environment. Most lithium batteries end up in landfills, where their hazardous components can leak into the soil and groundwater. Landfills are also a major contributor of greenhouse gas emissions, the **EPA** reports. Recycling would also limit the need for mining raw materials, an environmentally destructive stage in an electric car battery's lifespan.

Environmentally speaking, electric vehicle batteries are far from perfect: assembling them depletes the Earth of its natural resources; manufacturing them is energy intensive; charging them requires dirty energy (forms of energy that are destructive to the environment and are harmful to human health); and recycling them is nearly impossible. These negative effects, however, are offset by the absence of tailpipe emissions throughout the vehicle's lifetime. the aforementioned ICCT study found electric vehicles in the U.S. produce 60%-68% fewer emissions over their lifetime than gas-powered cars. So, in short, electric vehicles are the more climate-friendly choice. However, there is a need for improvement as this industry moves forward, including:

- More efficient manufacturing methods
- Greener electric grids
- Improved recycling options would benefit electric car batteries and the environment

c. EV Weight and Tire Pollution

EVs also produce emissions beyond what spews from their tailpipe. Like all cars, their tires are constantly rubbing against pavement, releasing particulates that float through the air and leach into waterways, damaging human health and wildlife. New EV models tend to be heavier and quicker—generating more particulates increasing tire pollutants in the environment as compared to ICE vehicles. EVs are between 14% and 29% heavier than an equivalent-sized ICE vehicles from the same manufacturer. The extra weight of EVs is largely due to the weight of the battery and the associated secondary weight increases required to strengthen the vehicle body. The concern becomes that EVs have a tire-pollution problems, and one that is poised to get worse as Colorado begins to adopt electric cars to meet the target of 100% by 2050.

Much about tire pollution is still unknown. Compared with tailpipe emissions, tire particles are more difficult to measure in a laboratory and to isolate in the real world, where various kinds of car pollution mix together. Only in recent years has the concern started to come into view. As a form of microplastics, tire pollution hits wildlife hard: Compounds that settle on the ground gradually leach toxic chemicals into the soil and water. One study concluded that tires could be responsible for as much as 28 percent of the microplastics in global oceans; another found them to be among the largest sources of such pollutants in the San Francisco Bay. Microplastics can be consumed by tiny aquatic organisms, wreaking havoc as they travel up food chains. The smallest tire particles, measured in mere nanometers, can enter our lungs and spread to our organs. Various tire components have been linked to chronic conditions including respiratory problems, kidney damage, neurological damage, and birth defects—a particular concern in neighborhoods adjacent to highways, whose residents skew low-income and minority.

In the U.S., tire emissions aren't regulated at all; though more stringent rules have made cars cleaner, research reported in *The Guardian* last year found that in newer cars, pollution from tires is much greater than tailpipe emissions.

Electrification is poised to make these problems significantly worse. EVs use "regenerative braking," which captures energy as they slow down; all braking causes tire friction, but EVs are designed to

automatically do so more often in order to gain small amounts of power. Another factor is torque, or engine power. With instant torque, EVs are able to accelerate significantly faster than gas cars.

EVs can also be very heavy, which further worsens tire wear. The addition of a massive battery can dramatically increase a car's weight and can be as much as 35 percent more than a gas-powered equivalent vehicle. EV owners have already started noticing that their tires are wearing down quickly. A recent survey conducted by J.D. Power and Associates found that rapid treadwear is the biggest complaint that EV owners have about their tires. They're expecting 40,000 miles out of their tires, and they're getting 13,000.

Tire materials, a standard for how to measure tire performance within the industry with a pass-fail metric, driver tendencies (hard acceleration and braking), and roadway materials all will play a role going forward to address this environmental impacts.

The conversion of the fleet to electric has also posed a concern with the impact on roadways as they are designed for specific weight limits. In Colorado weight limits for semi-trucks is 80,000lbs. If the fleet is converted these semi-trucks will likely increase in weight. Therefore, if the weight limits on roadways stay the same (80,000 lbs) then the payloads will decrease, which will increase the costs of products, increase the number of trucks/drivers needed to bring the same amount of products to consumers, etc. If the weight limit on roadways is increased, then the roadways will have a decreased life expectancy and the cost of repairs will be accelerated. As this shift to EVs are considered these impacts should be weighed with the benefit of EVs and the potential; costs to society.

3. Safety Concerns with EV's

Guardrail/Safety Barriers

Current electric vehicles typically weigh significantly more than gasoline-powered cars and can easily crash through steel highway guardrails that are not currently designed to withstand the extra force, according to a crash test by the University of Nebraska.

Electric vehicles typically weigh 20 percent to 50 percent more than equivalent gas-powered vehicles due to their batteries that can weigh almost as much as a small gas-powered car. An example, Ford's F-150 Lightning EV pickup is 2,000 to 3,000 pounds heavier than the same model's combustion version. The Mustang Mach E electric SUV and the Volvo XC40 EV are roughly 33 percent heavier than the same gasoline models. Electric vehicles are typically much heavier than even the largest trucks and SUVs that are powered by gasoline or diesel. Besides the weight factor, electric vehicle batteries are typically installed under the vehicle, giving it a low center of gravity. Because of these differences, guardrails do little to stop electric vehicles from crashing through the current barriers typically made of steel or concrete. Because of higher weight and center of gravity, EV crashes into a roadside barrier could have 20% to 50% more impact energy.

Difference in weight between electric vehicles (EV) and internal combustion engine vehicles (ICE)

	SUV		SEDAN		SEDAN 2		MID-SIZE SUV		LUXURY SUV		PICKUP	
	EV	ICE	EV	ICE	EV	ICE	EV	ICE	EV	ICE	EV	ICE
	Hyundai Ioniq 5	Hyundai Tucson Hybrid	Hyundai Ioniq 6	Hyundai Sonata	BMW i4	BMW 330Xi	Ford Mustang Mach-E	Ford Edge	Audi Q4 e-tron	Audi Q5	Ford F-150 Lightning	Ford F-150 Hybrid
Weight (lb.)	4562	3774	4517	3176	5042	3640	4835	4250	5589	4141	6791	5946
Difference in Weight (lb.)	788		1341		1402		585		1448		845	

Table: CBS News • Source: Consumer Reports

The U.S. guardrail standards are not made to handle vehicles greater than 5,000 pounds and there are many new vehicles in the 7,000-pound range being manufactured today. The extra weight of electric vehicles comes from their oversized batteries needed to achieve a travel range of about 300 miles per charge. The purpose of guardrails is to help keep passenger vehicles from leaving the road. Guardrails are intended to keep cars from careening off the road at critical areas, such as over bridges and waterways, near the edges of cliffs and ravines and over rocky terrain, and into oncoming traffic where injury and death in an off-the-road crash are much more likely. As discussed, above, the extra weight also poses a problem to faster wear and tear to residential streets and driveways, vehicle tires and other infrastructure like parking garages. Many parking structures were built to hold vehicles that weigh 2,000 to 4,000 pounds in urban areas in which most EV buyers will be located.

In 2011, the National Bureau of Economic Research published a paper that said being hit by a vehicle with an added 1,000 pounds increases by 47% the probability of being killed in a crash. These bigger and heavier batteries are going to cause more damage as it is a simple matter of mass and speed. In addition, electric vehicles have very high horsepower rating, allowing them to accelerate quickly even in crowded urban areas. Currently, drivers are not trained or experienced to handle that type of acceleration and will need to be keenly aware and careful. These increase performance characteristics and inexperience drives have the likelihood that a collision between a vehicle and a pedestrian will result in a serious injury to the pedestrian is:

- 10% if the motor vehicle is traveling at 16 mph
- 50% if the motor vehicle is traveling at 31 mph
- 90% if the motor vehicle is traveling at 60 mph

The likelihood that a collision between a vehicle and a pedestrian will result in death to the pedestrian is:

- 10% if the motor vehicle is traveling at 23 mph
- 50% if the motor vehicle is traveling at 42 mph
- 90% if the motor vehicle is traveling at 58 mph

Combine these statistics with the additional weight and the increased probability death by every 1,000 lbs increase can put pedestrian at an increased safety risk.

The nearly 8,000 lb Rivian truck tested in Nebraska showed almost no damage to the cab's interior after slamming into the concrete barrier, which indicates that they offer protection to their occupants if the electric vehicle is big enough and heavy enough. While heavier vehicles are safer for their own occupants, they are more hazardous for the occupants of other vehicles and pedestrians and bicyclists as evidence by the above referenced study and probability.

It is going to be necessary to re-examine the designs of roadside barriers and the study referenced establishes a baseline for which additional research, design, materials will be needed to ensure safety of all roadway users.

EV Noise

Another safety concern with electric cars, e-bikes, and e-scooters are that they feature near-silent motors that can pose a significant hazard to the hearing-and visually impaired community. Pedestrians' inability to hear them could potentially result in more collisions and serious injuries. A study conducted by the University of California found that normal hearing individuals could detect a gas-powered car 36 feet away when blindfolded. In comparison, when an electric car drove past them, they could only detect it when it was 11 feet away. Researchers repeated that same study and added background noise to stimulate real-life city noise. In those conditions the gas-powered car could be detected only 22 feet away when blindfolded. The electric vehicle was undetectable. To address this concern, the U.S. Department of Transportation established rules in 2017. Under that rule, all hybrid and electric light vehicles with four wheels and a gross vehicle weight rating of 10,000 pounds or less will be required to make audible noise when traveling in reverse or forward at speeds up to 30 kilometers per hour (about 19 miles per hour). At higher speeds, the sound alert is not required because other factors, such as tire and wind noise, provide adequate audible warning to pedestrians.

A recent study led by Penn State University (2021) tested how well people detect electric vehicle sounds in terms of these mandated requirements. Participants in the study sat next to a lane of the Virginia Tech Transportation Institute's Smart Road facility and pressed a button when they heard an approaching electric vehicle. This allowed the researchers to measure the probability of detection of vehicles at different distances, rather than calculating mean detection distance, which has been the accepted measurement standard in the past. The results of the study showed that all of the cases had mean detection ranges that exceeded the National Highway Transportation Safety Administration minimum detection distances. However, there were cases where probability of detection, even at close ranges, never reached 100%. While the additive sounds greatly improve detection distances over the no sound condition, there are cases where pedestrians still missed detections. The sounds produced by electric vehicles are typically quieter than the sounds of vehicles with standard, internal combustion engines. Even after adding sounds, as required by government regulations, electric vehicles remain relatively quiet, which has the potential to increase the risk to the hearing and visually impaired members of society.

It should be noted that in addition to artificial sound many manufacturers have pedestrian detection systems with cameras and sensors. These technologies detect and alert the driver to the presence of pedestrians or other objects in the vehicle's path. Some EVs also have automated emergency braking systems that can detect potential collisions and take action to prevent them.

The key objective of adding sound to EVs should not be forgotten, and the effectiveness of this measure should be evaluated as the number of EVs increase, as it may not be as effective as was

originally assumed. Even the efficiency of other non-acoustic technical measures, such as automatic braking systems, could be further evaluated. In addition, future research should explore alternative non-acoustic measures and analyze the effectiveness of those that already exist, such as automatic braking systems.

4. Challenges with Charging Stations To Date

One of the biggest hurdles facing the EV industry is the lack of accessible charging infrastructure available to drivers. America, private companies largely, has had over 100 years to develop its network of gas stations, but if EVs are to become widely adopted, an equally comprehensive EV charging network needs to be developed within the space of the next decade. In recognition of this issue, Congress passed a bill to fund 500,000 new electric vehicle chargers in 2022, with a focus on delivering infrastructure to more remote, rural parts of the country.

The reliability of public charging infrastructure has improved slightly for the first time in two years according to a JD Power report in May 2023, but 20.8% of consumers still say they show up at a public charging stations that do not work. Similarly, overall customer satisfaction with Level 2 public charging, which represents 71% of all EV charging in America, continues to decline. Most public chargers work most of the time, but to get broad public adoption, EV charging has to be at least as reliable and pleasant as, gas stations. A new study offers national data that identifies the specific reasons for public charging station failures. It's part of a broader white paper released by Electrification 2030, that assesses pivotal issues affecting both EV adoption and home electrification by 2030. The study was produced by the Electrification Institute. From these studies, the following should be factored and accounted for in the deployment of EV Charging Stations.

a. Connectivity (55%)

The data and reports suggest that more than half of all charging failures come from a station not being able to connect to its network for authentication. Because most EV charging networks use cellular links in their stations, they're subject to the cell-service disruptions. The suggested fixes for this are:

1. The best practice would not only verify that there is grid availability for these station when locating it but also that cell services is adequate for the purposes of charging
2. Stations can be connected using hard-wired communications cables, which are considerably more expensive to install. This is more costly, but may be the only options.
3. The last option would be for any public station to default to free charging if it loses connectivity and can't validate a customer or a payment method.

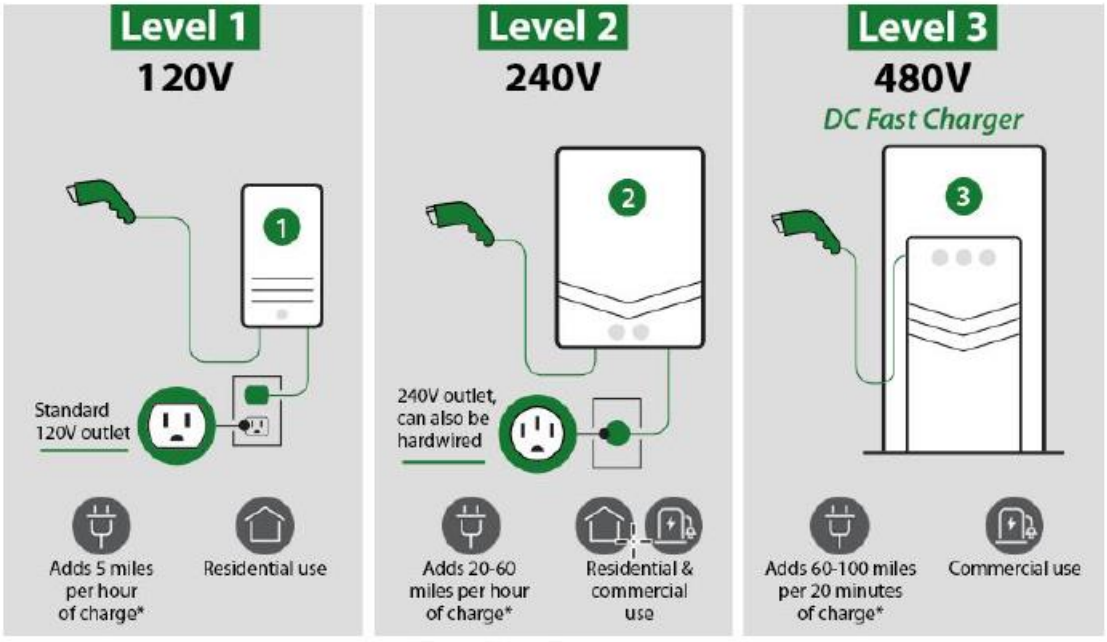
b. Station Internals (38%)

The next failure category, "internal faults or errors," which covers software and perhaps some hardware failures. Many EV drivers have posted photos of non-working charging stations that have seemingly frozen in the middle of rebooting, including what looks suspiciously like Windows code on their screens. This is likely a host of different issues, each of which has to be addressed separately, for different stations from different makers. It's complicated issue but certainly warrants consideration when plan for and implementing stations.

The following is provided as a reference for understanding charging stations and their demands and suggested charging use.

EV Charger Levels

Level 1	Level 2	Level 3
Volts: 120 volts, the amount used in standard household outlets.	**Volts:** 208-240 volts on a 32-48 amp charger. New chargers are coming out at 64 & 80 amps.	**Volts:** 400-900 volts (DC Fast Chargers and Tesla Superchargers) with a 100 to 400 amp current.
Connection: Uses J1772 or Tesla connectors.	**Connection:** Uses J1772 or Tesla connectors.	**Connection:** Connectors vary (Combo, CHAdeMO or Tesla).
Charging Speed: Three to five miles of battery range per hour.	**Charging Speed:** 12 to 80 miles of battery range per hour.	**Charging Speed:** 3 to 20 miles of battery range per minute.
Wiring: Does not require any special wiring, uses alternating current (AC), and comes with all EVs	**Wiring:** Uses AC, but requires a dedicated circuit and a supply line from the breaker box, much like air conditioners and clothes dryers. Homes may require electrical circuit box upgrades.	**Wiring:** Designed for commercial use, these chargers require a much higher voltage than is normally available in a residential area. Even if your area allows the voltage, a Level 3 charger can cost as much as or more than an EV.
Summary: Level 1 charging overnight or at work is adequate for short commutes but is too slow for traveling across town or more.	**Summary:** Most EV drivers use Level 2 charging for daily or overnight charging. Home installation of the necessary equipment is relatively inexpensive. Many public places, like shopping centers, also host Level 2 chargers.	**Summary:** Level 3 EV chargers are remarkably fast, completely charging a car in less than an hour. Level 3 public chargers cost more to use, but they enable travelers to make quick stops to recharge. However, these chargers are not recommended for daily use, and not all EVs can use them as some EVs have batteries too small to accommodate fast chargers.



** Estimated. Actual charge times may vary.*

Image Source: Central Hudson Gas & Electric Corp

c. Other Failures

All other causes are minor. They include credit-card reader malfunction (1%), display screen issues (1%), and charging cable or connector compatibility (4%). Only establishing a network and programs that prioritize maintenance, oversight, and response times.

Overall, the best solution would be to require all charging operators to comply with new and more detailed standards, as well as for record-keeping and reporting. Access to highly reliable and dependable charging stations is critical to increasing consumer confidence in electric vehicle adoption and understanding whether there is equitable access to reliable charging stations. The California Energy Commission is mandated under Assembly Bill 2061 (Chapter 345, Statutes of 2022) to develop uptime recordkeeping and reporting standards for electric vehicle charging stations. This public rulemaking will support charging station reliability and data collection by, in part, developing standards for reporting the uptime of publicly funded charging stations and collecting data to help inform state policy.

5. Cost and Disproportional Economics

If everyone in the US switched to an electric vehicle, it could increase the overall electricity demand by around 25 percent. Research that explored air quality changes from having more electric vehicles on the road found that without transitioning the power grid to renewable sources, increased pollution could have significant adverse health impacts on communities surrounding power plants—which in some cases are disproportionately communities of color and low-income communities.

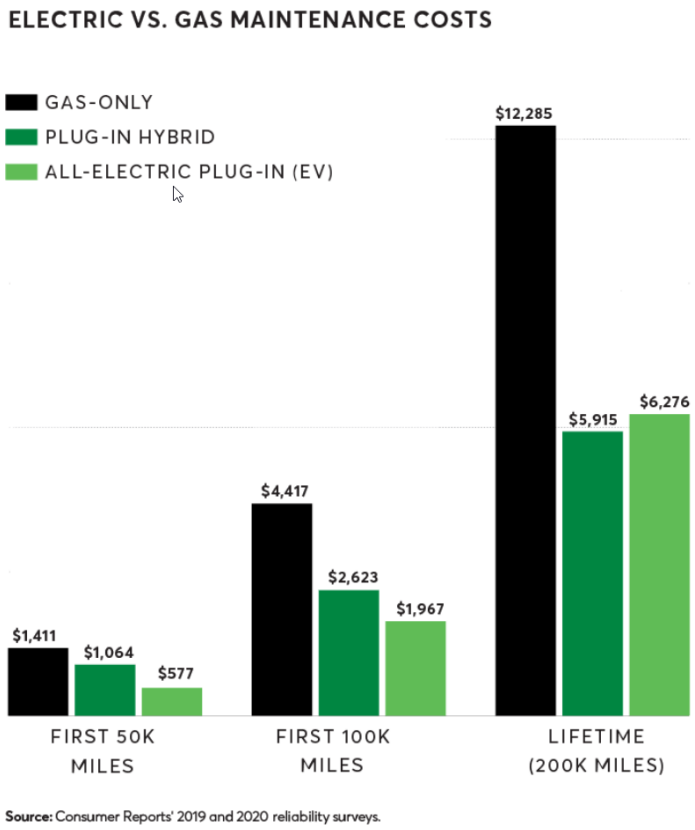
The shift to electrified transport represents a societal and technological change on par with the industrial revolution, the New Deal and the more recent digitalization of everything. The effects will have lasting impacts on our economy and built environment. As we embark on the mission to increase electric vehicle (EV) adoption, it is incumbent upon all stakeholders leading the transition to ensure equitable access to the benefits.

While EVs are becoming more attainable to average consumers thanks to government incentives, battery innovation and used cars entering the market, access to charging stations is a major barrier. Installing home charging systems is expensive, and for moderate-to-low-income people living in apartments or affordable housing, it's simply not an option. Consider that nearly two thirds of renters do not have a garage or carport. Currently, most EV stations are located in higher-end shopping areas that may be difficult or inconvenient to reach for middle- to lower- income consumers, because of where they are in relation to where they live, or the types of businesses that host the stations. Therefore, it's important that we shift the perception of EVs as being a status symbol for eco-conscious affluent consumers. A 2017 study by the California Air Resources Board found that EV adoption increased at a faster rate in neighborhoods that saw early adoption, indicating that socioeconomic status and exposure does indeed play a role in advancing electrification. Like with the diversity issue in tech, planners need to increase representation of EV owners. A lot of this will come down to community engagement programs and automakers' marketing campaigns, with a shift in messaging that emphasizes health, environment, financial and community benefits.

While the cost of EVs continues to decrease, the initial expense of EV charging infrastructure and the higher cost of most EVs available today still pose a barrier to EV purchases. In 2022, the average cost of a new non-luxury light-duty vehicle overall was nearly $44,600, while comparable EVs available cost over $65,000 on average before applicable tax credits (9 percent higher than the average EV price in 2021). New EV models have recently trended towards larger platforms (SUVs

and trucks) and more luxurious trims, which has driven up average EV pricing, along with increased consumer demand and supply chain constraints. EV prices span a wide range, with some models starting as low as $25,600 and others costing over $90,000. Medium- and heavy-duty EVs are also comparatively more expensive to purchase than their diesel counterparts.

The U.S. DOT has reported that EVs have a lower total cost of ownership than conventional vehicles due to lower fuel and maintenance costs, and therefore have the potential to yield significant savings for owners. However, the up-front purchase price can be a barrier for many, particularly for low-income individuals. In addition, many people aren't accustomed to considering total cost of ownership when purchasing a vehicle, so they may perceive the cost of owning an EV over time to be higher than it really is.



While the cost of charging will depend on the cost of electricity in particular areas, the high fuel economy of EVs leads to lower fueling costs compared to gasoline or diesel vehicles. For example, the electricity required to drive an EV 15,000 miles in a year costs an average of $600, while the gasoline required to drive the same distance averages $2,700, representing a savings of over $2,100 per year. Lower fuel costs are especially beneficial in rural areas, where residents drive on average ten more miles per day than urban residents in vehicles that are, on average, larger and less fuel efficient. Largely due to these factors, rural drivers ultimately spend 44 percent more on gasoline and motor oil than urban drivers.

Given how lower-income families often rely on public buses to get to their jobs, take their children to school and obtain essential services, expanding access to clean, affordable and reliable transportation is a pillar of an equitable society. And like commercial fleets, electric bus fleets come with complex energy needs that can only be met by the development of robust on-site energy and charging infrastructure. With the emergence of energy-as-a-service providers focused on vehicle electrification, real estate developers, commercial fleet owners and municipalities now have feasible, low-risk options for deploying charging infrastructure at no upfront cost. This type of business model innovation and collaboration across sectors is what will unlock rapid electrification and equitable access.

In a first of its kind study, University of Michigan researchers found that the lowest-income U.S. households would keep experiencing the highest transportation energy burdens even if all gas-powered cars were replaced with EVs. The study identified disparities that will require targeted policies to promote energy justice in lower-income communities pointing toward charging subsidies and better public transportation. With most EVs priced like luxury cars, early adopters have typically been wealthy people who live in single-family homes where it's relatively easy to install a home charger. When more affordable cars like GM's $30,000 plug-in Chevrolet Equinox hit the market in 2024, access to public charging will become more important — especially for those who don't have a private garage or driveways.

Graphic inspired by Robert Wood Johnson Foundation, 2017.

Equality and equity have distinct meanings. Equality applies the same treatment to all people. Equity recognizes that people come with different histories and circumstances and treats them accordingly. In this figure four people receive a standard-size bicycle that is equal: all residents get the same bicycle. But differences in age, mobility, and body size mean that not everyone benefits in the same way. When the same concept is applied equitably, everyone receives the bike that they need. Therefore, not all neighborhoods would have access to charging or other electric vehicle facilities due to economic factors, infrastructure, etc. that are tied to electric vehicles. Targeted investment in these kinds of communities can help ensure EVs and e-micromobility access is both safe and equitable. Centering equity in transportation also means listening to the people most impacted by

transportation inequities and use these conversations to inform this report's findings, recommendations, and implementation.

With the federal government goal of installing 500,000 EV fast-chargers across America, starting along interstate highways. Once a reliable nationwide charging network is established (charging stations every 50 miles along major highways), states can use leftover funds to install chargers in other places, including disadvantaged neighborhoods, multi-family buildings, and rural areas. Equity is supposed to be a focus of the program, even for highway chargers and that is exemplified by an executive order signed by President Biden in 2021 requiring that 40% of the overall benefits of federally funded programs go to disadvantaged communities. But this doesn't mean 40% of all charging infrastructure must be installed in disadvantaged communities. Rather, it means each state must identify, prioritize and measure the total benefits that flow from federally funded EV charging infrastructure, including job growth and more.

What this means is that installing more public chargers doesn't fully address inequity issues because it's more expensive to charge at a public station than at home. Residents of single-family homes have access to low-cost, off-peak rates from their regulated utility. Users of public chargers, however, must pay whatever fee the operator chooses. Often times this is double or more the cost of home charging. The average price of electricity in the U.S. is 16 cents per kilowatt-hour, while public charging rates can be anywhere from 30 cents to 60 cents per kilowatt-hour. Therefore, while recharging your EV at home might cost about $10, it's likely to cost $20 or $30 at a public charger, based on typical rates and figures.

The other economic impact associated with EV ownership is the cost of insurance. Car insurance for an EV is about 25% more expensive than the cost for the same car with a gas engine. Car insurance costs are typically higher for electric cars because EVs tend to cost more to buy, cost more to repair, and cost more to replace after a car accident. One of the main reasons for more expensive rates is that electric vehicles contain expensive, high-capacity batteries. The following is an example of the price increase between traditional gasoline and EV Models.

- **Replacement parts.** The cost to repair and replace electric parts is often more expensive than their non-electric equivalents. Replacement parts for an EV are 2.7% more expensive than replacement parts for a gas-powered car, according to a report from CCC Intelligent Solutions, a provider of data to the automotive, collision repair and insurance industries.

- **Electric vehicle batteries**. The cost to replace a damaged battery in an EV can range between $5,000 to $15,000, according to GreenCars, a website that provides tools and resources for electric car shoppers.

- **Repair shops.** Facilities may charge more for repairs because of the specialized training required to fix EVs.

Cost of gas vs. electric cars

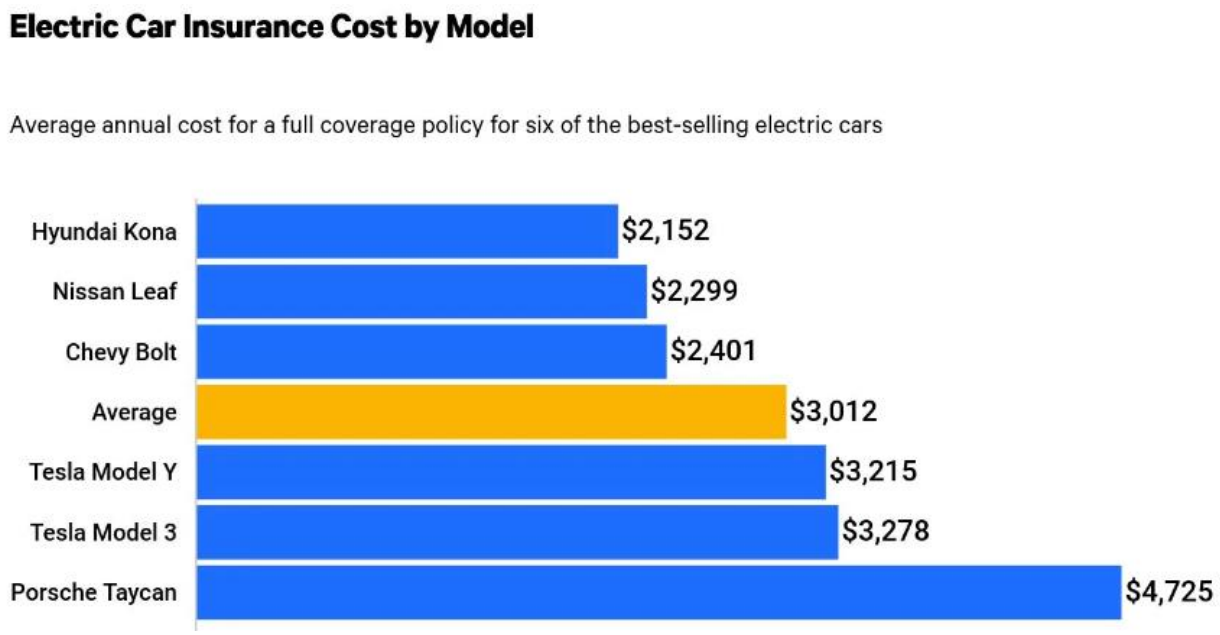
Car	Gas MSRP	Electric MSRP	MSRP cost increase
Fiat 500	$25,500	$32,700	28%
Kia Soul	$18,200	$34,520	90%
Chevy Spark	$13,100	$25,900	98%

MSRP values from Kelley Blue Book.

For insurance comparison purposes, the above 3 vehicles will be used. These cars come in both an electric and gas version of the same model, the electric Chevy Spark had the closest car insurance rates to its ICE counterpart, likely due to having a lower MSRP than most EVs. On average, if the insurance rate for a gas Chevy Spark is $1,000 per year, the premium for the electric version would be $1,190.

Gas vs electric car insurance costs

Car model	Rate increase for EV version
Chevy Spark	19%
Kia Soul	23%
Fiat 500	32%



6. Micromobility and Transit as it relates to Electric Vehicles

Transportation systems have a crucial role to play in the quality of life and accessibility of metropolitan areas. However, they also generate various impacts that affect the livability of urban environments. They include such impacts as such as congestion, air and noise pollution, etc. For this reason, the features of a sustainable mobility framework are at the forefront of public debate, aiming to make transport facilities environmentally friendly. To that end what are the options that are efficient and attractive for users?

While there is a push to discourage the use of private cars (should apply to both internal combustion and electric), these policies are also designed to promote public transport and other sustainable mobility options. It is fundamental to accompany such measures with efficient public transport services; otherwise, mobility needs will remain unmet. Therefore, the necessity of a multimodal approach is clearly needed. For this purpose, new mobility paradigms (such as alternatively powered vehicles and shared services) are becoming increasingly common and should be considered potential solutions.

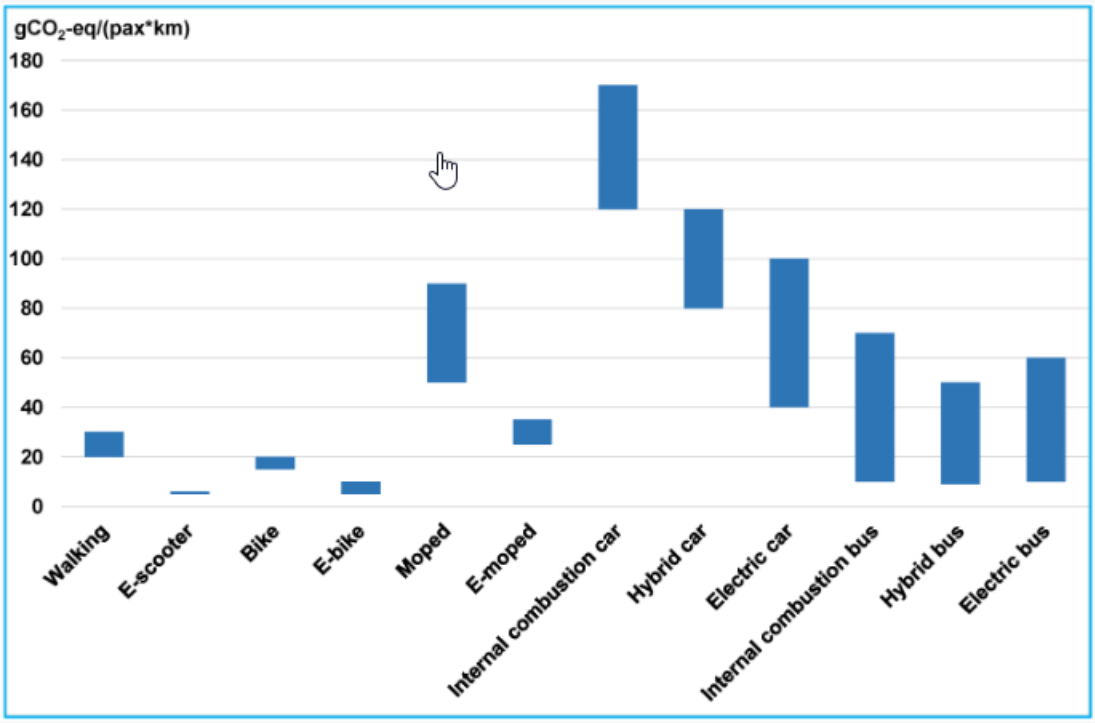
To that end, one of the main issues to be addressed is a new understanding of car use: When asked what cars are for, most would say that they were for moving around. While true for a portion of the day, cars are mostly stationary during the day. The basis for such a confrontational definition lies in the fact that, especially in urban contexts, most cars are used, at most, for 2–3 h in a day, which represents a utilization rate of lower than 15%. Hence, the main use of cars in urban areas is as stationary objects. This means that we have three alternatives:

- Conceive and design cities as places for parked cars (parking lots rather than roads need to be built);
- Increase the utilization of cars through car-sharing solutions (to change their primary use) and/or reduce the number of parked vehicles in urban centers by car-pooling (to increase the number of passengers carried by each vehicle);
- Adopt micromobility solutions as an alternative means to cars, either directly (in the case of trips made entirely with micromobility vehicles) or indirectly (in the case of adduction system to increase the attractiveness of public transport with respect to private cars).

- Or a combination of the three?

In a study produced by MDPI “Adoption of Micromobility Solutions for Improving Environmental Sustainability: Comparison among Transportation Systems in Urban Contexts” an assessment of the emission factors proposed in the literature in the last decade for different transport systems was presented below. Emission factors are expressed in terms of CO2-eq (considering the global warming impact of different greenhouse gases, such as nitrous oxide, ozone and chlorofluorocarbons) and as unit coefficients (with regard to a single passenger and a predefined unit of length, i.e., kilometer)

Figure 1. Range values for unit emission factors in the case of the use phase.



Life Cycle Assessment (LCA)) of the vehicles involves the production, transport and final disposal of vehicles, as well as the fuel life cycle.

As can be seen by this analysis of the life cycle of the various modes of transportation, transit and micromobility have less of an environmental impact of most modes, especially cars and including electric vehicles (both electric and hybrid). Please note that active modes, such as walking and cycling, cannot be defined as emission-free since they require a human physical effort and, hence, an energy expenditure. For this reason, in general, related studies refer to emissions related to the production process of the food required to cover a certain distance by cycling. The European Cyclists Federation (ECF) states that the average European diet is responsible for 1.44 gCO2-eq per calorie of consumed food. Therefore, given the total amount of burned calories, an estimate can be made. However, the range varies considerably, since a meat-based diet generates higher emissions than a vegetarian diet, and the respective speeds of pedestrians and cyclists can be variable as well.

Figure 2. Range values for unit emission factors in the case of the entire life cycle.

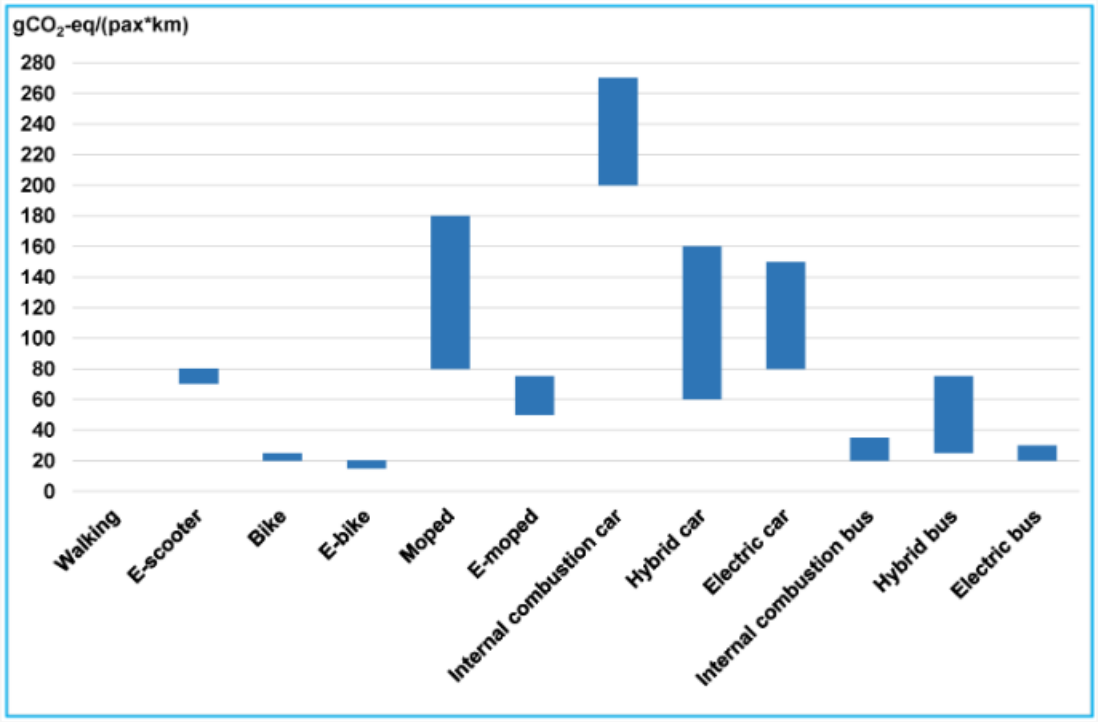


Table 1. Overview of unit emission factors for each analysed transport mode, both in the case of use phase and LCA.

Transport Mode	Range Values for Unit Emission Factors [gCO_2-eq/(pax*km)]	
	Use Phase	Life Cycle Assessment (LCA)
Walking	[20–30]	–
E-scooter	[5–6]	[70–80]
Bike	[15–20]	[20–25]
E-bike	[5–10]	[15–20]
Moped	[50–90]	[80–180]
E-moped	[25–35]	[50–75]
Internal combustion car	[120–170]	[200–270]
Hybrid car	[80–120]	[60–160]
Electric car	[40–100]	[80–150]
Internal combustion bus	[10–70]	[20–35]
Hybrid bus	[9–50]	[25–75]
Electric bus	[10–60]	[20–30]

Given the total amount of kilometers covered and a specific occupancy coefficient according to the analyzed mode in this study, the analysis computed total emissions, both for the entire life cycle and only the use phase, for each assessed transport system. The only exception is the walking mode for which, as already noted, there is no point discussing LCA. The related results are shown, respectively, in the Table 5 and Table 6, for both days in question. Red values show less sustainable modes while green values indicate the most environmentally friendly systems.

Table 5. Comparison of different transport modes, in terms of CO_2 total emissions, related to the whole life cycle assessment.

Transport Mode	Life Cycle Assessment			
	Day 1		Day 2	
	Total Emissions [gCO_2-eq]	Percentage Variation [%]	Total Emissions [gCO_2-eq]	Percentage Variation [%]
Walking				
E-scooter	180.83	100%	193.76	100%
Bike	54.25	30%	58.13	30%
E-bike	42.19	23%	45.21	23%
Moped	313.43	173%	335.85	173%
E-moped	150.69	83%	161.47	83%
Internal combustion car	566.59	313%	607.11	313%
Hybrid car	265.21	147%	284.18	147%
Electric car	277.27	153%	297.10	153%
Internal combustion bus	66.30	37%	71.05	37%
Hybrid bus	120.55	67%	129.17	67%
Electric bus	60.28	33%	64.59	33%

Table 6. Comparison of different transport modes, in terms of CO_2 total emissions, related to the use phase.

Transport Mode	Use Phase			
	Day 1		Day 2	
	Total Emissions [gCO_2-eq]	Percentage Variation [%]	Total Emissions [gCO_2-eq]	Percentage Variation [%]
Walking	57.87	436%	62.00	436%
E-scooter	13.26	100%	14.21	100%
Bike	42.19	318%	45.21	318%
E-bike	18.08	136%	19.38	136%
Moped	168.77	1273%	180.84	1273%
E-moped	72.33	545%	77.50	545%
Internal combustion car	349.60	2636%	374.60	2636%
Hybrid car	241.10	1818%	258.35	1818%
Electric car	168.77	1273%	180.84	1273%
Internal combustion bus	96.44	727%	103.34	727%
Hybrid bus	71.13	536%	76.21	536%
Electric bus	84.39	636%	90.42	636%

For electric modes, e-bikes emerge as being more sustainable than e-scooters, due to the option of pedal assistance. However, the impact of e-mopeds is comparable to that of e-scooters, despite the greater mass that has to be moved. This is due to the higher speeds that an e-moped can reach, leading to a greater distance being covered during its service life. The highest impact is generated by cars, especially internal combustion vehicles. This is due to the fact that congestion limits the speeds that can be attained by cars in urban environments. Finally, the low impact shown for buses is due to the high carrying capacity involved, which generates a very low unit emission coefficient (i.e., gCO2/pax).

The cost associated with each of the travel modes was also analyzed in the study. The results are shown in Table 7, where red percentages show more expensive modes, green values indicate less expensive modes and the orange value represents an intermediate condition. The latter refers to walking which, against a small environmental impact, has the great drawback of a much longer travel time than other transport modes, when the distance to be covered is equal.

Table 7. Comparison of different transport modes in terms of total cost.

Transport Mode	Externalities Cost [€]	User-Generalised Cost [€]	Total Cost [€]	Percentage Variation [%]
Walking	23.67	3013.79	3037.46	185%
E-scooter	5.42	1636.18	1641.60	100%
Bike	17.26	1205.52	1222.78	74%
E-bike	7.40	1636.18	1643.58	100%
Moped	69.04	1865.02	1934.06	118%
E-moped	29.59	1865.02	1894.61	115%
Internal combustion car	143.01	8487.01	8630.03	526%
Hybrid car	98.63	8487.01	8585.65	523%
Electric car	69.04	8487.01	8556.05	521%
Internal combustion bus	39.45	5611.10	5650.55	344%
Hybrid bus	29.10	5611.10	5640.19	344%
Electric bus	34.52	5611.10	5645.62	344%

In summary electric micromobility options are available at much lower price points than Electric Vehicles or gasoline- or diesel-fueled vehicles, which helps explain why in the U.S. in 2020 more than twice as many e-bikes were sold compared to EVs. Even with EV sales more than doubling in 2021 (100,000 in 2019; 400,000 in 2021), e-bike sales were still almost 45 percent higher (according to the US DOT). Budget model e-bikes are now available for $1,500 or less, with mid-range models (including cargo models) costing up to about $4,000.

E-bike testing has demonstrated between 2,200 and 3,800 MPGe—18 to 29 times more efficient than an EV with 130 MPGe. Operating costs for an e-bike are generally less than $0.10 per charge and estimated to be $30-$50 per year for regular usage.

E-bikes may be cost-competitive with annual expenditures on public transportation for some individuals who use transit as their primary mode of transportation. And owning an e-bike or e-cargo bike instead of a car could potentially save tens of thousands of dollars over the vehicle's lifetime.

Summary

As can be seen with the information presented above, conversion to electric vehicles is only a piece of the solution in addressing transportation demands, implementation, and certain environmental impacts. A multi-prong approach that includes a strategy involving a mixture of electric vehicles, micro-mobility, transit, and land use planning considerations are needed. Many of the concerns listed above are outside the role of local government to solve, but they should be aware of the concerns so where possible they can influence solutions. Furthermore, to meet the electrification goal of all vehicles by 2050, equity and affordability will be a huge challenge and potential obstacle that needs to be addressed for this goal to be met. As we focus on air quality and reduced tailpipe

emissions, we should also focus on safety with electric vehicles. The two are not mutually exclusive. We should aim for improved safety and improved air quality.

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APPENDIX F. PUBLIC FEEDBACK PROCESS

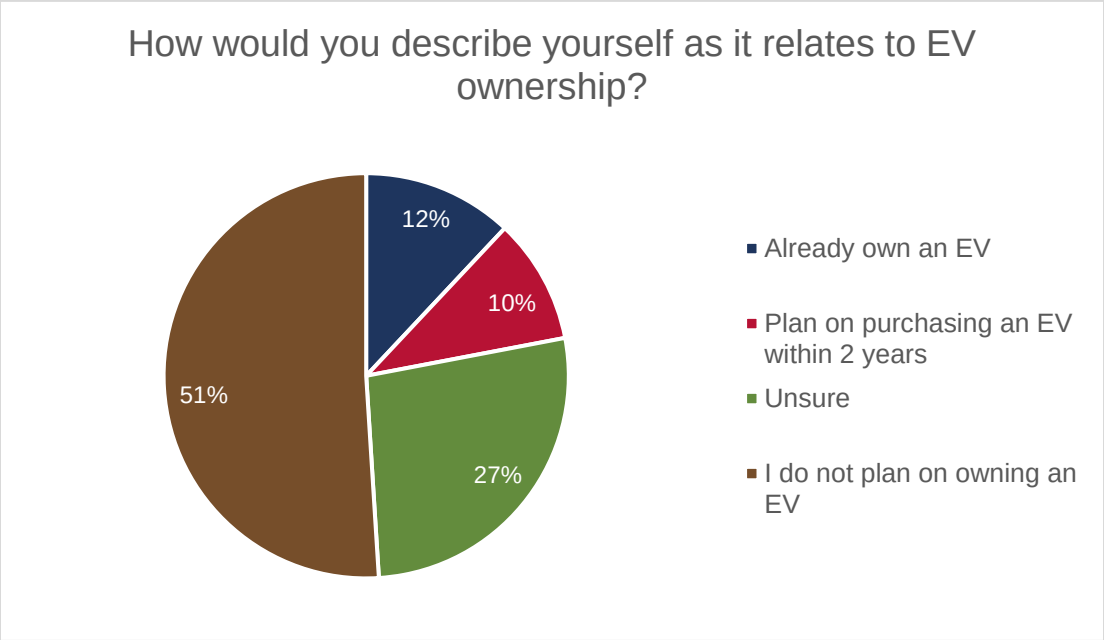
Arapahoe County and stakeholder partners sought public feedback on the Regional Electric Vehicle (EV) Action Draft Plan with a public event and open comment period.

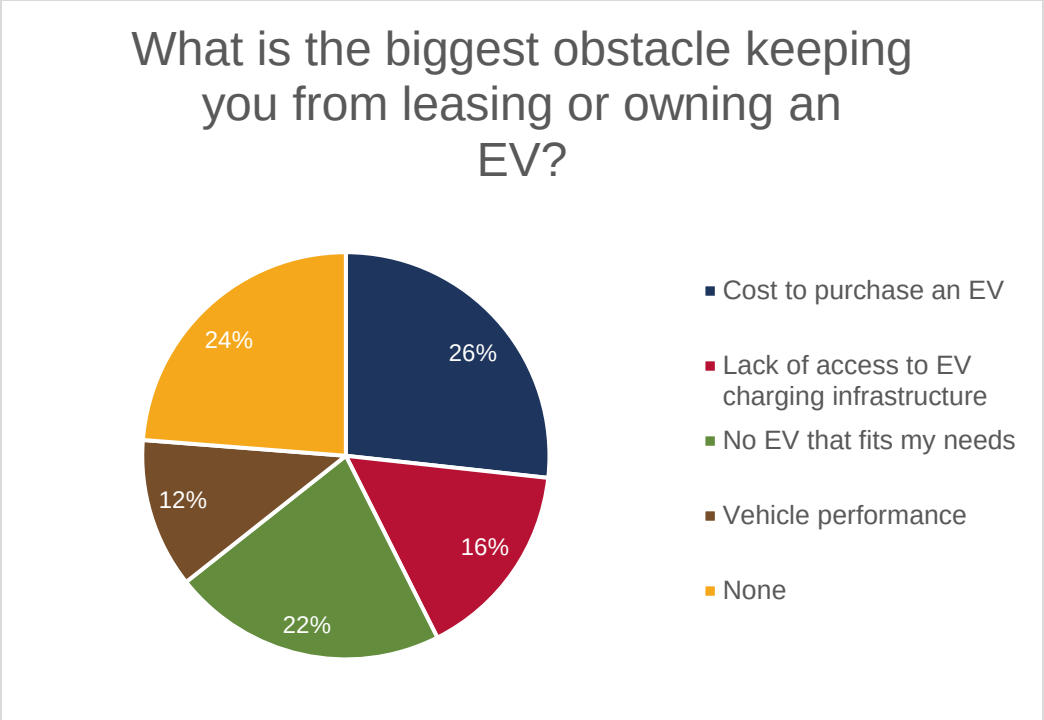
Public Event

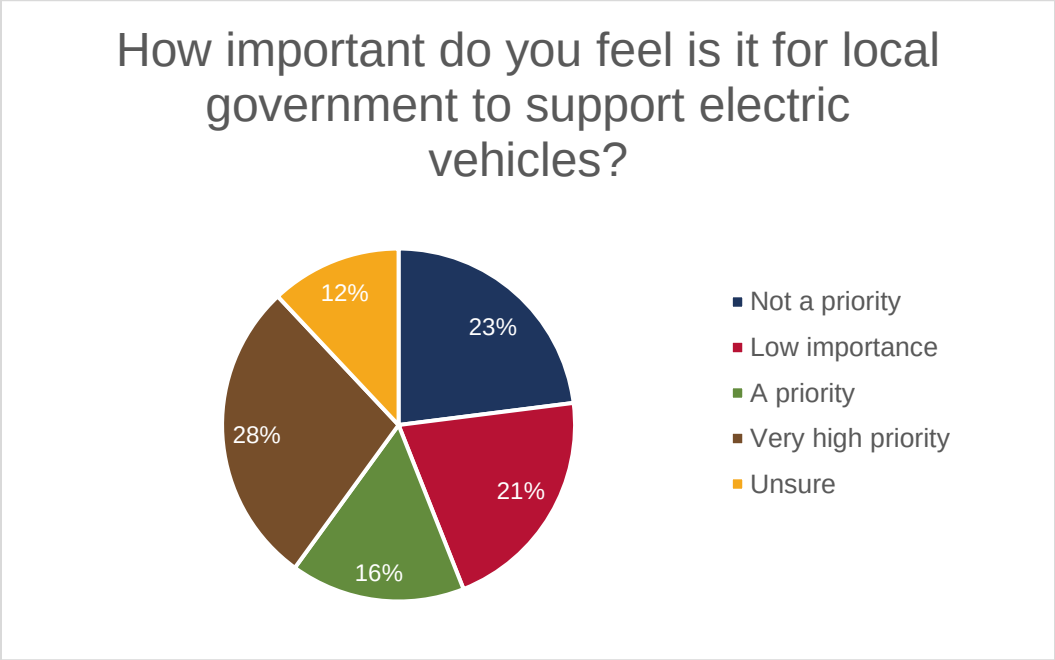
A virtual meeting was held on February 8th, 2024 to discuss the draft plan, gather feedback, and answer questions from attendees. A recording of that meeting is available on the County's YouTube channel.

Nearly 600 attendees participated in the event by attending, participating in polling questions, and asking questions. Almost three quarters of attendees live in a suburban community, about one quarter live in an urban community and about two percent live in in a rural community. Questions asked and answered during the event included topics some including EVs as one component of the overall transportation sector and how electrified transportation is also part of transit and micromobility, grid capacity, battery concerns around manufacturing and recycling and different charging station levels and business models.

Results from polling questions asked at the event are below.







Public Comment

The draft Plan was open for comment from January 12th to February 29th, 2024. Comments were provided through a survey. There were 67 responses that ranged from very supportive to disapproving of EVs and the Plan. Survey questions included both multiple choice and open-ended questions that asked about how respondents relate to EVs, elements of the plan, information to include, and who should be involved to assist with implementation of the strategies within the Plan.

In the open-ended questions that included feedback on the visions statement and elements of the four focus areas responses ranged from opinions to highlight why transportation electrification is

important for improving air quality due to a reduction of tailpipe air pollutants, to the importance of improving other methods of transportation such as transit and bicycling, to reasons why EVs should not be supported through infrastructure investment or concerns about the cost of EVs or the manufacturing of batteries.

One consistent theme was that the County should not use taxpayer money to install County-owned public charging stations. The term public charging typically is used to denote publicly accessible charging stations whether on private property or government-owned property and whether the station is owned by a private entity or a government. Responses used the term public charging in a limited definition to mean charging that is on government land and government owned.

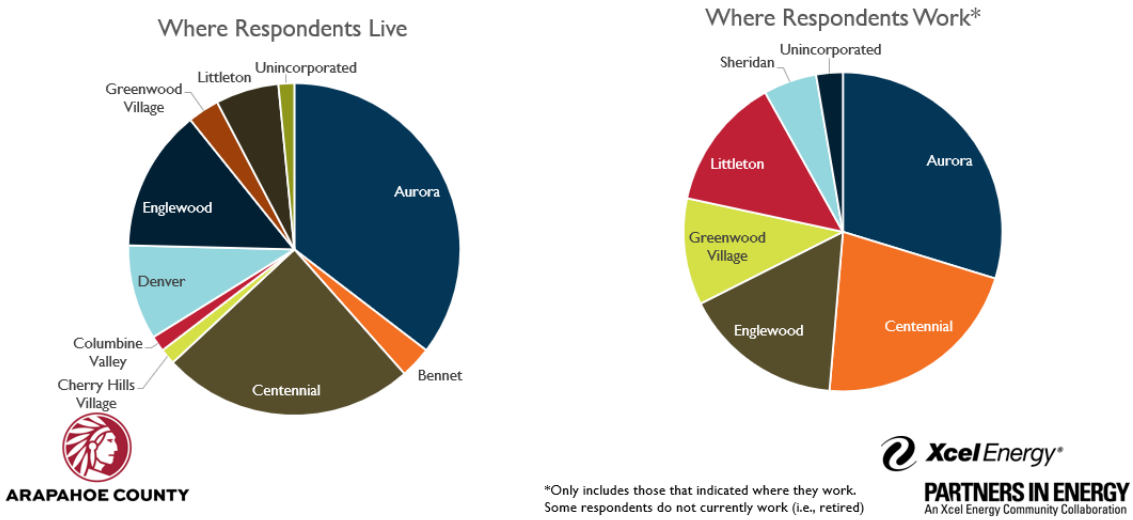
Related to the Outreach and Education focus area, comments added provided types of resources and information that would be helpful such as material to debunk common myths about EVs, where to find charging stations, resources about available funding. Comments also included specific outreach to non-English speakers at community events.

Related to the Public Charging focus area comments included charging access for renters or multifamily dwelling residents and accessing renewable energy sources to power the stations. Criteria for how to site public charging stations include areas with large parking lots, lighting, places that serve a dual purpose, near amenities that can also increase economic development and activity.

Comments related to the Fleets and Electrified Multimodal fleet had few comments. Fleets focused on providing informational resources for private fleets to make informed decisions and to develop case studies from fleets that have electric vehicles. For implementing the Electrified Multimodal Transportation focus area feedback included engaging with disability organizations and advocates.

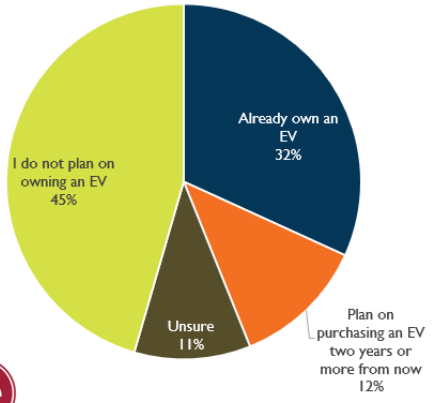
Results from multiple choice survey questions are below.

RESPONDENTS

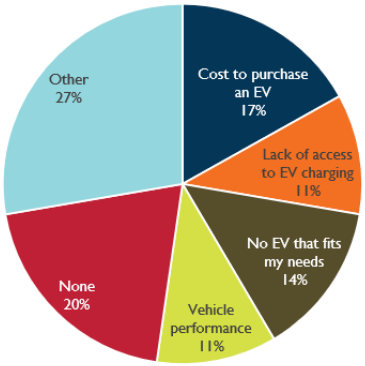


EV OWNERSHIP AND BARRIERS

Ownership



Barriers



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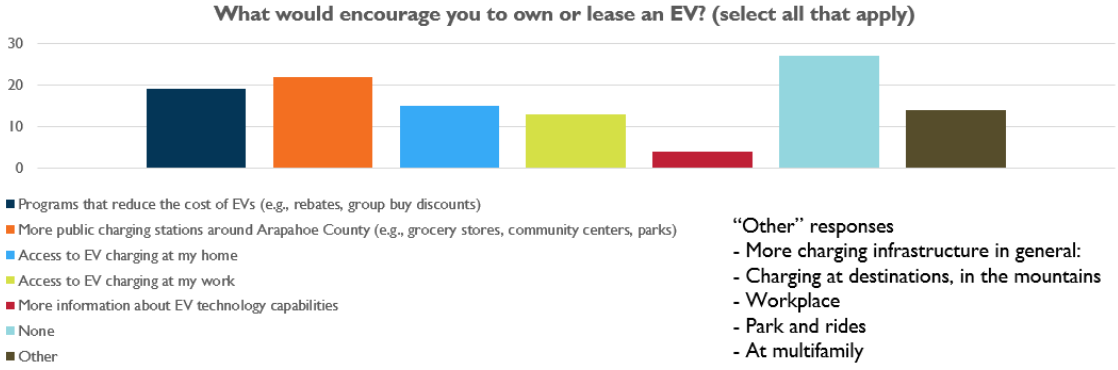
WHAT WOULD ENCOURAGE YOU TO OWN OR LEASE AN EV?



"Other" responses
- More charging infrastructure in general:
- Charging at destinations, in the mountains
- Workplace
- Park and rides
- At multifamily

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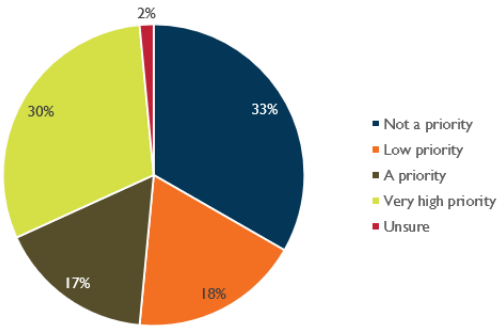
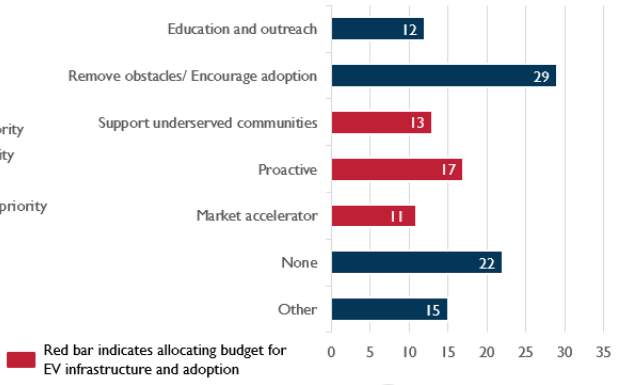
WHAT IS THE PRIORITY FOR ELECTRIFYING THE TRANSPORTATION SYSTEM?



COUNTY GOVERNMENT'S ROLE IN ELECTRIFIED TRANSPORTATION?



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Note: Appendix G: Works Cited does not include references from Appendix E: Arapahoe County EV Supplemental Report.

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