PUEBLO COUNTY

# ELECTRIC VEHICLE READINESS PLAN

**January 2021**


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***EV Charging Stations at CDOT Offices,*** *Pueblo, CO.*


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# Commonly Used Terms & Acronyms

**Alternating Current (AC)** — An electric current that reverses direction multiple times per second, used to offer faster charging.

**Alternative Fuel Vehicle (AFV)** — A vehicle with a motor that runs entirely or partially on alternative fuel(s) other than traditional gasoline or diesel.

**Annual Average Daily Traffic (AADT)** — The average daily volume of vehicle traffic along a roadway segment over the course of a year.

**Automatic Metering Infrastructure (AMI)** — Systems that measure, collect, and analyze energy usage to provide variable rates for users.

**Battery Electric Vehicle (BEV)** — A vehicle that receives all its power from batteries and electric motor(s).

**Charge de Move (CHAdeMO)** — A charging standard for fast-charging stations.

**Colorado Beneficiary Mitigation Plan (BMP)** — The statewide plan to distribute funds from the Volkswagen Clean Air Act Settlements.

**Colorado Department of Local Affairs (DOLA)** — A department within the State responsible for distributing some grant funds to support adoption and infrastructure expansion.

**Colorado Department of Public Health and Environment (CDPHE)** — A cabinet-level department providing public health and environmental protection services for Colorado.

**Colorado Energy Office (CEO)** — A non-regulatory department working to reduce greenhouse gas emissions and consumer energy costs by advancing clean energy and energy efficiency.

**Combined Charging System (CCS)** — A charging station standard that provides a combination of connectors for compatibility.

**Diesel Emissions Reduction Act (DERA)** — A program developed to support the distribution of funds from the Volkswagen Clean Air Act Settlements to improve air quality by reducing harmful emissions from diesel engines.

**Direct Current (DC)** — An electric current flowing in one direction only, used to provide standard-level charging.

**Direct Current Fast Charger (DCFC)** —Chargers that convert AC power to DC power to provide faster charging.

**Electric Vehicle (EV)** — A vehicle propelled by one or more electric motors using energy stored in rechargeable batteries.

**Electric Vehicle Supply Equipment (EVSE)** — Infrastructure, such as charging stations, providing energy to recharge electric vehicles.

**Electric Vehicle Supply Provider (EVSP)** — Groups providing connectivity across a network of charging stations.

**Greenhouse Gas (GHG)** — A gas that contributes to the greenhouse effect by absorbing infrared radiation, such as carbon dioxide, or $CO_2$.

**Heavy-Duty Vehicle (HDV)** — Any vehicle exceeding twenty-six thousand and one (26,001) pounds in gross weight.

**Hybrid Electric Vehicle (HEV)** — A vehicle powered by an internal combustion engine in combination with one or more electric motors that use energy stored in batteries.

**Internal Combustion Engine (ICE)** — An engine that generates power by burning gasoline, oil, or other traditional fuels.

**Light-Duty Vehicle (LDV)** — Any vehicle with a gross weight of eight thousand five hundred (8,500) pounds or less.

**Medium-Duty Vehicle (MDV)** — A vehicle with a gross weight between eight thousand five hundred and one (8,501) pounds and ten thousand (10,000) pounds.

**Plug-In Hybrid Electric Vehicle (PHEV)** — A hybrid electric vehicle whose battery can be recharged by plugging in to an external source of power and by the on-board engine and generator.

**Regional Air Quality Council (RAQC)** — The lead air quality planning agency along the North Front Range.

**Regional Electric Vehicle Plan for the West (REV West Plan)** — An agreement by eight (8) western states to develop fast-charging corridors along key regional highway corridors.

**Transportation Network Company (TNC)** — A company providing prearranged rides or car rentals for a fee using an online-enabled application or platform, such as a smartphone application.

**United States Department of Energy (DOE)** — A federal department working to address the country's energy and environmental challenges.

**Vehicle Miles Traveled (VMT)** — A measure of the amount of travel for all vehicles in a geographic region over a given period of time.

**Zero Emission Vehicle (ZEV)** — A vehicle that emits no exhaust gas from the onboard source of power.

## *Dear Pueblo County Commissioners,*

Pueblo County embraced an ambitious vision to be a leader in the adoption of electric vehicles (EV) in the State of Colorado to reduce greenhouse gas emissions and improve sustainability in Pueblo County and throughout the state.

After collaborating with local utilities to promote EVs and EV charging infrastructure, the County recognized the need to develop a plan to strategically guide education, policy, and infrastructure investment to enable the broader use of EVs. The Pueblo County *Electric Vehicle Readiness Plan* advances this mission to provide clear direction on the development, siting, and implementation of appropriate EV charging infrastructure for public use and to foster greater use of EVs within Pueblo County.

This plan establishes an EV vision and goals for the County, expands collaboration with a broader range of stakeholders to be active partners to facilitate broader EV adoption, identifies national and regional barriers (based on stakeholder engagement and survey responses) to EV adoption and strategies to overcome them, provides regionally focused strategies to educate the public about EVs, and provides recommendations about the siting and possible funding of EV charging infrastructure.

HDR Engineering, Inc. (HDR) is proud to have partnered with Pueblo County on the development of this regionally significant *Electric Vehicle Readiness Plan* that will promote the adoption of EVs in southern Colorado. HDR respectfully presents this plan to Pueblo County and its residents.

Sincerely,

**Jim Hanson, PE, PTOE**
*HDR Project Manager*


***Downtown, Main Street & 3rd Street,*** *Pueblo, CO.*

# Chapter 1 Introduction

# Introduction

Pueblo County, Colorado (the County), developed this *Electric Vehicle Readiness Plan* (*EV Readiness Plan* or the plan) to provide clear direction on the development, siting, and implementation of appropriate electric vehicle (EV) charging infrastructure for public use and to foster greater use, or "adoption," of EVs within Pueblo County and across Colorado. While the County has made strides in education about EVs and electric vehicle supply equipment (EVSE) availability, it is estimated that only 0.03 percent (0.03%) of County residents currently own and operate an EV.

The County has actively engaged the community in conversations regarding funding opportunities that can support a transition to EVs; however, the community lacks EV-specific policies and goals to complement these education and funding components. Developed to parallel the strategies of the State of Colorado (the State), the *EV Readiness Plan* is a guide for the County to prepare and implement actions that support increased adoption of EVs and an expanded network of EVSE installations throughout southern Colorado. Each of the *EV Readiness Plan*'s sections describes and evaluates different aspects of the County's ongoing transition to EVs.


***City Municipal Campus Area,*** *Pueblo, CO.*

# Chapter 2 Vision, Mission, Goals, and Objectives

# Vision, Mission, Goals, and Objectives

Vision and mission statements, as well as goals and objectives for the *EV Readiness Plan*, were established to steer its development. These elements are important in having a plan that best reflects the intent of the County as it applies to the needs of the community and the State of Colorado's goals for an EV transition.

## Vision Statement

The vision statement describes the unique future the County hopes to create and how the public will be better served because of it.

***The vision statement for this plan is:***

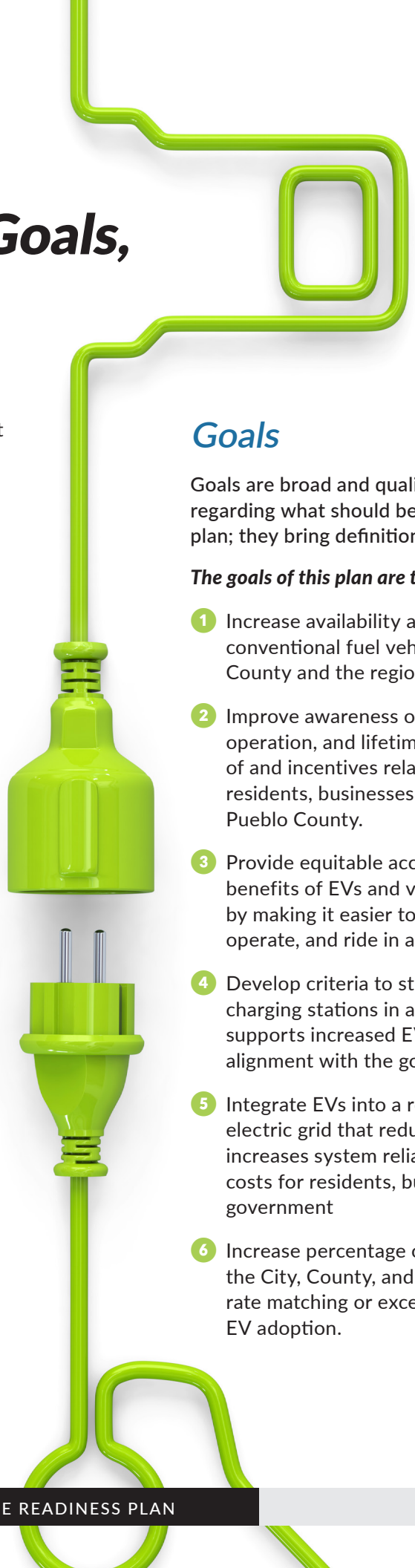
> *"To reduce greenhouse gas emissions and improve sustainability in Pueblo County by creating conditions that make electric vehicle (EV) use convenient and accessible for residents and visitors."*

## Mission Statement

The mission statement states the purpose of the plan and describes what is being done, for whom, and why.

***The mission statement for this plan is:***

> *"To provide clear direction on the development, siting, and implementation of appropriate EV charging infrastructure for public use and to foster greater use of EVs within Pueblo County."*



## Goals

Goals are broad and qualitative statements regarding what should be achieved by the plan; they bring definition to the vision.

***The goals of this plan are to:***

1. Increase availability and use of EVs over conventional fuel vehicles in Pueblo County and the region.
2. Improve awareness of purchase, operation, and lifetime costs and benefits of and incentives related to EVs among residents, businesses, and visitors to Pueblo County.
3. Provide equitable access to EVs and the benefits of EVs and vehicle electrification by making it easier to purchase, charge, operate, and ride in an EV.
4. Develop criteria to strategically locate charging stations in a way that best supports increased EV adoption in alignment with the goals listed above.
5. Integrate EVs into a renewably powered electric grid that reduces GHG emissions, increases system reliability, and reduces costs for residents, businesses, and government
6. Increase percentage of EVs and EVSE in the City, County, and private fleets at a rate matching or exceeding that pf public EV adoption.

# Objectives

Objectives are specific, time-limited, quantifiable, and desired achievements in support of the goals. They are aligned with the Leadership in Energy & Environmental Design (LEED) for Cities and Communities guidelines and the State of Colorado's goals.

***The objectives of this plan are to:***

| | | | | |
|---|---|---|---|---|
| 1 |  | **Provide charging stations for** | **2%** | of public parking spaces within Pueblo County |
| 2 |  | **Exceed** | **1.07 Public Charging Stations** | for every 10,000 County residents, equating to roughly 19 stations today for a projected 2020 County population of 172,000 persons and increasing with population growth |
| 3 |  | **Meet Colorado's low EV growth scenario such that EVs account for** | **0.63%** | of all light-duty vehicles on the road, equating to roughly 1,100 EVs now for a projected 2020 County population of 172,000 persons compared to today's share of approximately 50 and increasing with population growth |
| 4 |  940,000 | **Support the aspirational statewide goal of** | **940,000 Light-Duty EVs** | in Colorado by 2030 by striving to reach a share of 26,700 light-duty EVs in the County |
| 5 |  | **Support the development of a** | **Public Outreach/ Education Plan** | for implementation by 2022 |
| 6 |  | **Support equitable distribution of** | **Charging Infrastructure** | based on area demographics and demand |
| 7 |  | **Support electrification of the** | **County Fleet** | within Pueblo County at a rate matching or exceeding public adoption |
| 8 |  | **Distribute EV charging infrastructure such that** | **All Pueblo County Residents** | have access to a charging station within 5 miles of their residence or workplace |

# Chapter 3 Stakeholder Working Group

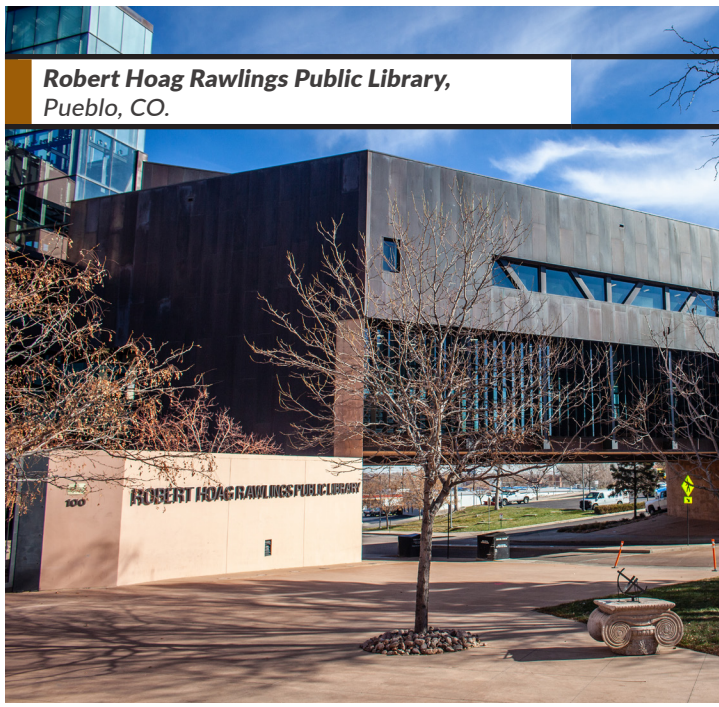
# Stakeholder Working Group

A stakeholder working group was formed to provide insights that helped guide the development of the *EV Readiness Plan*. The group consisted of representatives of organizations that have a stake in EVs—the utility, government, business, automotive, education, and other industries.

***The following organizations were represented:***

+ Black Hills Energy
+ City of Pueblo - Public Works
+ Clean Energy Economy
+ Colorado Auto Dealers Association
+ Colorado Energy Office
+ Forth Mobility
+ IBEW Local 111
+ National Renewable Energy Laboratory
+ Proterra
+ Pueblo Area Council of Governments
+ Pueblo Community College
+ Pueblo County
+ Pueblo County Fleet
+ Pueblo West Metropolitan District (PWMD)
+ ReCharge Colorado: South Central Region
+ Renewable Energy Owners Coalition
+ San Isabel Electric Association (SIEA)
+ Southern Colorado Clean Cities Coalition
+ Vidmar Honda
+ ZEF Energy


***Colorado State University,*** *Pueblo, CO.*




***Robert Hoag Rawlings Public Library,*** *Pueblo, CO.*


***Pueblo Community College,*** *Pueblo, CO.*

**Three stakeholder working group meetings were held where participants learned about the County's plans for EV transition, asked questions, voiced concerns, and discussed ideas and recommendations.**

| | *Topics Discussed:* |
|---|---|
| **September 24, 2020** | + Project overview<br>+ Project timeline<br>+ Vision, mission, goals, and objectives |
| **October 15, 2020** | + Goals, objectives, and opportunities<br>+ Public e-survey results<br>+ Existing market conditions<br>+ Initiatives and incentives |
| **November 19, 2020** | + Plan recommendations<br>+ Siting criteria and locations |

The participants informed the *EV Readiness Plan* and preliminary siting analysis. They also helped identify opportunities for the County to consider as it implements the *EV Readiness Plan* recommendations. Meeting materials are included in **APPENDIX A.**

***Key opportunities and the County goals they relate to are:***

| | | |
|---|---|---|
| 1 | **Implement creative EV transportation programs** | and marketing efforts, such as a drag race event with EVs or promotional videos starring policymakers. (1, 2) |
| 2 | **Provide education for the public** | particularly for senior groups. (1, 2) |
| 3 | **Actively engage and partner with dealerships** | to stock EVs, operate ride-and-drive events, and install charging stations on site. (1, 2, 3) |
| 4 | **Require most or all new developments** | to include EV infrastructure. (3, 4) |
| 5 | **Partner with utility companies** | to provide site preparation services. (3, 4, 5) |
| 6 | **Consider charging stations** | within the public right-of-way in constrained areas. (3, 4, 5) |
| 7 | **Replace City of Pueblo buses** | with EVs or other hybrids/AFVs. (3, 6) |

# Chapter 4 Community Questionnaire

# Community Questionnaire

To gain input from citizens and visitors regarding EVs/EVSE across the County, an "e-survey" was conducted in September and October 2020. Complete results from the e-survey are provided in **APPENDIX B.**

| | | |
|---|---|---|
| ***All responders*** | | |
| **More than** | **200** | responses were received |
| **More than** | **70%** | of responders indicated that they only make one (1) to three (3) one-way trips per day |
| **Approximately** | **90%** | of these trips are taken by personal vehicle |
| **Daily distance driven by responders** | **varied greatly** | |
| **Miles driven per day** | **30%** | under six (6) miles per day |
| | **30%** | more than six (6) miles per day |
| **Most responders** | ☑ | are familiar with EVs |
| **However...** | **40%** | do not know much about EVs |
| ***Responders who have an EV*** | | |
| **Many drivers indicated they chose an EV for** | | + Cost effectiveness<br>+ Low maintenance needs<br>+ Environmental friendliness |
| **Seasonal use** | **99%** | use their EVs year-round |
| **Operating EVs in extreme weather conditions or on rough terrain** | **3/4** | responders do not experience problems |
| **Most responders** | charge their vehicle at home | |

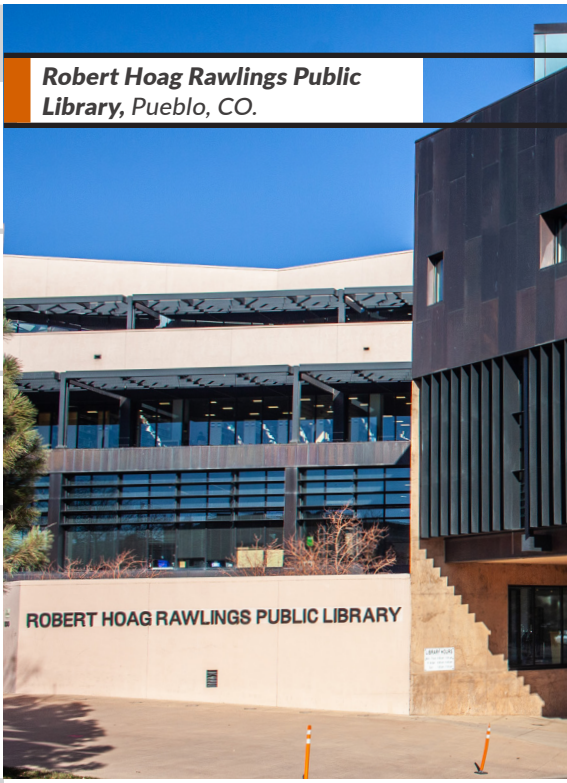
***City Transit Center,*** *Pueblo, CO.*

| *Responders who have an EV (cont.)* | |
|---|---|
| **Preferred charging locations** *(other than home)* | + Parking lots<br>+ Shopping areas<br>+ Community facilities |
| **Largest issue faced by responders when charging their vehicle** | **30%** cited lack of convenient public charger locations |
| **Percent of responders would pay for a slow (2-3 hours) charge** | **50%** |
| **Percent of responders that would pay for a full charge that takes 30 minutes or less** | **95%** |

This may be an opportunity for the County to recoup a portion of the costs related to EVSE installation, particularly for higher-cost Direct Current Fast Chargers (DCFC).

| *All responders* | |
|---|---|
| **Major influences on the decision to purchase or lease an EV** | + Increased access to charging stations<br>+ The ability to maintain and purchase EVs locally<br>+ Reduced or waived fees for installing private home chargers |
| **Government Incentives** | would have a major influence on persuading responders to choose an EV. *However...* |
| **50%** | of responders indicated that they were unaware of such programs |
| **30%** | of responders indicated that having more information on EV benefits and operations could influence their decision next time they purchase a vehicle |
| **50%** | of non-owners/-leasers indicated that they would be willing or could be convinced to purchase an EV |

| *Responders who don't have an EV* | |
|---|---|
| **Barriers to purchasing an EV were identified as** | + Cost<br>+ Lack of infrastructure<br>+ Lack of local supply and service centers<br>+ Limited capabilities (real or perceived) in off-road or snow and ice conditions |




***Robert Hoag Rawlings Public Library,*** *Pueblo, CO.*


***Pueblo Union Depot,*** *Pueblo, CO.*

# Chapter 5 Electric Vehicle Background

# Electric Vehicle Background

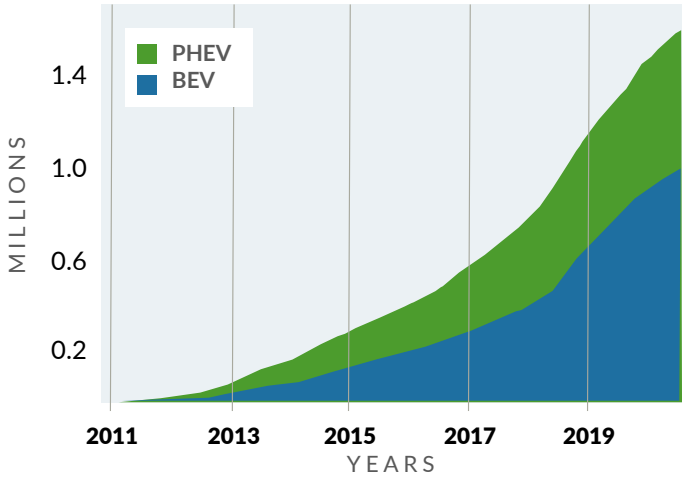
To gain an understanding of the state of EVs/EVSE today, the existing market for EVs/EVSE in the United States (U.S.) was evaluated. The types of EVs/EVSE were reviewed, including current and upcoming EV models and prominent EVSE technologies.

## EV Market

According to the U.S. Environmental Protection Agency, there are two types of electric-powered vehicles: Battery Electric Vehicles (BEV) and Plug-In Hybrid Electric Vehicles (PHEV). BEVs operate entirely using electricity with a battery and an electric motor rather than gasoline tank and internal combustion engine (ICE). PHEVs are combination gasoline and electric vehicles with a battery, an electric motor, a gasoline tank, and an ICE.

**In August 2020, cumulative sales of Plug-In Electric Vehicles (PEV), which include both BEV and PHEV, reached one point six (1.6) million vehicles.** Cumulative BEV sales reached one (1) million vehicles, while cumulative PHEV sales were approximately six hundred thousand (600,000) vehicles. BEV sales began to outpace PHEV sales in 2015; currently, BEV sales account for sixty percent (60%) of all PEV sales. These trends are displayed in **FIGURE 1**.

FIGURE 1: BEV AND PHEV CUMULATIVE SALES BETWEEN DEC 2010 AND AUG 2020





***An existing EV charging station,*** *Pueblo, CO.*

*There are about*

**40** *EV and PHEV Models*

*on the market in 2020.*

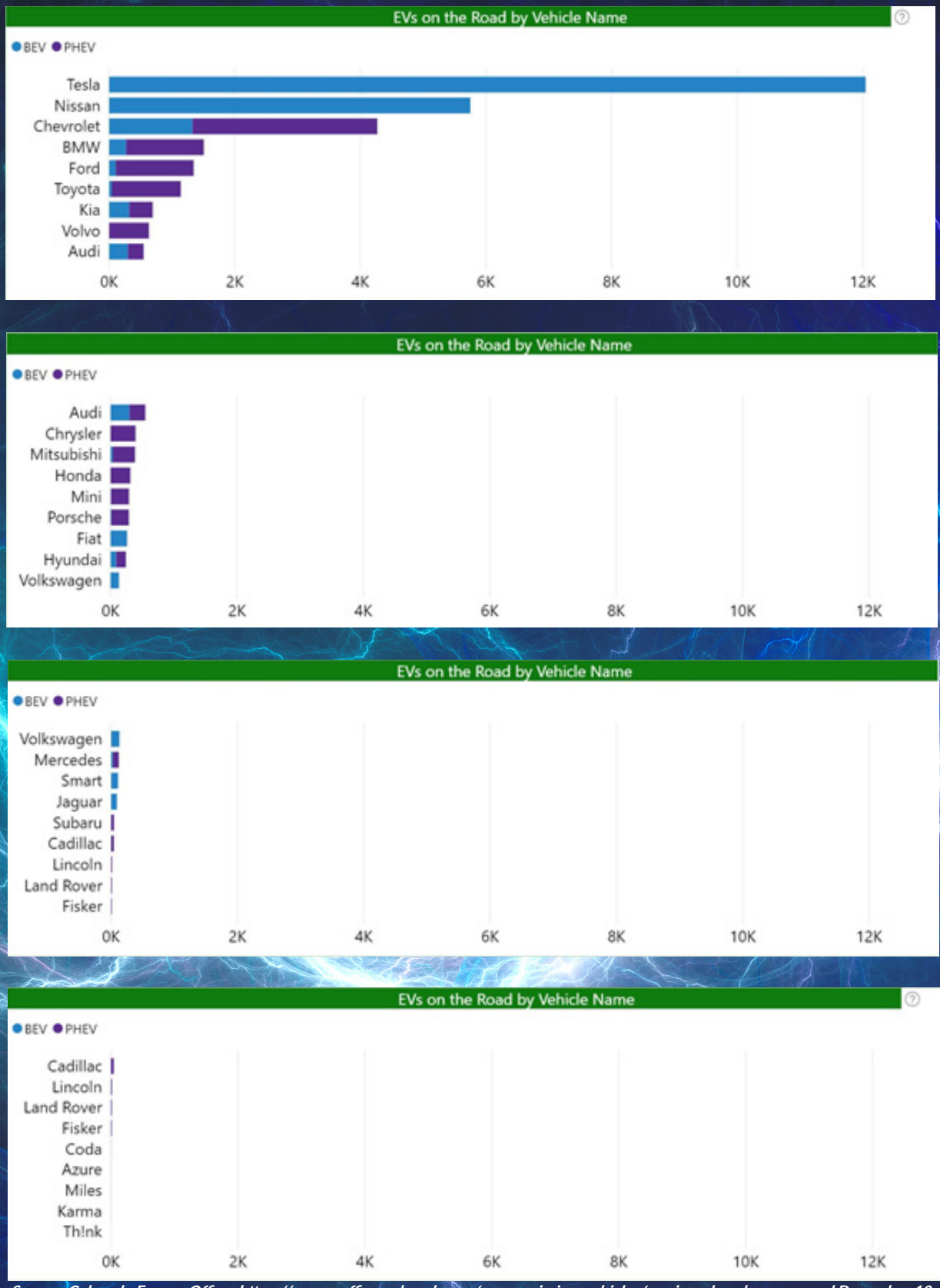
There are currently about forty (40) EV and PHEV models on the market, and more models will be released in coming years. The full list of models can be found on the Colorado Office of Energy Efficiency and Renewable Energy website[1] and is included in **APPENDIX C**. A detailed breakdown of sales for each model per year can be found on the U.S. Department of Energy's website.[2] The most common EV models available on the market in 2020 are listed in **TABLE 1**. All of these EV models are available in Colorado, including Pueblo County. **FIGURE 2** shows the market share of all EVs currently available in Colorado.

Until 2018, the Chevrolet Volt had been available the longest and had the most overall sales, but the model was discontinued in 2019. The Nissan Leaf was introduced to the market in 2011 and has become one of the most popular EV models. In 2018, the newly introduced Tesla Model 3 rapidly increased vehicle sales and established the vehicle as the best-selling BEV with nearly fifty percent (50%) of the market share. Note that Hyundai Kona must be ordered from other states as it is not yet available in Colorado. Additionally, as of 2020, the Honda Clarity Electric model has been discontinued.

TABLE 1: MOST COMMON EVS CURRENTLY AVAILABLE

| MAKE | EV MODEL | EV COST |
|---|---|---|
| **Nissan** | 2019 Nissan Leaf | $29,990 |
| **Kia** | 2019 Kio Niro EV | $38,500 |
| **Hyundai** | 2020 Hyundai Kona Electric | $36,990 |
| | 2020 Hyundai Ioniq Electric | $30,000 |
| **Honda** | 2020 Honda Clarity Electric | $33,400 |
| **Chevrolet** | 2020 Bolt EV | $36,620 |
| **BMW** | 2020 i3 | $44,450 |
| **Tesla** | 2020 Model 3 | $37,990 |

FIGURE 2: MARKET SHARE OF EVS CURRENTLY AVAILABLE IN COLORADO




*Source: Colorado Energy Office, https://energyoffice.colorado.gov/zero-emission-vehicles/evs-in-colorado, acceessed December 10, 2020.*

**Because the EV market is still relatively new, there is a limited selection of vehicle types of EVs, especially sport utility vehicles (SUV), vans, and trucks.** This situation stands to change. Automakers have announced a diversified menu of electric cars, many of which are expected in 2021 or 2022.

A list of new and upcoming EV models is included in **APPENDIX D**.

### Existing automakers that currently have BEV/PHEV models:

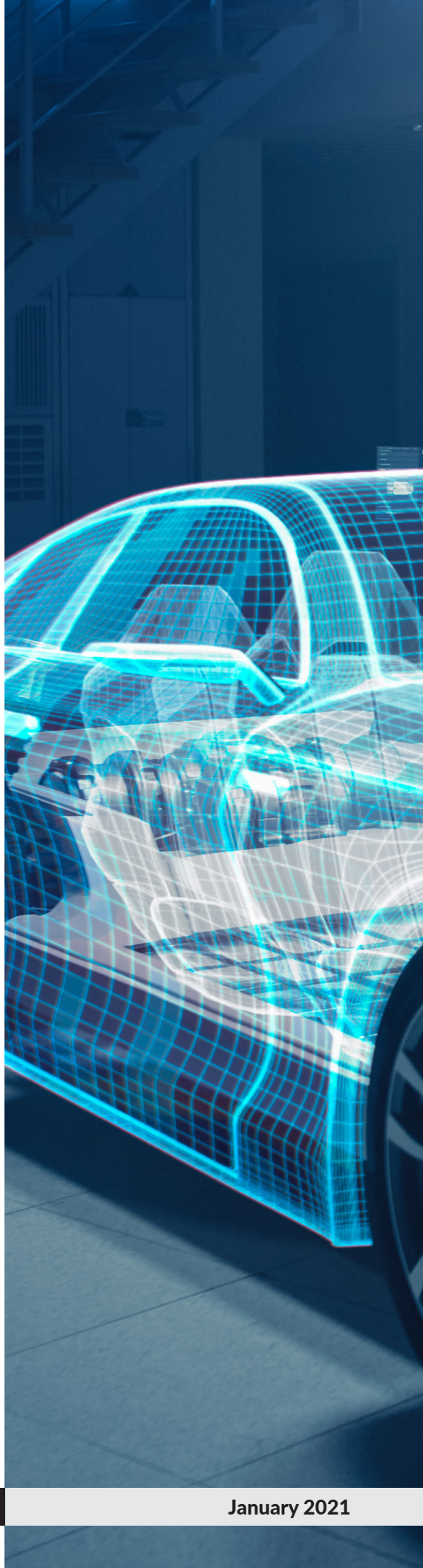
Acura, Audi, BMW, Buick, Bentley, Chevrolet, Chrysler, Dodge, Ferrari, Fiat, Ford, GMC, Honda, Jaguar, Jeep, Kia, Land Rover, Lexus, Lincoln, Mercedes-Benz, Mini Cooper, Mitsubishi, Nissan, Porsche, Subaru, Smart, Toyota, Volkswagen, and Volvo.

### New EV automakers entering the market:

Tesla and Rivian, among others.

### For the next five (5) years, automakers have announced plans to release another two hundred (200) new EV models,

many of which are in the popular sport utility vehicle market segment.



# EVSE Market

**There are currently three categories of commercially available chargers for light-duty EVs: Level 1 chargers, Level 2 chargers, and Direct Current Fast Chargers (DCFC).** Each of these charging systems offers unique advantages and challenges, and each fills an important role in the charging life cycle of BEVs. The U.S. Department of Energy has summarized the types of chargers as shown in **FIGURE 3.**[4]

FIGURE 3: EV CHARGING TECHNOLOGIES

| LEVEL 1 | LEVEL 2 | DIRECT CURRENT FAST CHARGER (DCFC) |
|---|---|---|
| 2 to 5 miles of range per 1 hour of charging | 10 to 20 miles of range per 1 hour of charging | 60 to 80 miles of range per 20 minutes of charging |
| **J1772 Charge Port** | **J1772 Charge Port** | **CCS Charge Port** / **CHAdeMO** / **Tesla** |
|  |  |  |
| Alternating Current (AC) **LEVEL 1** equipment (often referred to simply as Level 1) provides charging through a 120 volt (V) AC plug. Most, if not all, PEVs will come with a Level 1 cordset, so no additional charging equipment is required. On one end of the cord is standard NEMA connector, (for example, a NEMA 5-15, which is common three-prong household plug) and on the other end is SEA J1772 standard connector (often referred to simply as J1772, shown in the above image). The J1772 connector plugs in to the car's J1772 charge port, and the NEMA connector plugs in a standard NEMA wall outlet.<br><br>Level 1 charging is typically used when there is only a 120V outlet available, such as while charging at home, but can easily provide charging for all of a driver's needs. For example, 8 hours of charging at 120V can replenish about 40 miles of electric range for a mid-size PEV. As of 2019, less than 5% of public charging outlets in the United States were Level 1. | AC **LEVEL 2** equipment (often referred to simply as Level 2) offers charging through 240V (typical in residential applications) or 208V (typical in commercial applications) electrical service. Most homes have 240V service available, and because Level 2 equipment can charge a typical PEV battery overnight, it is commonly installed at PEV owners' homes for home charging. Level 2 equipment is also commonly used for public and workplace charging. This charging option can operate at up to 80 amperes (Amp) and 19.2 kW. However, most residential Level 2 equipment operates at lower power. Many of these units operate at up to 30 Amps, delivering 7.2 kW of power. These units require a dedicated 40 Amp circuit. As of 2019, over 80% of public outlets in the United States were Level 2.<br><br>Level 2 charging equipment uses the same J1772 connector and charge port that Level 1 equipment uses. All commercially available PEVs have the ability to charge using Level 1 and Level 2 charging equipment. Although Tesla vehicles do not have a J1772 charge port, Tesla does sell an adapter. | **DIRECT-CURRENT (DC)** fast charging equipment (typically 208/480V AC these-phase input), enables rapid charging along heavy traffic corridors at installed stations. As of 2019, about 15% of charging outlets in the United States were DC fast chargers. There are three types of DC fast charging systems, depending on the type of charge port on the vehicle: SAE Combined Charging System (CCS), CHAdeMO, or Tesla.<br><br>The CCS (as known as J1772 combo) connector is unique because a driver can use the same charge port when charging with Level 1, 2 or DC fast equipment. The only difference is that the DC fast charge connector has two additional bottom pins. The CCS connector is used by Chevorlet and BMW PEVs, for example.<br><br>The CHAdeMO connector is the most common of the three connector types and is used by Nissan, Mitsubishi, and Toyota PEVs, for example.<br><br>Tesla vehicles have a unique charge port and connector that works for all their charging options including their fast charging option, called a supercharger. |

**Publicly available chargers are described below.** It should be noted that Tesla's charging system is not directly cited because Tesla's EVSE network is quasi-public in that it does not allow non-Tesla cars to use the network chargers. However, Tesla does offer adapters that allow their cars access to other Level 2 and DCFC networks. This is a key consideration with Tesla being the most popular BEV on the market.

## LEVEL 1

*Level 1 chargers operate at one hundred and twenty volt (120V) and have the slowest charging time.*

Level 1 chargers are almost always found at the homes of owners, as they operate at common household voltages and can plug in directly to a one hundred twenty volt (120V) outlet (a standard home outlet). Level 1 chargers are typically protected by a fifteen A (15A) or twenty A (20A) breaker and are most often mounted to the wall. Level 1 chargers are the cheapest to purchase and install, with single connectors ranging from three hundred dollars ($300) to fifteen hundred dollars ($1,500); however, these costs do not include site preparation. The U.S. market has standardized SAE J1772 charger connectors for EVs, shown in **FIGURE 4**.

Level 1 chargers do not typically exceed 1.8 kW (similar to a large microwave) based on breaker sizes and often do not operate at much more than half the breaker rating; therefore, Level 1 EVSE do not charge at greater than an eight (8) miles per hour rate. To fully charge an EV with a range of one hundred twenty-five (125) miles—the average range of all EVs on the U.S. market in 2018 per the U.S. Department of Energy— from zero battery charge will take approximately fifteen and six tenths (15.6) hours. Because of the slow charge, Level 1 chargers are generally only deployed at homes, airport long-term parking, or workplaces where the EV is able to sit for many hours. Additionally, the traditional overnight charging pattern can result in the lowest energy costs.

FIGURE 4: SAE J1772 CHARGER

## LEVEL 2

*Level 2 chargers operate at two hundred and eighty volt (208V) or two hundred and forty volt (240V) depending on the site.*

Higher voltage and the corresponding higher wattage of Level 2 chargers means faster charging (two [2] to ten [10] hours) than with a Level 1 charger (fifteen and six tenths [15.6] hours on average). Level 2 chargers are generally hard-wired to an electrical panel, which results in a higher installation cost than Level 1 chargers. Single connectors can range from four hundred dollars ($400) to six thousand five hundred dollars ($6,500). Based on previous experience, with site preparation services, the final cost of commercial public chargers generally ranges from seven thousand five hundred dollars ($7,500) to twelve thousand dollars ($12,000). The chargers are generally installed at homes, businesses, and public charging locations. However, public Level 2 chargers are likely to be replaced by higher-rate chargers in the future as EVs/EVSE transition to faster chargers and alternative connectors. There are currently over thirty (30) Level 2 charger models available, ranging from three (3) kW to eighteen (18) kW (roughly the energy equivalent of one to six [6]) electric clothes dryers) depending on the breaker size and the EVSE manufacturer. Typical Level 2 charger energy levels, charge rates, and footprints are shown in **TABLE 2**.

| ENERGY LEVEL (kW) | MAXIMUM CHARGE RATE (mi/hr) | TYPICAL PEDESTAL FOOTPRINT (in) |
|---|---|---|
| 3-4 | 13 | 60Hx6Wx18D |
| 7.2-7.7 | 26 | 72Hx18Wx18D |
| 9.6 | 32 | 72Hx18Wx18D |
| 11-12 | 40 | 96Hx18Wx12D |
| 15-18 | 60 | 96Hx18Wx18D |

TABLE 2: LEVEL 2 EVSE SIZES AND CHARGE RATES

Based on this information, Level 2 chargers can charge at a rate of between ten (10) and sixty (60) miles per hour (mi/hr) rate, with seven and two tenths (7.2) to seven and seven tenths (7.7) kW (equating to twenty-six [26] mi/hr) being the most common. Similar to Level 1 chargers, Level 2 EVSE use the SAE J1772 charger connectors in the U.S.

## DIRECT CURRENT FAST CHARGE

*Direct Current Fast Chargers (DCFC) use a direct current.*

DCFCs are different from Level 1 and Level 2 chargers in many respects. The biggest difference is that they use direct current (DC) rather than alternating current (AC). DCFCs take four hundred and eighty volt (480V) AC power from the grid and convert it to DC power. DC is more efficient that AC for short distances and offers more efficient power transfer, resulting in charge times as low as twenty (20) minutes. However, DCFCs are the most expensive of the three public charger types available, with installation costs (not including site preparation services) for commercial public chargers ranging from ten thousand dollars ($10,000) to forty thousand dollars ($40,000). With site preparation services included, the final cost for a DCFC installation can range from eighty thousand dollars ($80,000) to one hundred thousand dollars ($100,000). It is important to consider this cost against the benefits of faster charging when siting chargers and selecting the appropriate charger type to install.

FIGURE 5: DCFC CONNECTORS
(CHAdeMo left, CCS right)

The EVSE connector is also different between Level 2 chargers and DCFCs. While there is not currently a standard DCFC connector, two connectors have risen to prominence in the U.S. market. These are the CHArge de MOve (CHAdeMO) and SAE's Combined Charging System (CCS). Each of these connectors is shown in **FIGURE 5**.

The CHAdeMO connector was very prominent among early DCFC installers and EVs, but the CCS is becoming more popular and will likely soon be the predominant DCFC connector in the U.S. Additionally, EV manufacturers recognize the need for high-speed charging to attract EV consumers; newer EV models typically include connections for both DCFC and Level 1 and 2 charging. A summary of market-available DCFCs is provided in **TABLE 3**.

TABLE 3: MARKET-AVAILABLE DCFCS

| MANUFACTURER/ MODEL | POWER LEVEL (kW) | OUTPUT VOLTAGE (V) | OUTPUT CURRENT (A) | FOOTPRINT/ SIZE (IN) | NUMBER OF CON-NECTIONS |
|---|---|---|---|---|---|
| **ABB Terra 24** | 20 | 150 to 500 | 125 | 77.6Hx31.9Wx23D | 2 |
| **Schneider Evlink DCFC** | 24 | 150 to 530 | 65 | 74.9Hx21.9Wx13.7D | 3 |
| **Bosch EV2000** | 25 | 200 to 500 | 65 | 31Hx19Wx12D | — |
| **JuiceBar Delta** | 25 | 200 to 500 | 65 | 17Hx27Wx9D | 1 |
| **ABB Terra 54** | 50 | 150 to 500 | 125 | 77.6Hx35.9Wx23D | 2 |
| **Blink Veefil** | 50 | — | — | 82Hx31Wx19D | 1 |
| **JuicePump** | 50 | 50 to 500 | — | 79Hx29.5Wx13D | — |
| **ChargePoint Express 200** | 50 | 200 to 500 | 125 | 79Hx30Wx13D | 1 |
| **BTCPower 50 kW** | 50 | 50 to 500 | 125 | 86Hx34Wx22D | 2 |
| **OPConnect DCFC** | 50 | 450 | 500 | 73Hx43Wx32D | 1 |
| **OPConnect Slimline** | 50 | 450 | 500 | 82Hx34Wx19D | 1 |
| **Proterra 60 kW** | 60 | — | — | 70.8Hx31.5Wx24D | 1 |
| **ChargePoint CPE250** | 62.5 | 200 to 1000 | 156 | 88Hx46Wx17.4D | 1 |
| **ABB Terra 94** | 90 | 150 to 920 | 200 | 77.6Hx35.9Wx23D | 2 |
| **EVBox Troniq** | 100 | 480 | 132 | 86.1Hx39.2Wx36.2D | 1 |

TABLE 3: MARKET-AVAILABLE DCFCS *(cont.)*

| MANUFACTURER/ MODEL | POWER LEVEL (kW) | OUTPUT VOLTAGE (V) | OUTPUT CURRENT (A) | FOOTPRINT/ SIZE (IN) | NUMBER OF CON-NECTIONS |
|---|---|---|---|---|---|
| **BTCPower 100 kW** | 100 | 50 to 920 | 200 | 86Hx42Wx34D | 2 |
| **BTCPower HPCT 100 kW** | 100 | 50 to 950 | 250 | 82Hx42Wx35D | 2 |
| **ABB HVC 100** | 100 | 150 to 850 | 166 | 79.9Hx46.1Wx30.3D | 3 |
| **ABB Terra 124** | 120 | 150 to 920 | 200 | 77.6Hx35.9Wx23D | 3 |
| **ChargePoint CPE250 (Paired)** | 125 | 200 to 1000 | 156 | (2) 88Hx46Wx17.4D | 2 |
| **Proterra 125 kW** | 125 | — | — | 115Hx40Wx30D | — |
| **BTCPower HPCT 150 kW** | 150 | 50 to 950 | 375 | 82Hx42Wx35D | 2 |
| **ABB HVC 150** | 150 | 150 to 850 | 200 | 79.9Hx46.1Wx30.3D | 3 |
| **Siemens MaxxHP** | 150 | 200 to 800 | 200 | 82Hx78Wx49 | 4 |
| **ABB Terra 184** | 180 | 150 to 920 | 200 | 77.6Hx35.9Wx23D | 3 |
| **BTCPower HPCT 200 kW** | 200 | 50 to 950 | 500 | 82Hx42Wx35D | 2 |
| **BTCPower HPCT 350 kW (Paired)** | 350 | 50 to 950 | 500 | (2) 82Hx42Wx35D | 2 |
| **ChargePoint Express Plus** | 500 | — | — | — | — |
| **Proterra 500 kW** | 500 | — | — | 72"Hx129Wx24"D | — |

# Chapter 6 Literature Review

# Literature Review

Existing literature was reviewed to gain insight into the current state of EV support, infrastructure, and governance across Colorado. This review included EV-related plans from other jurisdictions, state regulations and legislations, and regional agreements regarding EV/EVSE in the western U.S. Federal and state incentive programs were reviewed to inform the County regarding potential funding opportunities as it expands its EVSE network.

A summary of initiatives and key aspects for consideration in the development of the *EV Readiness Plan* follow.

## Local Jurisdiction Initiatives

To evaluate how other agencies are supporting EV/EVSE at the local level, plans from three local jurisdictions were reviewed.

| 2017 | 2018 | 2020 |
|---|---|---|
| ***Aspen Community Electric Vehicle Readiness Plan*** | ***Fort Collins Electric Vehicle Readiness Roadmap*** | ***Denver Electric Vehicle Action Plan*** |

***City Municipal Campus Area,*** *Pueblo, CO.*

## *Aspen Community*[5]

### *2017 Aspen Community Electric Vehicle Readiness Plan*

**In 2014, nearly twenty percent (20%) of greenhouse gas emissions in the City of Aspen were a result of vehicle transportation.** As EVs have zero tailpipe emissions, increased adoption is expected to help lower this share of the City's environmental footprint. This plan notes three special considerations for driving EVs in cold and/or mountainous regions, which can apply to Pueblo County.

+ Cold temperatures can reduce an EV's driving range as the inside of the car is heated and cooled. However, as battery ranges increase over time, this will be less of a concern.

+ High altitudes do not lower an EV's power or torque as there is no oxygen required.

+ EVs can have better driving and handling performance in ice and snow conditions because of their weight distribution. The availability of all-wheel drive in EVs is constantly increasing.

One noted aspect to consider when expanding the prevalence of EV/EVSE in Pueblo County is equitable access to infrastructure. Two ideas identified in the City of Aspen Plan to tackle this are to support multi-unit housing complexes with charging stations and to start with affordable housing locations when developing solutions and education programs. Other notable aspects identified in the plan include the City's internal EV readiness—"lead by example"—and incentivizing charging during off-peak hours to create a sustainable use pattern for utilities. One method for doing this is to support automatic metering infrastructure (AMI), which enables dynamic utility pricing by demand. The plan identifies EV education and streamlining the permitting process as key towards promoting private installation of EV infrastructure. The County should consider these aspects as it works to meet its objective of exceeding one and seven-hundreths (1.07) charging stations per ten thousand (10,000) County residents.


### 2017 ASPEN COMMUNITY ELECTRIC VEHICLE READINESS PLAN

The plan notes special considerations for driving EVs in cold and/or mountainous regions:

Cold temperatures can reduce an EV's driving range

High altitudes do not lower an EV's power or torque

EVs can have better performance in ice and snow conditions

## *City of Fort Collins*[6]

### *2018 Fort Collins Electric Vehicle Readiness Roadmap*

The City of Fort Collins released a comprehensive roadmap toward a future with EVs in 2018. Important goals in the plan include Education ("Improve Awareness") and Accessibility ("Make Accessible").

***Top strategies identified in the plan include:***

#### Education

Target education and outreach to key audiences:

+ Developers
+ Employers
+ Utility companies
+ Low-income and under-represented communities, etc.
+ Maintain a comprehensive EV website

#### Accessibility

+ Encourage EV ride-hailing/car sharing
+ Revise multi-family/commercial building codes to require EV-ready developments
+ Establish/enforce EV parking rules, incentivize consumer EV purchases (e.g., coordinate group buys, exempt from sales tax or allocate sales tax to EV charging projects)
+ Support public charging station installation
+ Assess/adjust utility rate structures for EV drivers (e.g., pilot time-of use discount rate program, exclude charging stations from demand charges)

### 2018 FORT COLLINS ELECTRIC VEHICLE READINESS ROADMAP

An important benefit noted in the plan that applies to Pueblo County is that EVs can use "clean" sources of electricity to charge, which can be used to help justify diversifying electricity sources and expanding the use of renewable fuels.

This diversification could directly decrease the "well-to-wheel" emissions of EVs in the County. A noted impact of EVs, however, can be a decrease in dealership profits from parts and service, which may lessen their desire to sell EVs. Overcoming this barrier will be important for the County in supporting the statewide goal of nine hundred forty thousand (940,000) light-duty EVs by 2030.

***Downtown Area,*** *Fort Collins, CO.*

## *City and County of Denver*[7]

### *2020 Denver Electric Vehicle Action Plan*

Denver identifies its strengths as its EV-First Fleet Policy, under which it generally replaces city fleet vehicles with EVs, and its EV multi-family and workplace building codes that require charging stations at these locations when they are constructed or renovated. These policies should be considered as Pueblo County continues to develop and implement its *EV Readiness Plan*. Denver also identifies a weakness in its lack of EV chargers. Their current rate of progress is not enough to meet their future adoption goals.

***Key executable actions, or those that are lower-cost and more immediately implementable, are identified in this plan as:***

| | |
|---|---|
| **Building EV Partnerships** | with businesses, regional organizations, and the surrounding communities |
| **Establishing Consistent EV Language** | for messaging, and branding |
| **Educating City Employees** | about EVs and using its fleet |
| **Developing Educational Materials** | for residents installing chargers |
| **Clearly Communicating and Expediting** | the permitting process for installation |

These are items that the County should consider to support increased EV adoption throughout the region and support the statewide adoption goal.

### 2020 DENVER ELECTRIC VEHICLE ACTION PLAN

The plan evaluates each proposed action based on its "shared value to the community" in reaching EV adoption goals and Denver's ability to execute the action. The "shared value" aspect was evaluated based on stakeholder interest, market impact, and climate impact. The "ability to execute" aspect was evaluated based on Denver's capabilities and resources, market traction, and estimated project cost. Their plan also considered equity in applying each action, noting impacts on affordability, access, economic empowerment, and inclusion/accountability.

# Colorado Initiatives

Several statewide initiatives were reviewed. The *Colorado Electric Vehicle Plan 2020* plan sets a clear vision for the future. Existing regulations and legislations determine the extent of programs and laws promoting and governing EV/EVSE in Colorado. Finally, the *Colorado Beneficiary Mitigation Plan* from the Volkswagen Clean Air Act Settlements was reviewed as a potential source of future funding.

## *State of Colorado Electric Vehicle Plan*[8]

In April 2020, the State released the *Colorado Electric Vehicle Plan 2020*, as an update to the 2018 plan that had set forth "goals, actions, and strategies to develop EV fast-charging corridors across the state" and established a target of nine hundred forty thousand (940,000) EVs statewide by 2030. The 2020 plan acknowledges statewide achievements in EV adoption—between 2017 and 2019 the number of EVs registered in Colorado grew from approximately eleven thousand two hundred fifty (11,250) to over twenty-four thousand (24,000).

> *"Large-scale transition of Colorado's transportation system to zero emission vehicles, with a long-term goal of 100% of light-duty vehicles being electric and 100% of medium- and heavy-duty vehicles being zero emission."*

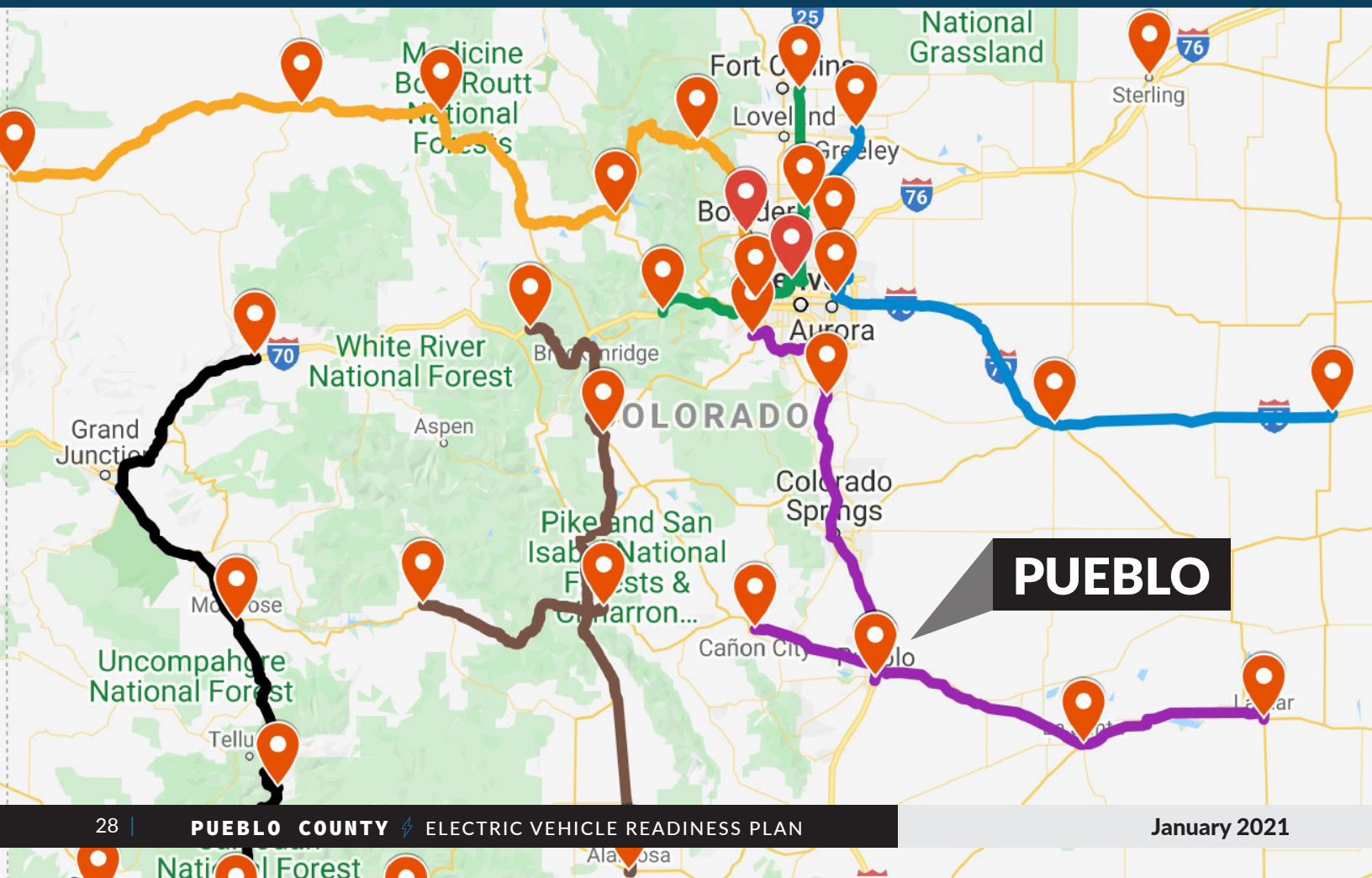
***Pueblo County can consider consistency with the five goals of the statewide plan:***

| | | | |
|---|---|---|---|
| 1 | **Increasing the number of light-duty EVs to** | **940,000** | in Colorado by 2030 |
| 2 | **Developing plans for transitioning** | **+ medium-duty (MDV)**<br>**+ heavy-duty (HDV)**<br>**+ transit vehicles** | to Zero Emission Vehicles (ZEV) |
| 3 | **Developing an EV infrastructure goal by undertaking a gap analysis to identify the type and number of charging stations needed across the state** | | to meet 2030 light-duty vehicle (LDV), MDV, and HDV goals |
| 4 | **State government agencies meeting directives and goals related to EVs** | | from the updated Greening State Government Executive Order |
| 5 | **Developing a roadmap to** | **full electrification** | of the LDV fleet in Colorado |

According to the State plan, EV community planning and charging facility development will be important in supporting the anticipated (and desired) growth in EV adoption across Colorado. To this effect, the Department of Local Affairs provides funding for communities to develop plans for EVs through its Renewable and Clean Energy Challenge program. Thus far, Estes Park, Colorado Springs, and Pueblo County have utilized this funding to develop their own EV plans. The Charge Ahead Colorado program, a joint effort of the Colorado Energy Office and the Regional Air Quality Council, was established "to award grants to support the purchase and installation of EV charging equipment at public buildings, workplaces, retail locations, and other sites statewide."[9] Priority is given to workplaces, locations with multi-family housing units, and tourist destinations. As it continues to expand its network of charging infrastructure, Pueblo should continue to position itself through recommendations in this plan to take advantage of these and other grant opportunities.

The Colorado Energy Office has also funded a major effort by ChargePoint to install infrastructure to create six (6) DC fast-charging corridors across the state, including I-25 and US 50, shown in **FIGURE 6**.[10] Stations are planned to be installed in thirty-four (34) communities across Colorado, including one in Pueblo. Pueblo's strategic location at the junction of I-25 and US 50 will provide opportunities to connect to the regional network and encourage the use of EVs when vehicle travel is necessary. As Pueblo sites its charging stations to meet its objectives, they should be evaluated in this context to capture the full benefits of a built-out network.

FIGURE 6: CHARGEPOINT PROPOSED
DC FAST-CHARGING CORRIDORS



### *Executive Order B 2019 002*[11]

*Supporting a Transition to Zero Emission Vehicles*

In 2019, Gov. Jared Polis issued Executive Order B 2019 002 - Supporting a Transition to Zero Emission Vehicles. This Order adopts the 2018 Colorado Electric Vehicle Plan's goal of nine hundred and forty thousand (940,000) EVs in Colorado by 2030 and directs the creation of a Transportation Electrification Workgroup to support widespread electrification of cars, buses, and trucks statewide. The Order also directs consideration of a ZEV rule by the Colorado Air Quality Control Commission requiring automakers to sell a certain percentage of ZEVs. It also directs the Colorado Department of Transportation (CDOT) to develop a clean transportation plan. **By promoting the manufacturing and sale of ZEVs statewide, this Order will help to increase their availability, resulting in reduced costs and better accessibility for all Pueblo County residents.**

### *Executive Order D 2019 016*[12]

*Amending & Replacing E.O. D 2018 026 - Concerning the Greening of State Government*

This Order builds on Colorado's greening-of-the-government efforts as established in 2018's Executive Order D 2018 026 - Concerning the Greening of State Government. The 2019 order establishes new goals and directives to save taxpayers money and reduce the impact of State operations on the environment and public health.

To achieve these goals, the Order requests the creation of a State Fleet Sub-Council, led by the Department of Personnel and Administration, to develop standard procedures and formulas for modeling and monitoring alternative fuel vehicles (AFV) and to identify other fuel-saving practices. The Order also requests creation of a vehicle management team for all state fleet vehicles to support deployment of future AFV technologies and directs all Agencies and Departments to prioritize the purchase of EVs for light-duty applications. Agencies and Departments are also directed to work with State Fleet Management (SFM) to procure PHEVs and/or BEVs when suitable. These programs and directives will help to increase the prevalence of AFVs around the County. As other drivers see the successful use of these vehicles in their town they may be more inclined to move away from ICE vehicles as well. **This can help the County to play its part in supporting the statewide goal of** nine hundred and forty thousand **(940,000) light-duty EVs by 2030.**

### *Senate Bill 19-077*[13]

*Electric Motor Vehicles Public Utility Services*

This Bill authorizes public utility services to provide charging stations as a regulated service. It requires public utility companies to file an application every three years for a program to support transportation electrification that may include direct investments or incentives, special rates or programs, and/or customer outreach and education. Guidance is provided to assist public utility companies in evaluating their EV efforts. This Bill may be useful for Black Hills Energy and San Isabel Electric Association in developing incentives, programs, and/or innovative rate structures to promote EV adoption and infrastructure expansion in the region. **This can offer an opportunity for Pueblo County to partner with utilities as it works to install enough charging stations to account for at least two percent (2%) of public parking in the County and sustain a minimum of one and seven-hundredths (1.07) EV charging stations per ten thousand (10,000) County residents.**

## *House Bill 19-1159*[14]

*Modify Innovative Motor Vehicle Income Tax Credits*

House Bill 19-1159 modifies the levels of existing income tax credits for the purchase or lease of EVs or hydrogen fuel cell vehicles and extends the number of years the credits are valid from the end of 2021 to the end of 2025. It also allows ridesharing companies to claim the full credit if vehicles are provided to drivers under a short-term rental program. **More information regarding the State's credit program is provided as part of the discussion of CO Income 69.**

## *House Bill 19-1261*[15]

*Climate Action Plan to Reduce Pollution*

This Bill establishes statewide goals to reduce greenhouse gas emissions by at least twenty-six percent (26%) by 2025, by at least fifty percent (50%) by 2030, and by at least ninety percent (90%) by 2050 compared to emissions levels in 2005. The Bill directs the Colorado Air Quality Control Commission to "consult with the public utilities commission with regard to rules that affect the providers of retail electricity." It also specifies that the Air Quality Control Commission will account for "the benefits of compliance and the equitable distribution of those benefits, the costs of compliance, opportunities to incentivize clean energy in transitioning communities, and the potential to enhance the resilience of Colorado's communities and natural resources to climate impacts" when implementing policies/rules to reduce greenhouse gas emissions. Greenhouse gas emissions reductions that result from implementation of the strategies within the *Colorado Electric Vehicle Plan 2020* and the Pueblo County *EV Readiness Plan* will contribute to reaching the goals of this legislation.

## *House Bill 19-1198*[16]

*Electric Vehicle Grant Fund*

In 2017, Colorado Revised Statute 24-38.5-103 created an EV grant fund in the State treasury to provide grants to agencies, governments, universities, and other groups to support installation of EV recharging stations.

Though the intention is to partially fund many installations (thereby maximizing spread) the State may choose to fund entire installations if they will significantly support expansion of the EV market to locations where current revenues are not high enough to support the infrastructure alone.

**These grants are to be prioritized by the recipient's commitment to energy efficiency:**

+ By location, such that installing the stations would encourage EV adoption.
+ By need, such that the stations would not be installed without financial assistance.

The 2019 bill modifies the initial statute to provide more flexibility in how funds are allocated by allowing them to be used for administration of charging station grants and offsetting station operating costs. Generally, the grant fund's terms can be seen as tailored toward rural and mountainous areas that have yet to see major EV adoption due to a lack of infrastructure. The *EV Readiness Plan* will identify such barriers and promote energy efficiency, helping to bolster future applications for funding assistance. By helping to offset the cost of installing and maintaining stations in support of increased coverage, this statute and bill offer significant opportunities for the County to expand its EVSE network and reach its objectives of charging stations accounting for two percent (2%) of public parking spaces and one and seven-hundreths (1.07) stations per ten thousand (10,000) County residents.

## *House Bill 19-1298*[17]

*Electric Motor Vehicle Charging Station Parking*

This bill authorizes the owner of a PEV charging station to install signage identifying the station. If the sign is installed, a driver is prohibited from parking in the space if their vehicle is not an EV; drivers of EVs are also prohibited from parking in the space if not charging. It also establishes a financial penalty for non-compliance. **The County and local jurisdictions within can consider adopting some of these regulations as they implement the recommendations of the *EV Readiness Plan*.**

## *Colorado Income 69*[18]

*Innovative Motor Vehicle and Truck Credits for EV and PEV*

This document from the Colorado Department of Revenue establishes tax credits for alternative-fuel vehicles; specifically, Income 69 covers EV and PHEV technologies, while the subsequent Income 70 covers other fuel sources, such as natural gas. Residents must file an income tax form and claim their vehicle purchase to receive the tax credit. To qualify for the tax credit, the motor vehicle must be powered to a "significant extent" by an electric motor that is rechargeable via an external power source. Income 69 also outlines circumstances by which a transportation network company that leases vehicles for use by its drivers may qualify for a tax credit. **As infrastructure is placed throughout the County, these tax credits will be crucial in promoting EVs and PHEVs as cost can be a significant barrier to adoption. These tax credits will directly help to reduce the existing cost differential between EVs and ICE vehicles. Education will also be important in informing the public that these tax credits are available.**

## *Volkswagen Settlements*[19]

*Colorado Beneficiary Mitigation Plan*

The *Colorado Beneficiary Mitigation Plan* describes how the State will prioritize and award its sixty-eight and seven tenths million dollars ($68.7 million) allocation of the national trust fund from the Volkswagen Clean Air Act Settlements and outlines specific eligibility requirements designed to maximize the impact of these dollars for sustainable transportation infrastructure. **The Colorado Department of Public Health and Environment has been designated as the State's lead agency to oversee administration of the trust.**

**The plan has directed these funds to the following eligible mitigation actions:**

+ EV Charging/ZEV Equipment
+ Zero Emission Transit Bus Replacements
+ Zero Emission Medium- and Heavy-Duty Vehicle Replacements
+ Diesel Emissions Reduction Act Program
+ Administrative Costs

| | | |
|---|---|---|
| 1 | **EV Charging/ ZEV Equipment** | These funds (ten and three-tenths million dollars [$10.3 million]) will be distributed to the acquisition, installation, operation and maintenance of new light-duty ZEV supply equipment located in public places, workplaces, or multi-unit dwellings. The Colorado Energy Office and Regional Air Quality Council will implement this program through the existing ALT Fuels Colorado and Charge Ahead Colorado programs. Pueblo County can apply for the ZEV funds through these programs, which will be used to support installation of DCFCs along identified fast charging corridors (ALT Fuels) and installation of Level 2 chargers and DCFCs in high-activity locations such as parks, ski resorts, public parking garages, and workplaces (Charge Ahead). |
| 2 | **Zero Emission Transit Bus Replacements** | This replacement program (thirty million dollars [$30 million]) targets Classes four to 8 (4-8) transit buses and includes installation of charging stations. These funds will be distributed by the CDOT Division of Transit and Rail through its Consolidated Call for Capital Projects. The various funding programs that make up the replacement grants are consolidated and require only one application in the fall of each year. To quality, an identified vehicle must be scrapped and replaced with a ZEV. Funds can be used for this and for associated charging infrastructure. |
| 3 | **Zero Emission Medium- and Heavy-Duty Vehicle Replacements** | This replacement program (twenty-one and five tenths million dollars [$21.5 million]) includes medium- and heavy-duty trucks, school buses, shuttle buses, railroad freight switchers, airport ground support equipment, and heavy forklifts. These funds will be distributed through the existing ALT Fuels Colorado program, administered by the Regional Air Quality Council. The Regional Air Quality Council will implement this program under a contract with Colorado Department of Public Health and Environment in partnership with the Colorado Energy Office and CDOT. Application rounds for these funds will occur multiple times per year until all funds are dispensed. A funding calculator and the program application can be found at the Clean Air Fleets website.[20] |
| 4 | **Diesel Emissions Reduction Act (DERA) Program** | The DERA option (one and five tenths million dollars [$1.5 million]) allows the State to match or over-match federal DERA funds with private (non-federal) trust funds. A number of projects to reduce emissions from diesel vehicles and non-road diesel engines are eligible under DERA. The DERA option makes a wider range of emissions reduction actions eligible for funding, including acquisition of construction equipment and engines used in agriculture, mining, or oil and natural gas production. Colorado Department of Public Health and Environment will coordinate with interested stakeholders to select and fund appropriate DERA projects. The DERA option should be considered for projects that do not exactly fit the required criteria for other funding sources through the Colorado Beneficiary Mitigation Plan. Generally, if a project should apply to the DERA option and another program, jurisdictions should apply for funds through the other applicable program; however, Colorado Department of Public Health and Environment may consider these applications through the DERA option in coordination with the agencies administering the funds. The application can be found at the Colorado Clean Diesel website. |
| 5 | **Administrative Costs** | These funds will cover the costs of program outreach, soliciting, and reviewing project applications, verifying project completion, accounting, audits, compliance, recordkeeping, reporting and related costs. The State anticipates that some of these functions, such as verifying the destruction of engines and chassis of the vehicles being replaced, may be outsourced to private contractors. |

## Regional Initiatives

The 2017 *Regional Electric Vehicle Plan for the West (REV West Plan)*[21] was reviewed to identify EV support at the regional level. The REV West Plan" is an agreement between the states of Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming (Signatory States) to accelerate the installation of charging infrastructure such that EV owners will be able to conveniently drive along the region's major travel corridors. The *REV West Plan* established regional corridors for EV infrastructure investment, including the I-25 corridor in Colorado. This corridor runs along the Front Range, connecting the cities of Pueblo, Colorado Springs, Denver, and Fort Collins. Any upgrades to the I-25 EVSE network will directly impact travel choices in and around Pueblo County.

The 2017 memorandum of understanding required the Signatory States to create voluntary minimum standards for aspects of charging stations including administration, interoperability, operations, and management. These standards were released in 2019 and dictate such aspects as siting and technical and signage standards.[22] The *REV West Plan* also identified "stretch standards" for states wishing to go above and beyond these minimums. A notable aspect of the stretch standards is "future proofing," or ensuring that EV infrastructure is able to "keep pace with advancing vehicle technology and expanding market share of EVs."

***The 2019 memorandum of understanding adds two actions for the signatory states to undertake.***

1. Use and promote the *REV West Plan* Voluntary Minimum Standards and, where appropriate, the Stretch Standards.

2. Support the build-out of DC fast-charging stations along identified corridors through direct investment and partnerships with utilities, local governments, and EV stakeholders.[23]

***Pueblo County should consider the following to future-proof its charging infrastructure:***

+ Inclusion of larger or additional concrete pads, transformers, conduit, and other utility-related equipment to avoid additional construction and costs in the future.
+ Provision of sufficient real estate for the addition of future DC fast-charging stations, if possible enough to double the initial capacity.
+ Positioning of charging stations in locations where they can be expanded to accommodate increasing demand in the future.

# Chapter 7 Electric Vehicle Incentives

# Electric Vehicle Incentives

**In an effort to support EV adoption, local, state, and federal funding or incentive programs have been developed nationwide.** These incentives can be financial and/or social. Financial incentives can include tax credits, purchase rebates, or charger installation subsidies. Social incentives can include access to High Occupancy Vehicle (HOV) lanes, free toll road access, or preferred parking locations.

***Incentives can include:***

| | |
|---|---|
| **Financial** | + Tax credits<br>+ Purchase rebates<br>+ Charger installation subsidies |
| **Social** | + Access to HOV lanes<br>+ Free toll road access<br>+ Preferred parking locations |

**TABLE 4** summarizes the types of EV incentive programs available and their applicability in Colorado.


***Downtown Pueblo, Main Street & 3rd Street,*** *Pueblo, CO.*

TABLE 4: SUMMARY OF EV INCENTIVE PROGRAMS

| FEDERAL PROGRAMS | APPLICABLE IN COLORADO (Y/N) |
|---|---|
| **Rebate Programs (AFV, PEV, EVSE, AF Refueling Stations)** | |
| + Federal Tax Credits for New All-Electric and Plug-in Hybrid Vehicles: (https://www.fueleconomy.gov/feg/taxevb.shtml) | Y |
| **STATE PROGRAMS** | |
| **Special Vehicle Registration Fees (HEV, EV)** | |
| + Colorado Motor Vehicle Fees: (https://leg.colorado.gov/content/vehicle-registration) | Y |
| **Emission Inspection Exemptions (EVs)** | N |
| **Rate Variants (PEV Charging)** | N |
| **Grants (PEV, EVSE, Clean Fleets)** | |
| + Charge Ahead Colorado Program: (https://energyoffice.colorado.gov/zero-emission-vehicles/charge-ahead-colorado) | Y |
| + DC Fast Charging Plaza Grant Program: (https://energyoffice.colorado.gov/zero-emission-vehicles/electric-vehicle-direct-current-fast-charging-plazas-program) | Y |
| + ALT Fuels Colorado Program: (http://cleanairfleets.org/programs/alt-fuels-colorado) | Y |
| + Transit Bus Replacement Program: (www.codot.gov/programs/planning/grants/grants) | Y |
| + ReCharge Colorado Coaches: (https://energyoffice.colorado.gov/zero-emission-vehicles/recharge-colorado) | Y |
| **Loans (AFV, PEV, EVSE, AF Refueling Stations)** | N |
| **Rebates (AFV, PEV, EVSE, AF Refueling Stations)** | N |
| **Traffic Exemptions (HOV, Tolls)** | N |
| **Parking Incentives, Requirements, and Exemptions (AFV)** | Varied |
| **Tax Credits (AFV EV, PEV, EVSE, AF Productions, AF Infrastructure, Commercial AFV Income):** | |
| + Alternative Fuel Tax Credit: (https://energyoffice.colorado.gov/zero-emission-vehicles/alternative-fuel-vehicle-tax-credits http://driveelectricnoco.org/tax-credits/) | Y |
| **UTILITY PROGRAMS** | |
| **Black Hills Energy and San Isabel Electric Association:** | |
| + Rebates ranging from $400 to $1,500 for EV charging infrastructure | Y |
| **Xcel Energy:** | |
| + $4,000 rebate for each new EV | Y |
| + $1,500 for a used EV | Y |
| + $1,500 for income-qualified buyers in 2020 | Y |

**A brief discussion of each incentive program that is applicable to Colorado residents/businesses is provided below.**

| | |
|---|---|
| ***Federal Rebate Programs*** | The federal electric vehicle tax credit program provides a tax credit ranging from two thousand five hundred dollars ($2,500) to seven thousand five hundred dollars ($7,500), depending on the vehicle (the capacity of the battery pack in kWh) and an individual's tax circumstances. These values and vehicles can change by year; buyers can find the specific amount available for any plug-in vehicle by visiting the U.S. fuel economy website.[24] |
| ***Special Vehicle Registration Fees*** | Many states face declining gas tax revenue—not only because of EVs—forcing policymakers to consider other ways to pay for the nation's transportation infrastructure. EV owners pay the same registration fees imposed on traditional ICE vehicle owners and some transportation-related taxes. However, as EVs do not require gasoline to operate, they do not contribute to the upkeep of highways through gas taxes. To offset this revenue gap, an annual fee of fifty dollars ($50) was introduced in Colo. Rev. Stat. §42-3-304(24)(a)—H.B. 1110 (2013). In comparison, ICE vehicle owners will typically spend up to four hundred dollars ($400) in gas taxes every year. |
| ***Grants*** | The State of Colorado provides several grants to support EV adoption and EVSE deployment; for example, the Charge Ahead Colorado and DC Fast Charging Plaza Grant programs. The Charge Ahead Colorado program provides funding for EVs and community-based Level 2 and DCFC stations, in particular for those at workplaces, locations with multi-family housing units, and tourist destinations. The DC Fast Charging Plaza Grant program is designed to increase access to high-speed charging in and around the Denver metro area for public users and high-mileage fleets, such as transportation network companies. |
| ***Tax Credits*** | Tax credits are available in Colorado for the purchase, lease, and conversion of light-, medium- and heavy-duty AFVs (e.g., EV, PHEV, compressed natural gas, liquefied natural gas, liquefied petroleum gas, and hydrogen). A brief on these credits is on the Colorado Department of Revenue's website, which covers Colorado Income 69.[25] Information on State-specific tax credits for EVs is also available at the Drive Electric Colorado website.[26] **TABLE 5** summarizes the tax credits available under this program. |

TABLE 5: SUMMARY OF TAX CREDITS FOR EV/PHEV IN COLORADO

| | TAX YEAR - beginning on or after: | 1/1/2019 | 1/1/2020 | 1/1/2021 | 1/1/2022 |
|---|---|---|---|---|---|
| | - but prior to: | 1/1/2020 | 1/1/2021 | 1/1/2022 | 1/1/2023 |
| CLASSIFICATION | GROSS VEHICLE WEIGHT RATING (GVWR) | CREDITS | | | |
| + Light-duty passenger vehicle | N/A | $5,000 | $4,000 | $2,500 | $2,000 |
| + Light-duty electric truck | greater than 8,500, but not more than 10,000 lbs | $7,000 | $5,000 | $3,500 | $2,800 |
| + Medium-duty electric truck | greater than 10,000, but not more than 25,000 lbs | $10,000 | $8,000 | $5,000 | $4,000 |
| + Heavy-duty truck | greater than 26,000 lbs | $20,000 | $16,000 | $10,000 | $8,000 |

***Educating the public about the available credits will be key to motiving a switch to EVs. This will help the County support the statewide goal of nine hundred and forty thousand (940,000) light-duty EVs by 2030.***

# Chapter 8 Pueblo County Charging Infrastructure

# Pueblo County Charging Infrastructure

To identify the charging infrastructure necessary to support the increased EV adoption in Pueblo County, it is important to understand what currently exists and to forecast what is required based on demand. This chapter documents existing and planned EVSE in the County, national and state EVSE trends, and likely County EV adoption rates. This information was used to develop siting criteria and recommendations as part of this *EV Readiness Plan*.

| | |
|---|---|
| **Charging stations (public and private) in Pueblo County** | **26** |
| + Public stations | **15** |
| + Public DCFC stations | **2** |

## Existing Infrastructure

Currently, there are twenty-six (26) EV charging stations (public and private) in Pueblo County; fifteen (15) of them are public stations—two (2) of which are DCFCs. Their locations are shown in **FIGURE 7**.

**TABLE 6** shows the location of existing EV chargers. **TABLE 7** lists new charger locations under construction.

FIGURE 7: PUEBLO COUNTY EXISTING CHARGING INFRASTRUCTURE

TABLE 6: EXISTING CHARGING INFRASTRUCTURE INVENTORY

| STATION | ACCESS | HOURS | LEVEL 1 | LEVEL 2 | DCFC | NETWORK | CONNECTOR | FACILITY | PRICING |
|---|---|---|---|---|---|---|---|---|---|
| **Dave Solon Nissan** 2525 W U.S. Highway 50 | Public | Dealership business hours | | 1 | 1 | Non-Networked | CHADEMO J1772 J1772COMBO | Car Dealer | Free |
| **Dave Solon Nissan** 2525 W U.S. Highway 50 | Private | | | 1 | | Non-Networked | J1772 | Car Dealer | Free |
| **FRA - Transportation Technology Center** 55500 DOT Rd. | Private | | | 1 | | Non-Networked | J1772 | Research Facility | |
| **Vestas - Pueblo** 100 Towers Rd. | Private | | | 2 | | Non-Networked | J1772 | Office | Free |
| **Pueblo County Courthouse** 215 W 10th St. | Public | 24 hours daily | | 2 | | Non-Networked | J1772 | Municipal | Free |
| **CDOT** 5615 Wills Blvd. | Public | 24 hours daily | | 6 | | ChargePoint Network | J1772 | - | Free |
| **Pueblo West Library** 298 S Joe Martinez Blvd. | Public | 24 hours daily | | 2 | 2 | ChargePoint Network | J1772 | - | $0.143 per kWh, $1 per session |
| **Victoria EV STN** 102 S Victoria Ave. | Public | 24 hours daily | | 4 | | ChargePoint Network | J1772 | | Free |
| **Sam's Club 6549 - Pueblo** 412 Eagleridge Blvd. | Public | 24 hours daily | | | 4 | Electrify America | CHADEMO J1772COMBO | | |
| **San Isabel Electric Association** 781 E Industrial Blvd. | Public | 8am-5pm M-F | | 2 | | Non-Networked | J1772 | Utility | Free |
| **San Isabel Electric Association** 781 E Industrial Blvd. | Private | For employee use only | | 2 | | Non-Networked | J1772 | Utility | |
| **San Isabel HQ** 781 E Industrial Blvd. | Public | 24 hours daily | | 4 | | ChargePoint Network | J1772 | | Free |
| **Kaiser Pueblo** 2625 W Pueblo Blvd. | Public | Not Specific | | 1 | | SemaCharge Network | J1772 | | $1.35/Hr Parking Fee |
| **Walmart Charger** 412 Eagleridge Blvd. | Public | 24 hours daily | | 1 | | | Non-Networked | Shopping Mall | |
| **Pueblo County Courthouse** 215 W 10th St. | Public | | | 2 | | | Non-Networked | Municipal | Free |
| **CO State Fairgrounds** 1001 Beulah Ave. | Public | | | N/A | | | Non-Networked | | |
| **St Mary Corwin Hospital** 1008 Minnequa Ave. | Public | | | 6 | | | Non-Networked | | Free |
| **Department of Transportation Region 2 Complex** 5615 Wills Blvd. | Public | | | 4 | | | ChargePoint Network | Office | Free |
| **Pueblo River Walk Public Parking** 110 S Victoria Ave. | Public | 24 hours daily | | 2 | | | ChargePoint Network | | |


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TABLE 7: UPCOMING NEW CHARGING INFRASTRUCTURE INVENTORY

| STATION | ACCESS | HOURS | LEVEL 1 | LEVEL 2 | DCFC | NETWORK | CONNECTOR | FACILITY | PRICING |
|---|---|---|---|---|---|---|---|---|---|
| **City Transit Center** Fred Weisbrod Parking Facility, 227 Court St. | Public | TBD | | 1 | | ChargePoint Network | TBD | | Free |
| **City Municipal Campus** the City of Pueblo Rio Grande Freight Station, 301 W B St. | Public | TBD | | 1 | | ChargePoint Network | TBD | Municipal | Free |
| **City Union Depot** Facility | Public | TBD | | 1 | | ChargePoint Network | TBD | | Free |
| **Pueblo Community College Charger 1** 900 W. Orman Ave. | Public | TBD | | 1 | | ChargePoint Network | TBD | | Free |
| **Pueblo Community College Charger 2** 900 W. Orman Ave. | Public | TBD | | 1 | | ChargePoint Network | TBD | | Free |
| **Pueblo Community College Charger 3** 900 W. Orman Ave. | Public | TBD | | 1 | | ChargePoint Network | TBD | | Free |

## National Trends

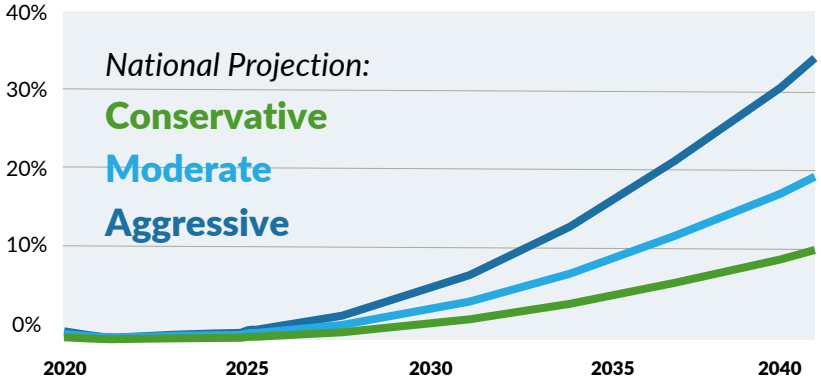
To project future county charging infrastructure needs, adoption trends and charging needs were considered.

| | | |
|---|---|---|
| | **U.S. EV adoption rate, in 2020** | **2.0%** |
| | **Total number of PEVs sold in the U.S.** | **358,000** in 2018 |
| 2018 | **Total number of cars sold in 2018** | **17.27** million |
| 2020 | **Cumulative sales of EVs, in 2020** | |
| | + Reached a total of | **1.6** million |
| | + Represented | **0.5%** of the 287.3 million vehicles registered |

Although two percent (2%) of new sales makes up a very small percentage of vehicles on the road, the growth in EVs has been exponential. **FIGURE 8** shows the EV growth projections of LDVs from 2020 to 2030. The projections were created by averaging eleven (11) public and private organizations' adoption forecasts in combination with the Oak Ridge Labs MA3T model.

EV sales are generally expected to "ramp up" between 2025 and 2030. The exponential curve separations would be anticipated in 2027 and 2030 for all scenarios. A combination of contributing factors will lead to the upward trend of EV adoption, such as improvement of battery range, access to charging, vehicle price parity, and expansion of model selection.

FIGURE 8: EV PROJECTIONS OF LDVS BY SCENARIO




***Three scenarios were introduced:***

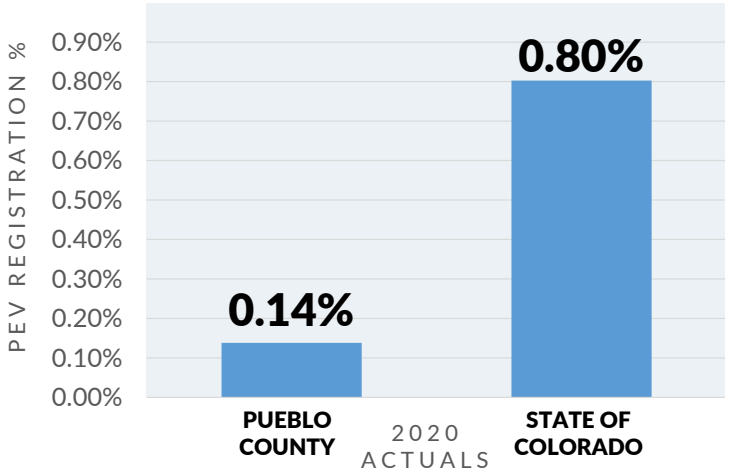
+ **Conservative & Moderate:** EV growth would be expected to increase from less than two percent (2%) to two and a half percent (2.5%) from 2025 to 2030.
+ **Aggressive:** EV sales were assumed to double from 2025 to 2030

## *County Adoption*

**Percent of total registered vehicles that are PEVs (by region)**

| 0.14% | 0.8% | 0.5% |
|---|---|---|
| Pueblo County | Colorado | National Average |

FIGURE 9: PEV ADOPTION RATE IN PUEBLO COUNTY VS. THE STATE




**The *Colorado Electric Vehicle Plan 2020* plan lays out three 2030 EV adoption goals:**

| | |
|---|---|
| + Low | 0.63% |
| + Medium | 5.0% |
| + High | 15.5% |

According to the Colorado Energy Office, there are 30,699 EVs on the road in Colorado in 2020, and the number is expected to grow exponentially in the next five (5) to ten (10) years.[27] **FIGURE 9** compares the adoption rate of PEVs in Pueblo County compared to Colorado's adoption rate.

The *Colorado Electric Vehicle Plan 2020* lays out three 2030 EV adoption goals: a low adoption scenario with a 0.63 percent (0.63%) share, a medium adoption scenario with five percent (5.0%) market share, and a high adoption scenario with a fifteen and a half percent (15.5%) share.

### *Linear Projection and Benchmarking*

One of the main purposes of EV adoption projection is to assist in development of EVSE strategies. The accuracy of EV adoption projection draws attention to the complexity of the contributing factors like technology advancement, policy incentives, and public acceptance. A linear projection based on 2018-2020 EV growth data in the County was used in this analysis. Benchmarks were calculated using the national conservative curve adoption and the three state adoption scenarios.

***The reasons for selecting a linear projection method are:***

+ The existing EV adoption in the County is relatively new with very low volume, and no clear adoption pattern has been observed from historical data. A linear model is a cost-effective way to establish an adoption pattern and achievable goals. However, the actual adoption pattern is expected to follow the national adoption pattern.
+ Although the utilization of a linear model can potentially overstate actual adoption, some overstatement is beneficial in EVSE planning to encourage adoption to achieve 2030 goals.

***Assumptions for the linear projection and benchmarking approach include:***

+ Twenty-five percent (25%) historical growth rate for 2018-2020 in the County.
+ The linear projection was calculated from 2020 to 2030 to align with state goals.
+ The national conservative adoption scenario was used to create a benchmark.
+ The registered number of EVs was used to calculate the adoption rate rather than percent sales, as a majority of the EV owners in the County purchased the vehicle outside of the County.

FIGURE 10: LINEAR ADOPTION TREND IN PUEBLO COUNTY BASED ON HISTORIC DATA

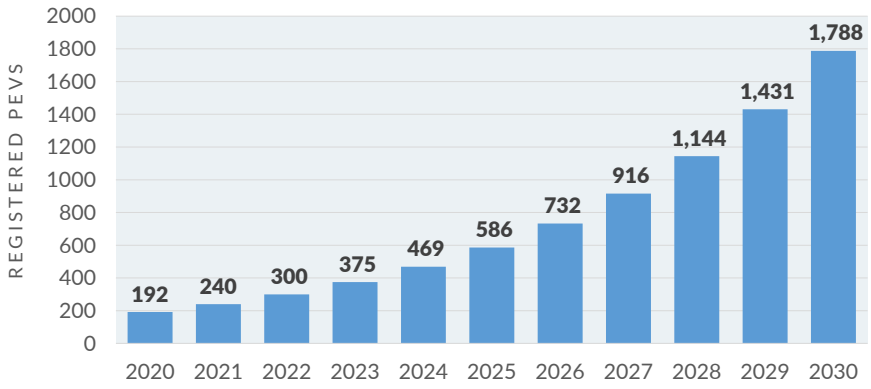
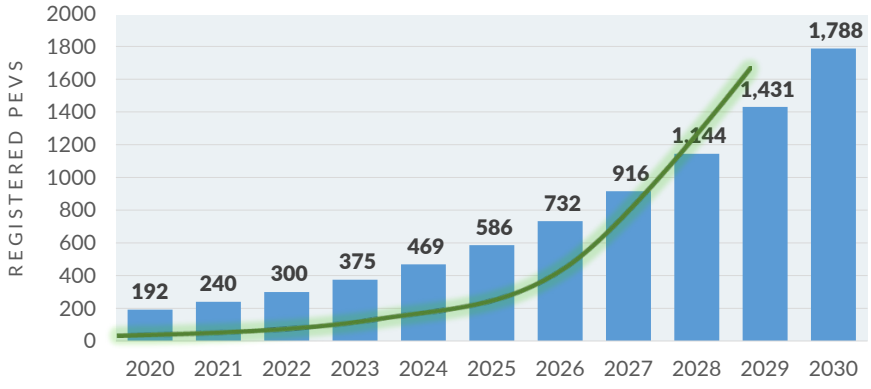



**FIGURE 10** shows the projected linear adoption in Pueblo County with a twenty-five percent (25%) historic growth rate. The projection indicates that by 2025 there could be five hundred eight-six (586) registered EVs, and by 2030 there could be one thousand seven hundred eight-eight (1,788) registered EVs in the County.

FIGURE 11: LINEAR AND ANTICIPATED ADOPTION TREND IN PUEBLO COUNTY BASED ON HISTORIC DATA




The green curve in **FIGURE 11** represents the national conservative adoption scenario. By comparing the national conservative adoption curve and the County linear projection, adoption rates can be forecasted. Linear models tend to overestimate the initial growth for mid-term (2022 to 2026). The year 2027 is projected to be the year that EV adoption will experience exponential growth, and the curve model will start to catch up with linear projection.

## *Pueblo EV Adoption Projection vs. 2030 State EV Adoption Goals*

FIGURE 12: 2030 FORECASTED PUEBLO COUNTY PEV ADOPTION

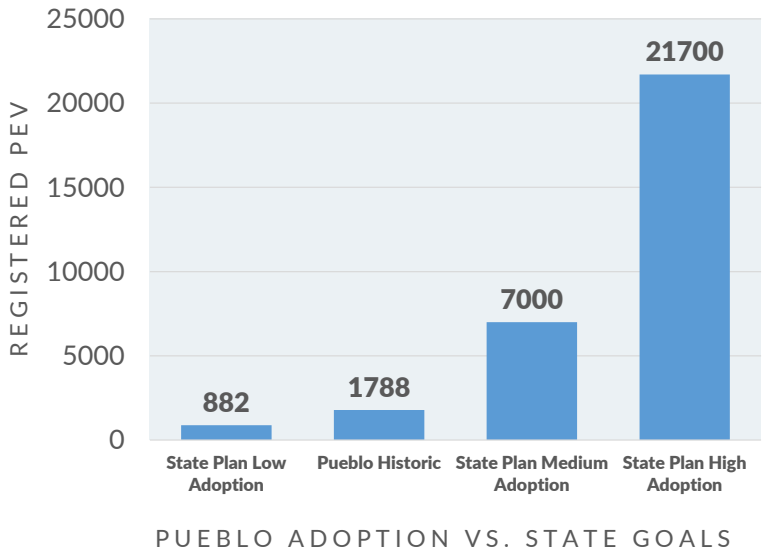



**FIGURE 12** shows forecasted number of registered PEVs in the County by 2030. Under the State's low, medium, and high adoption goals, the number of registered EVs is projected to grow to eight hundred eight-two (882), seven thousand (7,000), and twenty-one thousand seven hundred (21,700), respectively. The linear adoption projection falls between the State's low and medium adoption scenarios. The 2030 forecast for the County is about two (2) times higher than the state plan's low adoption scenario, but about seventy percent (70%) lower than the State's medium adoption scenario.

FIGURE 13: STATE ADOPTION GOALS FOR PUEBLO COUNTY

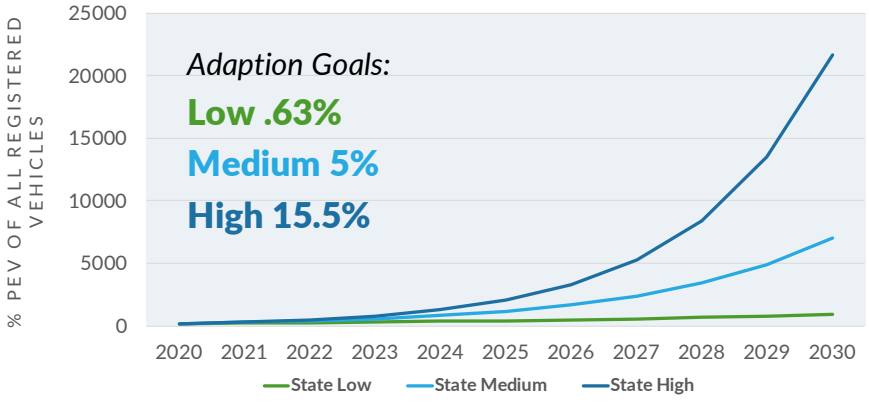



**FIGURE 13** shows that the split between the different scenarios will start to happen around the year 2027. Based on this projection, it is recommended that Pueblo County plan for the State's low adoption goal and work toward the medium adoption goal.

## *Electric Vehicle Infrastructure Project - EVI-Pro Lite Tool by the U.S. Department of Energy*

EVI-Pro Lite (https://afdc.energy.gov/evi-pro-lite/load-profile) is a tool developed by the U.S. Department of Energy to project consumer demand for EV charging infrastructure. It provides EVSE projections based on geographic location. EVI-Pro Lite was used to develop charging infrastructure guidelines by using the number of registered EVs under different adoption scenarios as inputs. These inputs are shown in **TABLE 8**.

TABLE 8: ADOPTION SCENARIOS COMPARISON

| YEAR | PUEBLO LINEAR ADOPTION | NATIONAL CONSERVATIVE CURVE ADOPTION | STATE PLAN | FOOTPRINT/ SIZE (IN) | NUMBER OF CONNECTIONS |
|---|---|---|---|---|---|
| **2020** | 192 | – | – | – | – |
| **2025** | 586 | 375 | – | – | – |
| **2030** | 1,788 | 1,788 | 882 | 7,000 | 21,700 |

## *Charging Infrastructure Guidelines for Pueblo County*

Charging infrastructure guidelines for the County were developed for the years 2025 and 2030. Guidelines for three types of charging infrastructure were generated, including workplace ports, public Level 2 ports, and public DCFC ports. **TABLE 9** presents the 2020 public charging infrastructure baseline for Pueblo County.

TABLE 9: 2020 CHARGING INFRASTRUCTURE BASELINE

| SCENARIOS | DCFCS | GAP | LEVEL 2 | GAP |
|---|---|---|---|---|
| **2020 Existing** | 2 | – | 13 + 6 | – |
| **2025 Linear** | 6 | 4 | 21 | 2 |
| **2030 Linear** | 17 | 15 | 65 | 46 |
| **2030 State Goal Low Adoption** | 8 | 6 | 32 | 13 |
| **2030 State Goal Medium Adoption** | 62 | 60 | 231 | 212 |

There are currently two (2) DCFCs and nineteen (19) Level 2 chargers in the County. By 2025, the County will need an additional four (4) DCFCs and two (2) Level 2 chargers to meet demand per the linear projection. By 2030, the demand gap will increase to fifteen (15) for DCFCs and forty-six (46) for Level 2 chargers.

**TABLE 10** shows the charging infrastructure needed to support the number of registered EVs under both the linear projection and national conservative curve pattern projection in 2025. The linear projection indicates a higher number of needed charging ports due to the possible overstatement of mid-term needs generated by this approach. Because additional charging infrastructure can support increased adoption, this overstatement is acceptable for the early adoption stages.

TABLE 10: 2025 CHARGING INFRASTRUCTURE GUIDELINES

| ADOPTION RATE | WORKPLACE CHARGING PORTS | PUBLIC LEVEL 2 CHARGING PORTS | PUBLIC DCFC CHARGING PORTS |
|---|---|---|---|
| **Pueblo Linear Adoption (586 PEV)** | 26 | 21 | 6 |
| **National Conservative Curve Adoption (375 PEV)** | 17 | 14 | 4 |

**TABLE 11** shows the charging infrastructure needed for 2030, when the national conservative curve projection is expected to meet Pueblo County's linear projection. Providing publicly accessible charging for drivers without home charging is critical to address range anxiety; a public network of DCFCs must be established to enable long-distance travel. Level 2 and workplace charging ports can be shared based upon site conditions.

TABLE 11: 2030 CHARGING INFRASTRUCTURE GUIDELINES

| ADOPTION RATE | WORKPLACE CHARGING PORTS | PUBLIC LEVEL 2 CHARGING PORTS | PUBLIC DCFC CHARGING PORTS |
|---|---|---|---|
| **Pueblo Linear Adoption (1,788 PEV)** | 81 | 65 | 17 |
| **National Conservative Curve Adoption (1,788 PEV)** | 81 | 65 | 17 |
| **State Low Adoption Scenario (822 PEV)** | 40 | 32 | 8 |
| **State Medium Adoption Scenario (7,000 PEV)** | 331 | 231 | 62 |

# Chapter 9 Recommendations for Strategic Siting

# Recommendations for Strategic Siting

One goal of the siting analysis is to identify EVSE funding opportunities and support the ongoing grant application effort. The ALT Fuels Colorado Electric Vehicle Direct Current Fast-Charging Plazas Program, which provides funding for DCFCs of at least 100kW, was identified as a near-term potential funding opportunity. Proposed plaza locations are best located in and around downtown areas, near high-density housing and commercial developments, near transit hubs, and where there is a high density population of drivers for transportation network companies or other EV fleets. Proposed locations must take into account the proximity of other existing and planned DCFC locations and the potential for high utilization.

## Methodology

The siting analysis was based on literature review, existing conditions analysis, and a series of data collection and mapping activities. To better understand the EV policy framework and goals for the County, the following were reviewed: the *Pueblo County Strategic Sustainability Plan*, the Clean Cities *Colorado PEV Readiness Plan*, the *Colorado Electric Vehicle Plan 2020*, LEED for Cities and Communities' Transportation and Land Use guidelines on EVSE, the Colorado Department of Local Affairs' Renewable and Clean Energy Challenge, and EV equity market research. Based on the reviews and discussions with County staff, key DCFC siting criteria are:

+ High traffic areas
+ Short destination dwell time (less than sixty [60] minutes for DCFCs)
+ Proximity to multi-family housing (more than five [5] units)
+ Non-corridor location (to be qualified for ALT Fuels Colorado grant requirements)
+ Fill existing EVSE gaps (areas not served by existing or planned EVSE)
+ Community equity diversity (consider low-income areas)


### ALT FUELS COLORADO ELECTRIC VEHICLE DIRECT CURRENT FAST-CHARGING PLAZAS PROGRAM

According to this plan, plaza locations are best located around or near:

+ Downtown areas
+ Near high-density housing
+ Commercial developments
+ Near transit hubs
+ Where there is a high density population of drivers for transportation network companies or other EV fleets

Discussions with the stakeholder working group were also used to inform development of siting considerations. The discussions indicated that a successful charging station should be easy to use, low cost, easily accessible, and reliable. It should be located in a place where users want to spend time; for example, trailheads, parks, museums, sit-down restaurants, and malls or shopping centers. They should have equitable access, especially for disabled users and in underserved areas. Utilization should be high in terms of both time occupied and turnover; the group suggested high-traffic areas, such as downtown Pueblo, key highway exits, and college campuses, as likely successful locations. The group noted that stations with lower charge rates could be placed at workplaces, as employees are likely to spend multiple hours in one spot.

Additional siting criteria for Level 2 chargers include:

+ Charge Ahead Colorado grant application requirements
+ A ratio of one and seven-hundredths (1.07) chargers per ten thousand (10,000) County residents
+ Community outreach and input

After the literature review and group discussions, an existing infrastructure inventory was developed to create a baseline for mapping and analysis activities. Additional activities were conducted to identify needs and opportunities. Existing traffic, land use, population, employment, housing, and income data was collected. The data was analyzed to identify traffic patterns for major roadways (annual average daily traffic [AADT]) and each parcel (vehicle miles traveled [VMT]), as well as a potential site's applicability to the ALT Fuels Colorado program requirements on proposed plaza locations. This methodology is briefly summarized in **TABLE 12**.

TABLE 12: SITING METHODOLOGY

| DATA | PURPOSE |
|---|---|
| **Existing EVSE Inventory** | + Develop a baseline |
| **Land Use** | + Understand land use patterns and identify downtown, commercial areas, and transit hubs |
| **Population** | + Identify areas with high population density |
| **Employment** | + Identify areas with high employment density |
| **Housing** | + Identify areas with high percentage of multi-family housing locations with more than five (5) units |
| **Income** | + Evaluate social equity for potential sites |
| **Major Roadways AADT** | + Identify regional travel patterns |
| **Parcels VMT** | + Identify areas with high travel demands |

In addition to data collection and mapping activities, the vehicle dwell time for potential areas was also considered when determining the likely level of charge needed. **TABLE 13** shows the estimated vehicle dwell time for different typical attractions as identified in the *Colorado Electric Vehicle and Infrastructure Readiness Plan 2012*.[28]

A comprehensive siting analysis incorporating the above considerations can confirm the charging infrastructure demand, identify optimal sites that will increase EV adoption, and promote efficient and equitable distribution of infrastructure across the County.

# Recommendations

Based on this analysis, recommendations for siting in the near, mid and long term were developed. A brief summary of each set of recommendations is provided below. Complete documentation of the analysis and recommended sites for EVSE deployment are provided in **APPENDIX E.**

## Near-Term Recommendations

DCFCs and Level 2 chargers are the focus of recommendations for near-term siting. In the early adoption phase, deployment of DCFCs will play a crucial role in addressing range anxiety for long-distance travel and enable quick charging for the community.

***General near-term siting guidelines include:***

+ Prioritize a public DCFC charging network to support long-distance travel and community quick charging
+ "Over"-adoption and deployment of EVSEs in the near term is acceptable; vsible and accessible EVSEs can drive EV adoption
+ County direct or shared ownership of EVSEs can support initial adoption efforts through continued partnering with EVSE providers to install/operate chargers for an accessible public charging network, and through coordination with state/federal grant programs designed to offset installation costs at charging sites
+ Level 2 and workplace charging can possibly be shared based upon site conditions

TABLE 13: VEHICLE DWELL TIMES FOR VARIOUS ATTRACTIONS

| DESTINATION | DWELL TIME (MIN) |
|---|---|
| Stadiums | 228 |
| Universities | 174 |
| Outdoor Museums (Zoo, Botanic Gardens) | 161 |
| Music/Theater Venues | 158 |
| Casinos | 155 |
| Bowling Alleys | 154 |
| Movie Theaters | 135 |
| Golf Courses/Tennis Courts | 131 |
| Museums | 112 |
| Ice Rinks | 109 |
| Soccer Fields | 103 |
| Churches | 101 |
| Recreation Centers | 77 |
| Yoga/Dance/Gymnastic Studios | 77 |
| Community and Senior Centers | 76 |
| Baseball Fields | 75 |
| Gyms | 74 |
| YMCA | 72 |
| Hiking Trailheads (State or National Park) | 67 |
| Hospitals | 65 |
| Martial Arts Studios | 65 |
| Swimming Pools | 63 |
| Bars | 61 |
| Sit-down Restaurants | 60 |
| Local Parks | 60 |
| Health Facilities | 55 |
| Malls | 50 |
| Hair and Nail Salons | 45 |
| Big-Box Grocery Stores (Costco, Sam's Club) | 40 |
| Walmart/Target | 33 |
| Government Offices | 32 |
| Bookstores | 30 |

***Level 2 siting recommendations were based on four criteria:***

+ Charge Ahead grant criteria
+ A ratio of one and seven-hundreths (1.07) chargers per ten thousand (10,000) County residents
+ A mapping analysis
+ Community input

## *Mid-Term Recommendations*

The focus of mid-term siting is to expand Level 2 charging infrastructure to public parking lots, state and national parks, secondary education campuses, and other destinations that meet a minimum one (1)-hour dwell time threshold.

## *Long-Term Recommendations*

***General long-term siting guidelines include:***

+ Inventory existing public EVSE
+ Evaluate utilization of existing EVSE networks
+ Recalibrate current adoption level and number of registered EVs
+ Reevaluate EVSE criteria and perform mapping exercise
+ Perform a gap analysis
+ Refer to the 2030 EVSE guidelines
+ Recalculate suggested EVSE by EVI-Pro

***Policy incentives should be implemented to encourage adoption in addition to siting strategies. Identified strategies from a literature review that may be applicable to the County include:***

+ Identify potential EVSE funding and grant programs
+ Use local zoning and building codes to encourage private support for EV readiness and EVSE in new buildings
+ Endorse parking ordinances to include adequate EVSEs including on-street, municipal lots, and garages
+ Streamline and allow for a fast-tracked permitting process
+ Encourage public-private partnerships in EVSE installation through procurement policies

## *Near-Term Charger Sites*

### LEVEL 2

+ Colorado Department of Human Services
+ Pueblo North Medical Center
+ Pueblo Library Rawlings Branch
+ Pueblo Library Lamb Branch

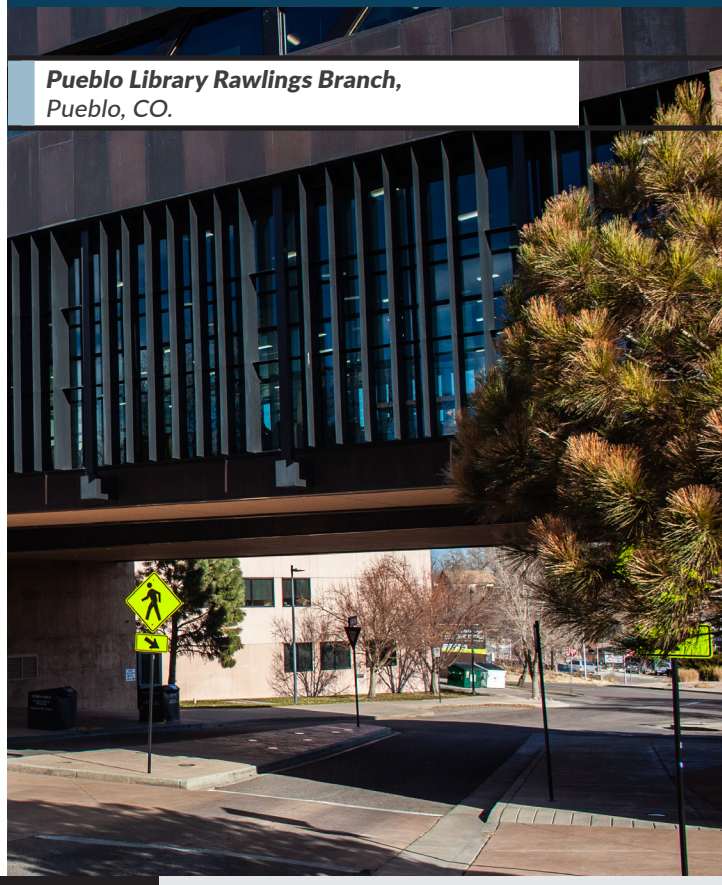
### DCFC CHARGER

+ Colorado Department of Human Services
+ Pueblo North Medical Center
+ Pueblo Library Rawlings Branch
+ Pueblo Library Lamb Branch

## *Mid-Term Charger Sites:*

### LEVEL 2

+ Colorado State Campus
+ Lake Pueblo State Park Trailhead
+ Pueblo Mountain Park Trailhead



***Pueblo Library Rawlings Branch,*** *Pueblo, CO.*

# Chapter 10 Regional Barriers to EV Adoption and EVSE Deployment

# Regional Barriers to EV Adoption and EVSE Deployment

**Currently, the EV adoption rate in Pueblo County is fourteen hundredths (0.14%), and the overall EV adoption rate in the U.S. is approximately two percent (2%) of registered light-duty vehicles.** The total number of PEVs sold in the U.S. reached three hundred and fifty-eight thousand (358,000) in 2018, while the total number of cars sold was seventeen and twenty-seven hundredths million (17.27 million).

Although the State of Colorado has established ambitious EV adoption goals and scenarios, there are many barriers the EV market has to overcome before achieving significant growth:

+ Vehicle range anxiety
+ Lack of secondary market
+ Charging infrastructure deployment
+ Public knowledge of technology and vehicle performance
+ Financial barriers/cost differential
+ Lack of local sales and service network

These barriers were also noted by members of the public in the e-survey results as discussed in ***Section 4: E-Survey***. A discussion of each barrier and how it can be addressed is provided on the following pages.

***EV adoption rate in Puebo County is*** **0.14%**

***Overall EV adoption rate in the U.S. is approximately*** **2%**

## Vehicle Range Anxiety

**Range anxiety is one of the greatest barriers to EV adoption.** According to the U.S. Department of Energy, the median EV range in 2018 was one hundred twenty-five (125) miles vs. ICE vehicles at four hundred eighteen (418) miles. indicating a very substantial difference in the range capabilities of electric and ICE vehicles.[28] This anxiety can cause drivers to rely on ICE vehicles for long trips and prevent drivers from switching to EVs entirely.

This barrier will be addressed by improvements in battery technology and expansion of public EVSE networks. Battery capacity has experienced a steady upward trend and this is expected to continue. **FIGURE 14** illustrates how the range of EVs has increased from 2011 to 2018. By 2030, the International Energy Agency expects the average EV to have a battery size of seventy (70) to eighty (80) kWh and a range of two hundred seventeen (217) to two hundred forty-eight (248) miles—nearly double the current average. Colorado is developing and implementing DCFC networks along interstates and highways, such as US 50, Highway 96, and I-25, to support regional travel.

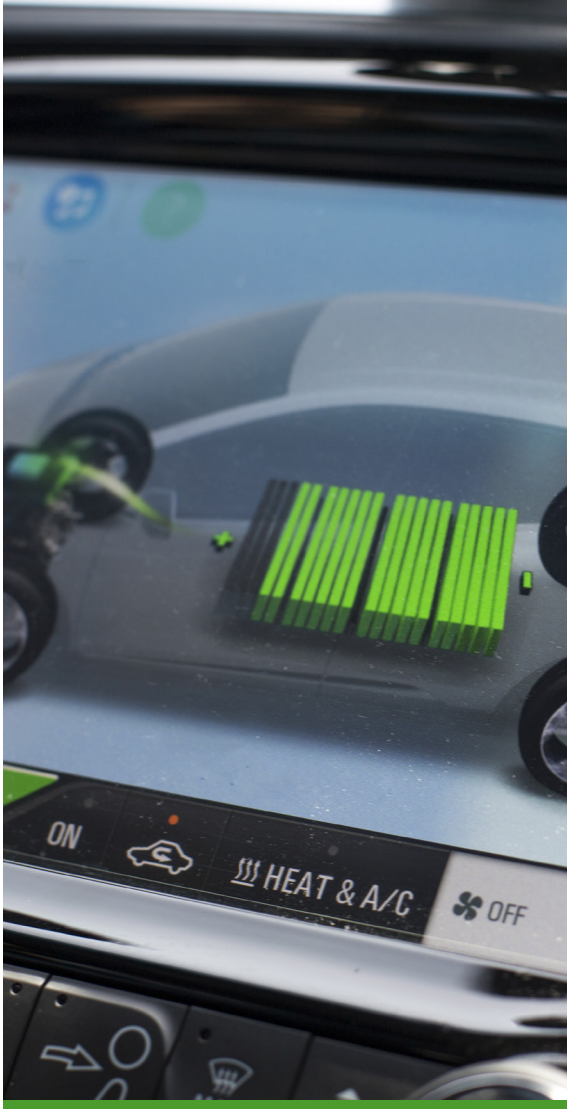
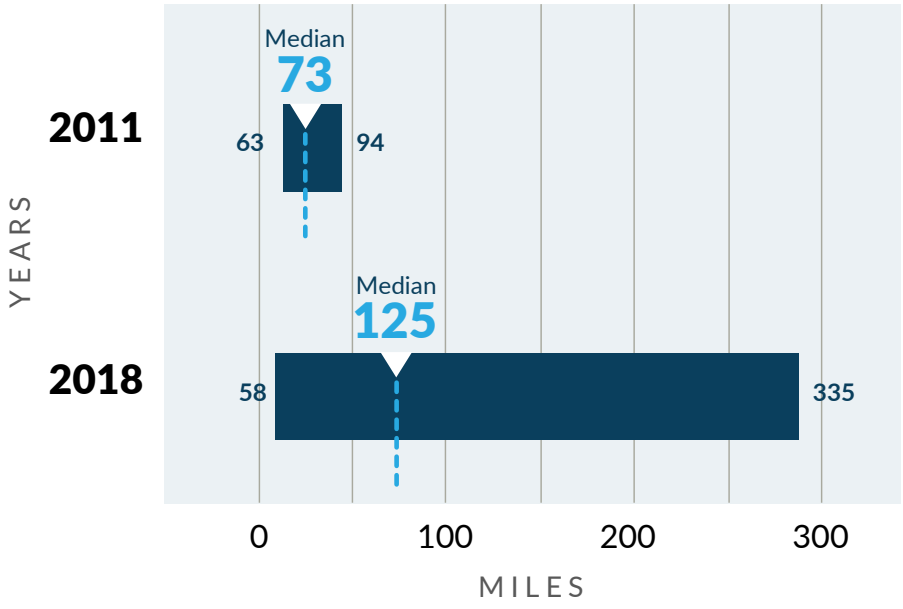



FIGURE 14: BREADTH OF EV RANGES IN 2011 AND 2018



## Lack of Secondary Market

**Nationally, EVs make up just two percent (2%) of all vehicle sales.** Because there are limited numbers of EVs that have been or are being sold, the secondary market for used EVs at this time is extremely limited. A large portion of the American population buys used cars; in 2019, used cars made up about seventy percent (70%) of all LDV sales.[30] This means that EVs are only a realistic option for about thirty percent (30%) of car buyers. However, fifty-one percent (51%) of BEVs are leased versus only thirty-two percent (32%) of ICE vehicles, and PHEVs are leased at an even higher rate.[31]

Vehicles coming off lease make up a significant portion of the late-model used car market. This buying behavior is an indicator that the development of a secondary market could happen fairly quickly. EVs have two major advantages in the secondary market: low vehicle maintenance requirements and supportive battery warranties. According to the U.S. Department of Energy, EVs generally require less maintenance than conventional fuel vehicles because there are typically fewer fluids to change (such as oil and transmission fluids) and far fewer moving parts. EVs require minimal scheduled maintenance for their electrical systems, including the battery, electrical motor, and associated electronics. Because of regenerative braking, brake systems on EVs typically last longer than those on ICE vehicles. Currently, most manufacturers are offering eight (8)-year/one hundred thousand (100,000)-mile warranties for their batteries. Nissan currently provides additional battery capacity loss coverage for five (5) years/sixty thousand (60,000) miles. Many manufacturers have also extended coverage in states that have adopted the California emissions warranty coverage periods, which require at least a ten (10)-year coverage for batteries on partial zero-emission vehicles.[32]

## EVSE Deployment


**Public EVSE must be adopted and deployed at a rate and at locations capable of sustaining and enabling the increased adoption rate of EVs by 2030.** This includes supporting both local and regional travel, as well as equitable access. However, there are several barriers to achieving ideal deployment. Addressing these barriers will require a systematic and long-term strategic approach. Taking advantage of EVSE grants, both at the County level and individual EV service provider (EVSP) level, will be useful in offsetting utilization and cost challenges. The County should support EVSPs that apply for these grants by sharing costs and facilitating the siting process, including partnerships with community members. Support can be both financial and through in-kind services, such as grant development and assistance with site selections and approvals. These supportive measures can entice service providers to offer EV service and infrastructure across the County. The County can make this an area of focus by assigning EVSE network tasks and objectives to existing staff to quickly progress toward achieving of the goals of this plan.

## DCFC Utilization

**Because of the expense, the EVSP needs high utilization of the charging infrastructure to justify installation and operating expenses.** However, current installations are being subsidized through local, state or federal grant programs. Today, there are not enough EVs to provide high utilization and adequately justify the charging infrastructure expenses; this results in a lack of charging infrastructure which is a barrier that prevents drivers from switching to EVs.

## Cost of Public EVSE

Currently, eighty percent (80%) of EV owners and leasers charge at home using Level 2 chargers, while only twenty percent (20%) charge at public charging stations, made up of mostly Level 2 chargers and some DCFCs.[33] The charger utilization rate is a key factor affecting EVSE deployment. Utilization rates for DCFCs deployed today are typically in the range of just five to ten percent (5-10%); assuming a ten percent (10%) utilization rate still only represents seventy-two (72) hours per month of charging time per DCFC. With a typical DCFC power level of fifty (50) kW, this indicates a total of thirty-six hundred (3,600) kWh of energy that can be sold each month. This thirty-six hundred (3,600) kWh of energy will cost around three hundred sixty dollars ($360) at the commercial rate for electricity in Colorado and the fifty (50) kW load will incur a demand charge, adding to the cost to operate.

## Utility

DCFC high power systems require four hundred eighty (480)V three-phase service and consume fifty (50) to three hundred fifty (350) kW or more of power. These installations are more likely to require an upgrade to the electrical infrastructure to support installation, particularly for multiple chargers at one location. Not all electrical grids in the County, especially in remote areas, are ready to support DCFC infrastructure without necessary transformer upgrades.

## Charger Availability

An increase in EVs will also require an increase in charging infrastructure deployment. Charging infrastructure will be required to support two main use cases: local travel (Level 1 & 2 chargers) and intercity travel (DCFCs). For local travel, lack of access to chargers in multi-family housing can be a major barrier for local EV adoption. It is expected that the share of EV charging that falls into this category will increase to thirty-five percent (35%) by 2030. However, these locations are less likely to have dedicated parking and a metered power connection at their parking location.

In addition, having real-time information about the locations of EV chargers is important. Several apps are available to assist with finding the location of EVSE when needed, including apps built into the GPS unit on several EVs. There are multiple charging networks, such as ChargePoint, that have deployed EVSE and provide members access to this infrastructure. While these are useful tools today, they alone will not address the availability barrier. This barrier will not be fully overcome until there are publicly accessible fast chargers at frequent intervals, which will allow drivers to find a charging station as easily as gas stations can be found today without the need for special apps or subscriptions.

## Charge Time

Estimated charge times based on the type of charger used are provided in **TABLE 14**. Deployed DCFC in combination with available EVs can recharge at a rate of around three (3) miles per minute, and future technology is expected to increase this rate to ten (10) miles per minute. This represents a current charge time from a zero battery level of forty (40) minutes for the average EV range of one hundred twenty-

TABLE 14: ESTIMATED CHARGE TIME FOR 125-MILE RANGE VEHICLE

| METRIC | LEVEL 1 | LEVEL 2 | DCFC |
|---|---|---|---|
| **Average Charge Rate (mi/hr)** | 8 | 30-40 | 180 |
| **Estimated Charge Time (hr)** | 16 | 3-4 | 0.6 |

five (125) miles, and a future charge time as low as twelve (12) minutes. Educating consumers about this metric and shifting their focus away from refueling time alone can help overcome this perceived barrier. With future advancements in technology and utilization of an optimal subset of the battery capacity, the recharge time experienced for most drivers is expected to reduce to between fifteen (15) and twenty (20) minutes. While this is about twice as fast as can be expected in most cases today, it is still two (2) to three (3) times longer than what it takes to refuel an ICE vehicle.

### *Installation Standard*

Level 2 EVSE have a universal standard in the SAE J1772 protocol; however, the standard for DCFCs is not unified. EVSE adoption is slightly impeded by the presence of multiple competing standards. There are two non-proprietary standards for DCFC: CHAdeMO, a Japanese standard and the earliest DCFC standard, and SAE J1772 Combined Charging System (CCS). The latest versions of these standards support four hundred (400) and three hundred fifty (350) kW maximum power, respectively. Vehicles typically only support a single DCFC standard, which means EVSE that are deployed today need to support multiple standards in order to maximize the available pool of vehicles that can be charged. There is no clear indication at this point what standard will ultimately become the universal one for DCFC.

### *Quasi-Public Network*

**Tesla EVSE connectors are not compatible with the CHAdeMO/CCS connectors on a non-Tesla EV for fast charging.** However, a connection adapter can allow Tesla EVs to charge at Level 2 or DCFC EVSE with CHAdeMO adapters and, soon in the U.S., CCS adapters.

## *Public Knowledge*

**The public at large does not have a good understanding of EV technology, compared to an ICE vehicle.** There is broad understanding of the efficiency metric for an ICE vehicle, specifically miles per gallon and range. The lack of knowledge related to EVs causes confusion and uncertainty about vehicle capabilities, which presents a real barrier to the adoption of EVs. In addition, ICE vehicles have a proven history, which means that drivers are familiar with ICE vehicles and have a good understanding of the pace of technology improvement and the path that vehicle development is likely to follow in the future. However, for EVs, there currently is uncertainty about the pace at which technology will develop. This creates some level of concern that an EV purchased today will become obsolete more quickly than an ICE vehicle. Buyers are more likely to purchase a product that they understand, so community outreach and education about EVs, battery technology, and EVSE in general is needed. This outreach and any educational materials should be developed such that all Pueblo residents can access and understand them; for example, materials should be offered in various languages to support the large population of non-English speakers in the County.

***There are two non-proprietary standards for DCFC:***

+ CHAdeMO, a Japanese standard and the earliest DCFC standard
+ SAE J1772 Combined Charging System (CCS)


***Existing EV facilities in Pueblo,*** *Pueblo, CO.*

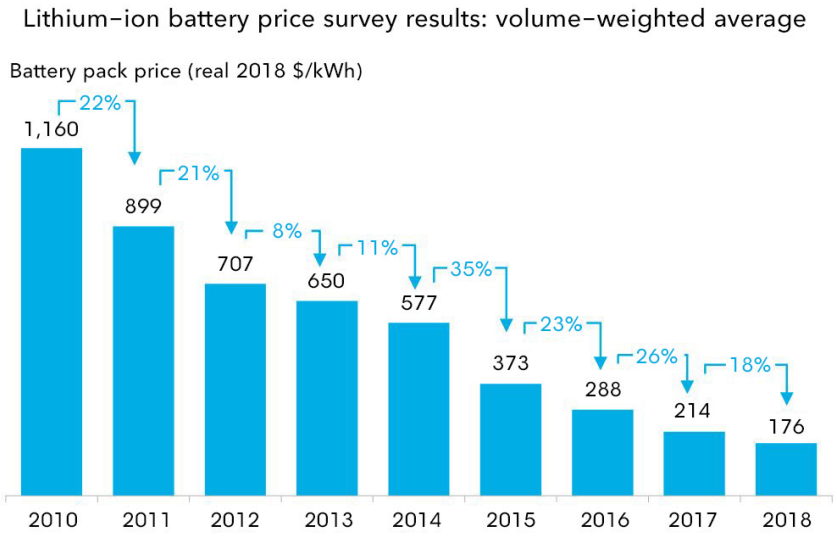
## Cost Differential

**Currently, EVs are more expensive than ICE vehicles; in June 2019, the median retail price for a new EVs was fifty-five thousand and six hundred dollars ($55,600), while the median price for all new vehicles was only thirty-six thousand six hundered dollars ($36,600).** There is a premium for the purchase of an EV, which is the result of product development, order size, and the cost of batte ries (the battery being the single most expensive component in the vehicle). **TABLE 15** summarizes this premium for the most popular EV models.

TABLE 15: 2020 EV PRICE PREMIUM

| MAKE | ICE MODEL | ICE COST | EV MODEL | EV COST | EV PREMIUM |
|---|---|---|---|---|---|
| **Nissan** | Versa | $17,425 | 2019 Nissan Leaf | $29,990 | 72% |
| **Kia** | Sportage | $20,690 | 2019 Kio Niro EV | $38,500 | 86% |
| **Hyundai** | Kona | $22,200 | 2020 Hyundai Kona Electric | $36,990 | 67% |
| | | | 2020 Hyundai Ioniq Electric | $30,000 | 35% |
| **Honda** | Civic | $20,000 | 2020 Honda Clarity Electric | $33,400 | 67% |
| **Chevrolet** | Sonic | $20,690 | 2020 Bolt EV | $36,620 | 77% |
| **BMW** | 2 series | $35,900 | 2020 i3 | $44,450 | 24% |
| **Audi** | Q5 | $43,300 | 2020 E-Tron | $75,000 | 73% |
| **Jaguar** | 2020 Jaguar F-Pace | $45,200 | 2020 I-Pace Electric | $69,850 | 55% |
| **Mini Cooper** | Hardtop | $21,600 | 2020 Mini SE | $29,900 | 38% |
| **Porsche** | 2020 Panamera | $87,200 | 2020 Taycan | $103,800 | 19% |
| **Tesla** | — | — | 2020 Model 3 | $37,990 | — |

FIGURE 15: LITHIUM-ION BATTERY PRICES



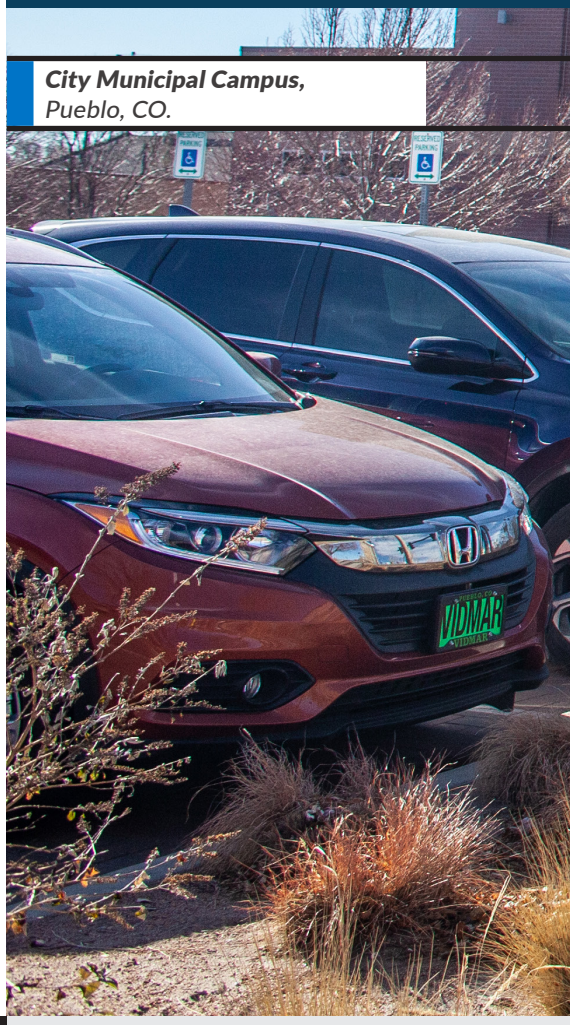

## Sales & Service Network

Many communities across the country, particularly those outside of major metropolitan areas, lack the sales and service network to support increased EV adoption. One barrier in the sales network is the limited available vehicle types for EVs. Many Colorado drivers wishing to purchase a truck, SUV, or crossover EV because of active lifestyles and to facilitate driving in the snow. However, most are unable to do so due to the current lack of stock and high cost of these options, including after-sales services when they are available out-of-state. The service network is largely limited, as EVs require different tools and technologies to maintain. The cost of service equipment can be prohibitive for local independent service centers, resulting in most maintenance being done at dealerships, which is both high-cost and low-convenience.

These barriers will be addressed as new vehicle types enter the market. Many larger EV models are planned for upcoming years. As EV adoption increases, service centers will need to adapt to the changing market and, as a result, barriers in the service network will continue to lessen. The County should look for opportunities through grants to incentivize service centers to purchase EV-related equipment. Smaller service centers without equipment can look to establish partnerships with larger centers to lease out the needed tools.

***The cost of batteries has continued to decrease as technology improves.***

The price per kWh for a battery pack fell from over one thousand dollars ($1,000) in 2010 to one hundred seventy-six dollars ($176) in 2018 (**FIGURE 15**). This price is expected to drop to one hundred dollars ($100) by 2023 and sixty-five dollars ($65) by 2030. It is expected that at a price of about one hundred dollars ($100)/kWh consumers will start to see price parity between the costs of EVs versus ICE vehicles.



***City Municipal Campus,*** *Pueblo, CO.*

# Chapter 11 Environmental, Community, and Economic Impacts of EVs

# Environmental, Community, and Economic Impacts of EVs

**The County's EV transition will offer significant benefits to residents, employees, and visitors alike.** Maintaining an EV-forward attitude and promoting EV-forward policies will push Pueblo County toward a healthier and more sustainable environment by reducing its dependence on fossil fuels, benefiting the overall community, as well as the County economy.

## Demand and Growth

The benefits of an EV transition are only realized as fast as the transition is occurring—a larger push toward EVs will realize larger impacts. This *EV Readiness Plan* recognizes that many growth scenarios are possible, and that it is in the hands of the County and its community stakeholders to promote an EV-ready and EV-first mindset through policy implementation and expansion of the EVSE network to provide accessible infrastructure for all. It should be noted that accepting a lower growth projection at the start does not mean growth has to remain low. Rather, the County and its stakeholders should work to accelerate growth beyond those projections by implementing the strategic actions identified at the end of this plan to drive demand rather than wait for demand to materialize.

## Sustainability

The 2015 *Colorado EV Market Implementation Study* estimated that each registered EV in 2014 accounted for an annual reduction in carbon dioxide ($CO_2$) emissions of approximately thirty-seven percent (37%). Combined, these EVs were estimated to account for an annual reduction of approximately five thousand nine hundred and twenty-two (5,922) tons of $CO_2$. With EV adoption constantly increasing, this environmental benefit stands to increase greatly.

***Riverwalk Area,*** *Pueblo, CO.*

***The 2015 Colorado EV Market Implementation Study estimated that each registered EV in 2014 accounted for an annual reduction in carbon dioxide ($CO_2$) emissions of approximately thirty-seven percent (37%).***

An important aspect of maintaining low or net-zero "well-to-wheel" emissions for EVs is utilizing renewable and sustainable energy sources to supply charging stations. The County will need to work with local utilities to identify opportunities to transition these sources to renewables, primarily solar and wind. The County should leverage increased EV adoption and reduced GHG emissions as motivators to encourage this transition.

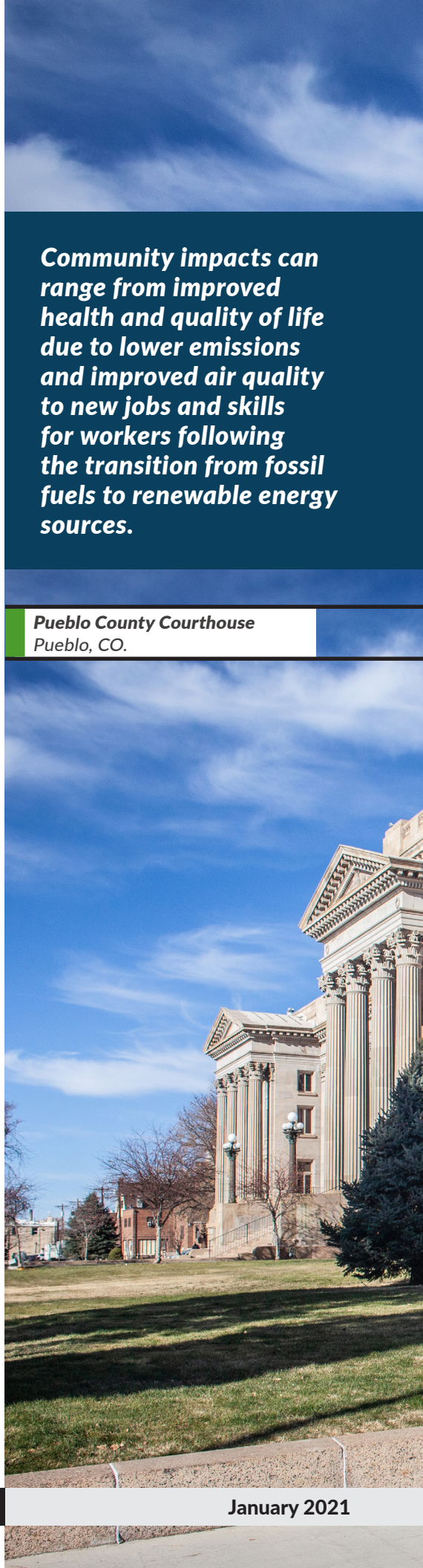
## Community Impacts

It will be important for the County to promote equity in its policy and infrastructure distribution to ensure the benefits of its EV transition are widespread and realized for all residents, employees, and visitors. Community impacts include improved health and quality of life because of lower emissions--for example, a recent study found that switching to EVs through the Greater Toronto Area would save up to 313 lives, a social benefit of $2.4 billion. Community impacts also include new jobs and skills for workers following the transition from fossil fuels to renewable energy sources. The County should work with local community colleges and energy providers to identify opportunities for this workforce transition.

## Economic Impacts

The 2015 *Colorado EV Market Implementation Study* estimated that the annual gasoline cost for traditional ICE vehicles is approximately thirteen hundred dollars ($1,300) versus an annual electricity cost per EV of two hundred twenty dollars ($220)—a savings of over one thousand dollars ($1,000) for the driver.[34] These savings should be directed to other needs and activities, in turn boosting the County's economy beyond just the automobile industry. Actively leveraging the use of renewable sources of energy for EVSE can also help the County's economic output by creating a healthier and more sustainable environment with an increased quality of life that attracts new residents and visitors who contribute to Pueblo County's economy.

***Community impacts can range from improved health and quality of life due to lower emissions and improved air quality to new jobs and skills for workers following the transition from fossil fuels to renewable energy sources.***



***Pueblo County Courthouse***
*Pueblo, CO.*

# Chapter 12 Education and Outreach

# Education and Outreach

EV technology is relatively new to the general public; responses to the community questionnaire indicated that many in the Pueblo community view EVs as being expensive and inconvenient to own. It will be important to educate the public to build a general awareness of EVs, as well as the benefits, costs, and incentives of owning an EV. The County's education and outreach approach must be easily accessible, comprehensible, and equitable to make sure it reaches members of the public from all walks of life.

The first step to developing a successful educational campaign is to develop key messaging that is easy to understand and consistent throughout all communication materials. This will help to easily educate the public while reducing or eliminating potential confusion. The County can also develop a memorable and appealing logo and/or "look-and-feel" that will be used for all educational materials. This will help build public excitement, as well as familiarity so when the public sees the logo and/or branding they know that it is related to EV awareness.

The County needs an outreach strategy that is targeted to a diverse audience, including local businesses, residents, elected officials, non-profit organizations, low-income communities, developers, property management companies, and fleet operators. Increased public awareness of EVs and Pueblo's EV efforts will help the County to build out a new image as an EV workforce hub and training destination. The following strategies can be used to educate the public and solicit feedback to further identify the barriers to owning EVs.

## EV Website

The County should develop a specific website that houses all information and resources about EVs, including fun facts, charging station locations and types, permitting guidance, building codes, local incentives, and future EV-related projects. This can also be a place for the public to easily contact the County with questions or concerns. The website should be included on all marketing materials to direct viewers to learn more.

***The County needs an outreach strategy that is targeted to a diverse audience, including local businesses, residents, elected officials, non-profit organizations, low-income communities, developers, property management companies, and fleet operators.***

# Media Campaign

Both social media and traditional media can be leveraged to help build EV awareness and solicit opportunities for public input using the consistent messaging and branding mentioned above.

***Media tools include:***

+ Social media posts through existing County and partner channels, as well as creating accounts that may not exist yet, including:
  - Facebook
  - Twitter
  - NextDoor
  - Instagram
  - TikTok
  - Snapchat
+ Press releases to local, state, and national publications
+ Direct mailers
+ Paid advertisements through the following outlets:
  - Social media
  - Local newspapers and publications (both digital and print)
  - Public transit, including bus wraps and shelters
  - Billboards
  - County banners
  - Radio commercials
  - Television commercials

There are potentially additional public feedback opportunities that can be explored to promote inclusivity and direct the County's EV promotion efforts. The County should coordinate with the Colorado Energy Office on media efforts to promote consistent messaging across the state.

***Examples of these opportunities include:***

# Surveys

Public surveys can be distributed to the community through the mail and/or online. They can include questions similar to the community questionnaire conducted for the *EV Readiness Plan* to advance the County's understanding of the community experience and perception of EVs.

# Public Meetings

The County can host public meetings or town halls in-person, online, or via telephone for the public to learn more about EVs and have questions answered by local experts. The County can also attend existing events or hold pop-up booths at high-trafficked areas, such as breweries, recreation centers, and grocery stores.

# Comment Maps

Comment maps that allow individuals to "pin" a comment to specific locations across the County can be helpful to gather information on where the public would like to see future EV charging stations or on the performance of existing charging stations.

***Additional public feedback opportunities should be explored to promote inclusivity and direct the County's EV efforts.***

Examples of these opportunities include:

+ Surveys
+ Public meetings
+ Interactive comment maps

# Chapter 13 Summary and Recommendations

# Summary and Recommendations

Based on the assessment described in this *EV Readiness Plan*, barriers to EV adoption and EVSE expansion, as well as recommendations to address them, were identified.

**FIGURE 16** lists these barriers and recommendations and how they relate to the goals of the County's *EV Readiness Plan*. Recommendations are defined as ongoing, near-term (zero to two [0-2] years), mid-term (two to five [2-5] years), or long-term (five [5]+ years). A responsibility assignment matrix, or "RACI chart," identifying the party responsible for implementation, the party holding those responsible accountable, and key stakeholders who should be consulted and/or informed during the implementation process is provided in **TABLE 16.**

***Downtown Area,*** *Pueblo, CO.*

FIGURE 16: SUMMARY OF GOALS, OBJECTIVES, BARRIERS, AND RECOMMENDATIONS

## 1 *Increased availability and use of EVs over conventional fuel vehicles in Pueblo County and the region.*

### OBJECTIVES

| | | | |
|---|---|---|---|
|  | **Meet Colorado's low EV growth scenario such that EVs account for** | **0.63%** | of all light-duty vehicles on the road |
|  940,000 | **Support the aspirational statewide goal of** | **940,000 Light-Duty EVs** | in Colorado by 2030 |
|  | **Support electrification of the** | **County Fleet** | at a rate matching or exceeding public adoption |

### BARRIERS

| | |
|---|---|
| | **Financial barriers/cost differential** |
| | **Lack of local sales and service network** |

### RECOMMENDATIONS

| | | |
|---|---|---|
| **Near-Term** | **Encourage EV** | ride-hailing and car-sharing |
| **Near-Term** | **Incentivize EV purchases** | through group buys, tax exemptions, etc. |
| **Near-Term** | **Coordinate with the State** | to reinitiate credit programs for incoming out-of-state vehicles |
| **Mid-Term** | **Actively engage and partner with dealerships** | to stock EVs, operate ride-and-drive events, and install charging stations on site |
| **Long-Term** | **Lead by example** | by integrating EVs into the County fleet |

FIGURE 16: SUMMARY OF GOALS, OBJECTIVES, BARRIERS AND RECOMMENDATIONS (cont.)

## 2 *Improved awareness of purchase, operation, and lifetime costs and benefits of and incentives related to EVs among residents, businesses, and visitors to Pueblo County.*

| | | | |
|---|---|---|---|
| OBJECTIVES | | **Support the development of a** | **Public Outreach/ Education Plan** for implementation by 2022 |
| BARRIERS | | **Vehicle range anxiety** | |
| | | **Lack of secondary market** | |
| | | **Public knowledge of technology and vehicle performance** | |
| RECOMMENDATIONS | **Near-Term** | **Establish consistent language, messaging, and branding** | such as key terms, word choice, formatting, logos, and icons |
| | **Near-Term** | **Implement creative EV transportation programs** | and marketing efforts, such as drag races and “demo days” events |
| | **Near-Term** | **Support the development of a community “EV Club”** | |
| | **Near-Term** | **Recognize local businesses with workplace charging through a business spotlight program.** | |
| | **Mid-Term** | **Provide education for the public** | particularly for underserved communities, speakers of non-English languages, and workers transitioning to renewables |
| | **Mid-Term** | **Partner with existing organizations** | to develop and share educational materials in multiple languages to support residents installing a private charging station |
| | **Mid-Term** | **Coordinate with the Pueblo County Energy Office** | to develop a plan to promote community EV adoption |
| | **Ongoing** | **Target key audiences** | such as housing and retail developers, employers, utilities, and low-income and under-represented communities |

FIGURE 16: SUMMARY OF GOALS, OBJECTIVES, BARRIERS AND RECOMMENDATIONS (cont.)

## 3 *Equitable access to EVs and the benefits of EVs and vehicle electrification by making it easier to purchase, charge, operate, and ride in an EV.*

| | | | | |
|---|---|---|---|---|
| OBJECTIVES |  | **Provide charging stations for** | **2%** | of public parking spaces within Pueblo County |
| |  | **Exceed** | **1.07 Public Charging Stations** | for every 10,000 County residents, equating to roughly 19 stations today for a projected 2020 County population of 172,000 persons and increasing with population growth |
| |  | **Support equitable distribution of** | **Charging Infrastructure** | based on area demographics and demand |
| |  | **Support electrification of the** | **County Fleet** | at a rate matching public adoption |
| BARRIERS | | **Lack of secondary market** | | |
| | | **Charging infrastructure deployment** | | |
| | | **Public knowledge of technology and vehicle performance** | | |
| | | **Financial barriers/cost differential** | | |
| RECOMMENDATIONS | **Near-Term** | **Expedite and clearly communicate** | the permitting process for EVSE installation | |
| | **Near-Term** | **Incentivize "e-bike" purchases** | and supporting infrastructure | |
| | **Mid-Term** | **Incentivize off-peak charging** | for lower electricity rates | |
| | **Near-Term** | **Develop consistent signing standards and enforceable policies for charging stations** | to prohibit non-EV use of dedicated parking spaces | |
| | **Mid-Term** | **Incentivize charging stations** | at multi-family housing properties | |
| | **Mid-Term** | **Amend the building code** | to require most or all new developments to include EV-ready infrastructure and dedicate two percent (2%) of their required parking to EVs | |
| | **Ongoing** | **Promote equity when developing solutions** | particularly for disabled users, users in underserved areas, and speakers of non-English languages | |
| | **Ongoing** | **Regularly (annually) perform a gap analysis** | to assess the need for charging stations in the County based on the siting criteria presented in this plan to account for shifts in demographics, demand, and EV market penetration | |

FIGURE 16: SUMMARY OF GOALS, OBJECTIVES, BARRIERS AND RECOMMENDATIONS (cont.)

**4** ***Development of criteria to strategically locate charging stations in a way that best supports increased EV adoption in alignment with the goals listed above.***

| | | | | |
|---|---|---|---|---|
| OBJECTIVES |  | **Support equitable distribution of** | **Charging Infrastructure** | based on area demographics and demand |
| |  | **Distribute EV charging infrastructure such that** | **All Pueblo County Residents** | have access to a charging station within five (5) miles of their residence or workplace |
| BARRIERS | | **Charging infrastructure deployment** | | |
| RECOMMENDATIONS | **Near-Term** | **Adopt the *REV West Plan's*** | voluntary minimum standards to support regional interoperability | |
| | **Long-Term** | **Consider charging stations within the public right-of-way** | in constrained areas | |
| | **Ongoing** | **Site EVSE where drivers want to spend time** | for example, at trailheads and near restaurants | |

FIGURE 16: SUMMARY OF GOALS, OBJECTIVES, BARRIERS AND RECOMMENDATIONS (cont.)

**5** ***Integration of EVs into a renewably powered electric grid that reduces GHG emissions, increases system reliability, and reduces costs for residents, businesses, and government.***

| | | | | |
|---|---|---|---|---|
| OBJECTIVES |  | **Provide charging stations for** | **2%** | of public parking spaces within Pueblo County |
| |  | **Exceed** | **1.07 Public Charging Stations** | for every 10,000 County residents, equating to roughly 19 stations today for a projected 2020 County population of 172,000 persons and increasing with population growth |
| BARRIERS | | **Charging infrastructure deployment** | | |
| RECOMMENDATIONS | **Near-Term** | **Incentivize off-peak charging** | to establish a sustainable use pattern for the utility grid | |
| | **Near-Term** | **Partner with utilities** | to develop a step-by-step process of best practices for site preparation services | |
| | **Long-Term** | **Work with local utilities** | to identify opportunities to transition fossil fuel sources to renewables, like solar and wind | |
| | **Long-Term** | **Support automatic metering infrastructure** | for dynamic utility pricing | |

FIGURE 16: SUMMARY OF GOALS, OBJECTIVES, BARRIERS AND RECOMMENDATIONS (cont.)

## 6 *Increased percentage of EVs and EVSE in and supporting the City, County, and private fleets at a rate matching or exceeding that of public EV adoption.*

| | | | | |
|---|---|---|---|---|
| OBJECTIVES |  | **Support electrification of the** | **County Fleet** | at a rate matching public adoption |
| BARRIERS | | **Financial barriers/cost differential** | | |
| | | **Lack of local sales and service network** | | |
| RECOMMENDATIONS | **Near-Term** | **Consider establishing an "EV-First Fleet Policy"** | under which the County would prioritize vehicle replacements with EV technologies | |
| | **Near-Term** | **Identify a County employee to serve as a champion for the County's EV efforts** | holding the County accountable for implementing the strategic actions identified in this plan | |
| | **Mid-Term** | **Encourage personal EV adoption amoung County employees** | by developing surveys, installing workplace charging stations, and coordinating with existing programs | |
| | **Long-Term** | **Work with the City of Pueblo** | to replace public transit buses with EVs or other AFVs | |
| | **Long-Term** | **Work with local school districts** | to replace school buses with EVs or other AFVs | |

TABLE 17: RESPONSIBILITY ASSIGNMENT MATRIX (RACI) CHART

| RECOMMENDATION | STAKEHOLDERS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PUEBLO COUNTY | COUNTY CHAMPION | STATE OF COLORADO | LOCAL JURISDICTIONS | AUTO DEALERSHIPS | AUTO GROUPS | TNCS | DEVELOPERS | UTILITY PROVIDERS | EMPLOYERS | NON-PROFIT GROUPS | COMMUNITY COLLEGES | RESIDENTS |
| R = Responsible A = Accountable C = Consulted I = Informed | | | | | | | | | | | | | |
| **1** ***Increased availability and use of EVs over conventional fuel vehicles in Pueblo County and the region.*** | | | | | | | | | | | | | |
| **Lead by example by integrating EVs into the County fleet.** | R | A | C | C | I | I | I | I | I | I | I | I | I |
| **Encourage EV ride-hailing/car-sharing.** | C | A | I | C | C | I | R | I | I | I | C | I | C |
| **Incentivize EV purchases through group buys, tax exemptions, etc.** | C | A | I | C | R | C | C | I | I | I | I | I | C |
| **Actively engage and partner with dealerships to stock EVs, operate ride-and-drive events, and install charging stations on-site.** | R | A | I | C | R | C | C | I | I | I | I | I | C |
| **Coordinate with the State to reinitiate credit programs for incoming out-of-state vehicles.** | R | A | R | I | I | I | C | I | I | I | C | I | I |
| **2** ***Improved awareness of purchase, operation, and lifetime costs and benefits of and incentives related to EVs among residents, businesses, and visitors to Pueblo County.*** | | | | | | | | | | | | | |
| **Provide education for the public, particularly underserved communities and workers transitioning to renewables.** | C | A | I | C | C | C | I | I | C | I | R | R | C |
| **Establish consistent language, messaging, and branding, such as key terms, word choice, formatting, logos and icons.** | R | A | I | I | C | C | C | I | I | I | C | I | C |
| **Develop educational materials to support residents installing a private charging station.** | C | A | I | C | I | I | I | C | C | C | R | I | C |
| **Target key audiences such as housing and retail developers, employers, utilities, and low-income and under-represented communities.** | C | A | I | I | I | I | I | C | C | C | R | I | C |
| **Implement creative EV transportation programs and marketing efforts, such as drag races and "demo days" events.** | C | A | I | C | I | C | I | I | I | I | R | I | I |
| **Support the development of a community "EV Club."** | C | A | I | C | C | C | C | I | I | I | R | I | I |

TABLE 17: RESPONSIBILITY ASSIGNMENT MATRIX ("RACI CHART") (cont.)

| RECOMMENDATION | STAKEHOLDERS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PUEBLO COUNTY | COUNTY CHAMPION | STATE OF COLORADO | LOCAL JURISDICTIONS | AUTO DEALERSHIPS | AUTO GROUPS | TNCS | DEVELOPERS | UTILITY PROVIDERS | EMPLOYERS | NON-PROFIT GROUPS | COMMUNITY COLLEGES | RESIDENTS |
| R = Responsible A = Accountable C = Consulted I = Informed | | | | | | | | | | | | | |
| **3 *Equitable access to EVs and the benefits of EVs and vehicle electrification by making it easier to purchase, charge, operate, and ride in an EV.*** | | | | | | | | | | | | | |
| **Incentivize charging stations at multi-family housing properties.** | C | A | I | C | I | I | I | R | R | I | C | I | C |
| **Promote equity when developing solutions, particularly for disabled users and in underserved areas.** | R | A | I | R | C | C | C | C | I | C | C | I | C |
| **Amend the building code to require most or all new developments to include EV-ready infrastructure and dedicate two percent (2%) of their required parking to EVs.** | R | A | I | R | I | I | I | R | C | C | I | I | I |
| **Expedite and clearly communicate the permitting process for EVSE installation.** | R | A | I | I | I | I | I | C | C | C | I | I | C |
| **Incentivize "e-bike" purchases and supportive infrastructure.** | C | A | I | C | I | I | I | I | R | I | C | C | C |
| **Incentivize off-peak charging for lower electricity rates.** | C | A | I | I | I | I | I | I | R | I | I | I | C |
| **4 *Development of criteria to strategically locate charging stations in a way that best supports increased EV adoption in alignment with the goals listed above.*** | | | | | | | | | | | | | |
| **Site EVSE where drivers want to spend time (e.g. trailheads, restaurants).** | R | A | C | C | I | I | C | C | I | C | C | C | C |
| **Consider charging stations within the public right-of-way in constrained areas.** | R | A | C | C | I | I | I | C | C | I | I | I | I |

TABLE 17: RESPONSIBILITY ASSIGNMENT MATRIX ("RACI CHART") (cont.)

| RECOMMENDATION | STAKEHOLDERS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PUEBLO COUNTY | COUNTY CHAMPION | STATE OF COLORADO | LOCAL JURISDICTIONS | AUTO DEALERSHIPS | AUTO GROUPS | TNCS | DEVELOPERS | UTILITY PROVIDERS | EMPLOYERS | NON-PROFIT GROUPS | COMMUNITY COLLEGES | RESIDENTS |
| R = Responsible A = Accountable C = Consulted I = Informed | | | | | | | | | | | | | |
| **5 *Integration of EVs into a renewably powered electric grid that reduces GHG emissions, increases system reliability, and reduces costs for residents, businesses, and government.*** | | | | | | | | | | | | | |
| **Work with local utilities to identify opportunities to transition fossil fuel sources to renewables, like solar and wind.** | C | A | C | C | I | I | I | I | R | I | I | I | I |
| **Incentivize off-peak charging to establish a sustainable use pattern for the utility grid.** | C | A | I | I | I | I | I | I | R | C | I | C | C |
| **Support automatic metering infrastructure for dynamic utility pricing.** | C | A | I | C | I | I | I | I | R | C | I | I | I |
| **Partner with utilities to provide site preparation services.** | R | A | I | I | I | I | I | C | R | I | I | I | I |
| **6 *Increased percentage of EVs and EVSE in and supporting the City, County, and private fleets at a rate matching or exceeding that of public EV adoption.*** | | | | | | | | | | | | | |
| **Consider establishing an "EV-First Fleet Policy" under which the County would prioritize vehicle replacements with EV technologies.** | R | A | C | C | I | I | I | I | I | I | I | I | I |
| **Work with the City of Pueblo to replace public transit buses with EVs or other AFVs.** | C | A | C | R | I | I | I | I | I | I | I | I | I |
| **Work with local school districts to replace school buses with EVs or other AFVs.** | C | A | C | R | I | I | I | I | I | I | I | I | I |

# Endnotes


1 https://www.energy.gov/eere/electricvehicles/find-electric-vehicle-models

2 https://afdc.energy.gov/data/10567

3 https://afdc.energy.gov/vehicles/search/results/?view_mode=grid&search_field=vehicle&search_dir=desc&per_page=8&current=true&display_length=25&fuel_id=41,57,-1&category_id=27,25,29,9,-1&manufacturer_id=365,377,355,211,231,215,223,409,219,213,209,351,385,275,424,361,387,243,227,239,425,263,217,462,391,349,383,237,221,347,395,67,117,394,426,415,201,113,205,71,5,408,9,13,11,458,81,435,57,195,416,141,197,463,417,121,53,397,418,85,414,17,21,143,403,23,398,27,399,31,207,396,107,465,193,460,125,35,419,37,147,199,-1

4 https://afdc.energy.gov/fuels/electricity_infrastructure.html

5 https://www.cityofaspen.com/DocumentCenter/View/977/Aspen-Electric-Vehicle-Readiness-Plan-PDF

6 https://www.fcgov.com/fcmoves/files/cofc-ev-readiness-roadmap.pdf

7 https://www.denvergov.org/content/dam/denvergov/Portals/779/documents/transportation/DenverVehicleElectrificationActionPlan.pdf

8 https://drive.google.com/file/d/1-z-lNQMU0pymcTQEH8OvnemgTbwQnFhq/view

9 https://energyoffice.colorado.gov/zero-emission-vehicles/charge-ahead-colorado

10 https://energyoffice.colorado.gov/zero-emission-vehicles/electric-vehicle-fast-charging-corridors

11 https://www.colorado.gov/governor/sites/default/files/inline-files/b_2019-002_supporting_a_transition_to_zero_emissions_vehicles.pdf

12 https://www.codot.gov/programs/environmental/Sustainability/d-2019-016.pdf

13 https://leg.colorado.gov/bills/sb19-077

14 https://leg.colorado.gov/bills/hb19-1159

15 https://leg.colorado.gov/bills/hb19-1261

16 https://leg.colorado.gov/bills/hb19-1198

17 https://leg.colorado.gov/bills/hb19-1298

18 https://www.colorado.gov/pacific/sites/default/files/Income69.pdf

19 https://environmentalrecords.colorado.gov/HPRMWebDrawer/Record/1451740/File/document

20 http://cocleandiesel.org/

21 https://www.naseo.org/Data/Sites/1/revwest_mou.pdf

22 https://www.naseo.org/Data/Sites/1/revwest_volminimumstandards.pdf

23 https://www.naseo.org/Data/Sites/1/revwest_mou_2019_final.pdf

24 https://www.fueleconomy.gov

25 https://www.colorado.gov/pacific/sites/default/files/Income69.pdf

26 https://driveelectriccolorado.org/incentives/tax-credits

27 https://energyoffice.colorado.gov/zero-emission-vehicles/evs-in-colorado

28 http://evchargingpros.com/wp-content/uploads/2015/05/Clean-Cities-Colorado-PEV-Readiness-Plan.pdf

29 https://www.energy.gov/eere/vehicles/articles/fotw-1064-january-14-2019-median-all-electric-vehicle-range-grew-73-miles

30 https://www.statista.com/statistics/183713/value-of-us-passenger-cas-sales-and-leases-since-1990/

31 https://www.csmonitor.com/Business/Saving-Money/2016/0912/Used-plug-in-cars-could-be-a-bargain

32 https://www.energy.gov/eere/electricvehicles/electric-car-safety-maintenance-and-battery-life

33 https://www.energy.gov/eere/electricvehicles/charging-home

34 https://www.colorado.gov/pacific/sites/default/files/atoms/files/EV%20Market%20Study%202015_0.pdf