CITY OF ASPEN

Electric Vehicle Public Charging Infrastructure Masterplan

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Executive Summary

This document, the *City of Aspen Electric Vehicle Public Charging Infrastructure Masterplan*, provides a series of action items and responsibility outlines for how the City of Aspen should advance its public charging infrastructure over the next five years. A high-level summary of each of these action items and responsibility outlines is listed below. Detailed action items and responsibility outlines, as well as the rationale for them, can be found in the "Electric Vehicle Charging Infrastructure Action Items and Responsibility Outlines" section.

Infrastructure Action Items

New Charging Stations

1. Install new charging stations toward a goal of having a total of 40 publicly available charging plugs, plus or minus 5 plugs (± 5), in the City of Aspen inventory by the end of 2026. Use a 25%, or higher, year-over-year growth rate of electric vehicle (EV) registrations in the local, tri-county region as the trigger to continue installing charging stations each year toward the goal number of plugs.

2. Prioritize the installation of new charging stations at the locations on the "Recommended Site List", pending the necessary evaluations of the site at the time of installation.

3. Prioritize the installation of Level 2 charging stations over Direct Current Fast Charging (DCFC) charging stations.

4. Prioritize the installation of banks of multiple charging stations at individual locations whenever possible.

Existing Charging Stations

5. Replace existing charging stations when they no longer properly provide a charge and/or they become more expensive to repair than replace.

Policy Action Items

Paid Charging Policies

1. Begin charging EV drivers a fee to use City of Aspen-owned charging stations. The fees should vary depending on the type of charging station. The fees' exact amount will be informed by an Aspen Electric Utility rate study and determined through collaboration with other service providers in the local region. The fees should be implemented in 2022 for DCFC charging stations and 2023 for Level 2 charging stations. The fees should be applied to City-owned charging stations that are located on the Holy Cross Energy grid on this timeline as well.

EV Parking Policies

2. Implement rules regarding EV parking at charging stations that complement the adopted fee for charging, such as those that would inhibit overstays at charging stations.

3. Maintain the current cost to park at all charging station sites.

4. Maintain the existing EV parking permit that is available for EVs to park for free in Residential Parking Zones until a sunset date at the end of 2023, at which time the permit can be reevaluated.

Operations Responsibility Outlines

Action Responsibilities

1. City departments and external partners have committed to assuming responsibility for the actions necessary for charging station installation and maintenance in this outline: Operations Responsibility Outline #1.

Budget Responsibilities

2. Budget responsibility for the components of charging station installation and maintenance is assigned to the committed City departments in this outline: Operations Responsibility Outline #2.

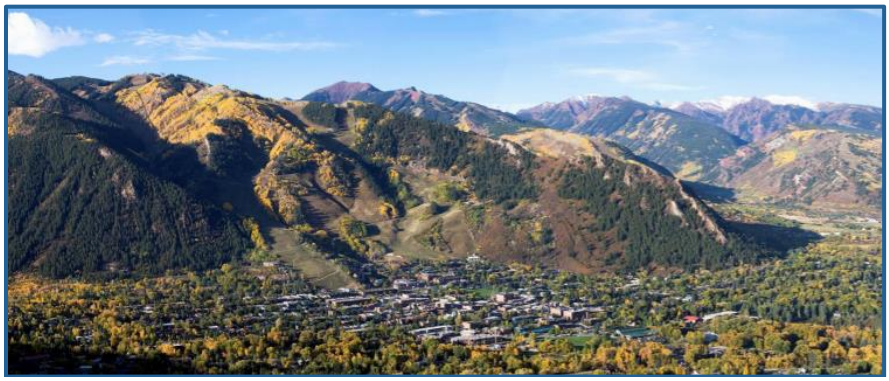
Electric Vehicle Charging Infrastructure Action Items and Responsibility Outlines

Introduction

In early 2017, Aspen City Council adopted the *Aspen Community Electric Vehicle Readiness Plan* (the "Readiness Plan"). The Readiness Plan was the City's first step toward strategic planning for the incorporation of electric vehicles, and their associated infrastructure, in the community. Today, projections foresee EV adoption growing rapidly in the coming years with some expecting there to be 4,000 – 5,000 EVs in the local region by 2026 (currently there are under 1,000 EVs in the local region). Accordingly, Aspen needs an updated iteration of the Readiness Plan, particularly focused on the strategic planning of EV charging infrastructure.

This plan, the *City of Aspen Electric Vehicle Public Charging Infrastructure Masterplan* (the "Masterplan"), provides action items and responsibility outlines for the expansion and management of municipally-owned and -operated EV charging infrastructure for the next five years: 2021 through 2026. Near the end of the useful life of this Masterplan, a new planning process should be undertaken to evaluate the successes and potential shortcomings of the plan and how EV charging infrastructure should be strategically approached for the following five years.

For background information on EVs, how they operate, and the benefits associated with driving an EV, please continue to refer to the Readiness Plan. The focus of this Masterplan will primarily be on public EV charging infrastructure.



View of Aspen from Smuggler Mountain. Photo by Shelia Babbie.

Approach to Creating the Action Items and Responsibility Outlines

This Masterplan is a product of collaboration between the City of Aspen Climate Action Office, Electric Utility, Engineering, Parking, Streets, Transportation, and GIS departments. Key external stakeholders from the Colorado Energy Office and Holy Cross Energy were included in this process as well. These internal and external stakeholders were each in one or more of three different subgroups depending on their area of expertise. The three subgroups: Infrastructure, Policy, and Operations, met separately to address the necessary deliverables of the Masterplan in a detailed and efficient manner.

Furthermore, a set of external partners, including individuals from the Aspen Skiing Company, Roaring Fork Transportation Authority (RFTA), and the Pitkin Country Elected Officials Transportation Committee (EOTC), provided useful input and expert opinions on a handful of discrete items within this Masterplan. A full list of those involved in the Masterplan can be found in Attachment A in the Appendix.

An additional source of input was a community survey. This community survey was made available to community members who own EVs and those who are considering purchasing an EV in the future. The survey gathered responses on the community members' expected habits at public charging stations and their preferred locations for the installation of new charging stations. The survey results were considered by the stakeholder group when crafting the action items of this Masterplan, especially those related to the siting of new charging stations.

Each action item and responsibility outline is listed below and followed by a rationale statement, when necessary, to provide relevant contextual information.

Infrastructure Action Items

New Charging Stations

Infrastructure Action Item #1

Install new charging stations toward a goal of having a total of 40 $\pm$ 5 plugs in the City's public charging inventory by the end of 2026 and allocate the necessary resources to achieve this goal.

New charging stations should continue to be installed when EV registration growth in the local, tri-county region (Pitkin, Eagle, and Garfield counties) is at, or above, 25% year-over-year (YOY).

Infrastructure Action Item #1 Rationale

There are currently 14 plugs in the City's public charging inventory. This goal would require adding approximately 26 more plugs over the next five years. A new DCFC charging station is slated to be installed at the new Aspen City Hall building in summer 2021, thus adding one plug to the City's inventory. Therefore, the goal would require approximately 12 dual-cord, Level 2 charging stations to be installed by the end of 2026, given the preference for Level 2 charging stations listed in Action Item #3 of this section. The estimated total purchase cost for these new stations would be approximately $108,000. The cost of installation would be between $11,000 and $21,000 for each charging station, depending on site conditions. Detailed information on the cost of installing charging stations can be found in the "Charging Station Cost Estimates" portion of the "Supporting Information" section.

Holy Cross Energy, using the State of Colorado's EV growth projections and their own observations, has developed their own projection for EV ownership in the local region. Holy Cross Energy anticipates a 34% YOY growth in EV registrations in the local region in the coming years. Growth at this pace would result in 4,000 – 5,000 EVs registered in the local region by 2026 (there are currently less than 1,000 EVs in the local region). More information on the historic and projected growth in EV ownership can be found in the "Regional EV Registration Trends" portion of the "Supporting Information" section. Using a 25% YOY growth rate in

registrations in the local region as a trigger for new installations generally aligns with the YOY growth rate of charging plugs required to reach 40 ± 5 plugs by the end of 2026. Observing a 25% YOY, or higher, growth rate in EV registrations at the start of each calendar year before installing more charging stations will provide a form of checks and balances on the stated goal number of plugs. Although the anticipated growth in EV registrations is 34% YOY, the Infrastructure Subgroup opted for a conservative approach to the number of new charging plugs to install by the end of 2026, hence the 25% YOY growth rate trigger for installing new plugs.

Infrastructure Action Item #2

Prioritize charging station installation at the sites listed in the Recommended Site List:

- S Galena St. & E Durant Ave. (near the existing DCFC charging station)
- Current Aspen City Hall (Armory building) alleyway
- N 8th St. & W Hallam St.
- Aspen Ice Garden
- Red Brick Recreation Center and Center for the Arts
- Francis Whitaker Park (S Monarch St.)
- Old Powerhouse Building
- Herron Park
- E Bleeker St. & N Monarch St.
- Koch Lumber Park
- E Main St. & N Monarch St.
- E Cooper Ave. and S Spring St.

Infrastructure Action Item #2 Rationale

The Recommended Site List outlines the 12 best locations to install new charging stations, in alignment with the goal number of installations outlined in Action Item #1, and are not ranked in order of prioritization. This list is not prioritized because charging station installation at these sites should utilize contemporary infrastructure projects whenever possible to aggregate and minimize costs. Sites will require further, on-the-ground analysis prior to installation to confirm their suitability for installation. Attachment B in the Appendix outlines the siting criteria process that developed the Recommended Site List.

The City's GIS team has also created a "heatmap" of the locations in Aspen that would be best suited for new charging stations based on the scores assigned to the quantitative criteria, such as proximity to transit hubs, proximity to electrical transformers, etc. This "heatmap" can be found in Attachment C in the Appendix and will be useful for City staff, as well as future iterations of the Masterplan, when considering potential new sites for charging stations.

Infrastructure Action Item #3

Prioritize the installation of Level 2 charging stations over DCFC charging stations except in circumstances where the costs of DCFC charging stations are signficiantly reduced via grant opportunities or similar cost mitigation avenues.

Infrastructure Action Item #3 Rationale

Level 2 charging station units, and associated warranties, are significantly less expensive than their DCFC counterparts. In order to provide the most charging stations to meet public demand, while being most cost efficient, it would behoove the City to prioritize Level 2 charging station

installations. Detailed charging station cost information to support this rationale can be found in the "Charging Station Cost Estimates" portion of the "Supporting Information" section.

DCFC charging stations are also best suited for locations with short-term parking (under one hour). Level 2 charging stations are better suited for the majority of Aspen's parking areas (which permit longer-term parking), such as the Residential Parking Zones and the Rio Grande Parking Garage. Data collected from the City's existing charging stations indicate that most EVs are using the charging stations for 2 – 3 hours. Thus, the typical public charging needs in Aspen can be best accommodated by Level 2 charging stations.

Infrastructure Action Item #4

Prioritize the installation of banks of multiple charging stations at individual locations whenever possible, particularly at park and ride or parking lot locations with close proximity to transit.

Infrastructure Action Item #4 Rationale

Installing banks of charging stations at park and ride and parking lot sites is suggested for the following reasons:

- These locations are often free to park (which is an added bonus for the EV driver).
- Parking at these locations encourage transit ridership and would reduce congestion in the downtown core.

Existing Charging Stations

Infrastructure Action Item #5

Continue utilizing an existing charging station until:

- The unit no longer functions properly to provide EV drivers with a charge; or
- The unit becomes more costly to repair than replace entirely.

When an existing charging station meets one or both of these criteria, the relevant stakeholders, as identified in the "Operations Responsibility Outlines" section, should pursue replacement.

Infrastructure Action Item #5 Rationale

There has been discussion around replacing charging stations that are no longer able to provide data to the City, which is the case for the oldest charging stations in the City's inventory. However, the Infrastructure Subgroup determined that as long as a charging station is still useful to an EV driver (i.e., the charging station is still able to provide a charge reliably), then the charging station should not be replaced in order to conserve City funds and resources.

Policy Action Items

Paid Charging Policies

Policy Action Item #1

Begin charging EV drivers a fee to use publicly available charging stations owned- and-operated by the City on the following dates:

- Level 3 DCFC: 1/1/2022.
- Level 2: 1/1/2023. Station usage and number of EVs registered in the region should be evaluated with up-to-date 2022 data prior to implementing a fee at Level 2 stations.

Rely on the Aspen Electric Utility to inform the fee for charging, depending on the results of their relevant rate study and time of use considerations. The Aspen Electirc Utility is commited to coordinating with other service providers in the region on the exact fee amount to ensure a general consistency throughout the region. The same rates should be applied to City of Aspen charging stations located on the Holy Cross Energy grid on the same implementation timeline. Once a fee is determined, it must be formally approved through the City's fee ordinance process.

Policy Action Item #1 Rationale

The City does not currently charge a fee for the use of any of its charging stations, regardless of type. However, implementing a fee on the timeline listed in this action item would align the City's charging stations with industry standards. A significant majority of DCFC charging stations in the local region and comparable locations are currently charging EV drivers a fee to use the station. While most Level 2 charging stations in the local region and comparable locations are currently free for the EV driver to use, it is expected that many Level 2 charging stations will begin charging a fee in the near future. As such, it is sensible for the City to begin to charge a fee at DCFC charging stations in the near-term and Level 2 charging stations shortly thereafter.

This action item was screened with regional partners to ensure that the timeline to implement a fee for charging will not create significant unintended consequences as other jurisdictions plan their fees as well. This screening was also conducted to ensure that charging fees in the local region have the potential to be generally consistent.

The kilowatt hour (kWh) rate the customer will pay is generally expected to fall between $0.10/kWh and $0.30/kWh. This range is subject to change depending on the results of the Aspen Electric Utility's rate study and changes in market forces. Fees for EV charging should aim to be cost competitive with the cost of gasoline. It is expected that the customer rate to charge at City charging stations will be in this range based on two factors:

- First, these fees are consistent with the fees that other municipalities, counties, utilities, businesses, and other organizations in the local region are currently charging or planning to charge. Fees charged in these comparable locations typically range from free to $0.25/kWh for Level 2 stations and free to $0.45/kWh for DCFC stations.
- Second, the Aspen Electric Utility confirmed that this range is an appropriate estimate given their knowledge of current and future customer electric rates as well as what would be required to cover the costs of supplying electricity to EV drivers.

Applying the same rates and timeline to charging station locations on both the Aspen Electric and Holy Cross Energy Grids will create consistency across all City charging stations and will make interpreting charging costs easier for EV drivers.

EV Parking Policies

Policy Action Item #2

When a fee for charging is applied to City charging stations, the City should also implement supporting charging station rules. For example:

- *Increase fee after allowable time limit*: If a car overstays at a station beyond the allowable time limit, the fee charged for charging should be increased for the remainder of the stay.

Policy Action Item #2 Rationale

Complementary rules of this nature will encourage courteous EV driver etiquette. EV drivers would be encouraged to only dwell for the allowable time and this would increase turnover at charging stations so that more drivers can utilize them.

Policy Action Item #3

Maintain the current cost to park at all charging station sites and manage payment for parking through the existing Parking Department systems.

Policy Action Item #3 Rationale

Currently, the cost to park at charging stations is the same as the cost to park in a regular parking space. When a fee to charge is applied to charging stations, EV drivers will still be utilizing the City's parking and should continue to pay the relevant parking costs as a result. The only existing exception to this is the permit for EVs to park for free in Residential Parking Zones, as referenced in Policy Action Item #4 below.

Policy Action Item #4

Continue the existing EV parking permit that is available for EVs to park for free in Residential Parking Zones until a sunset date of 12/31/2023. At this point the City can reevaluate the permit.

Policy Action Item #4 Rationale

This parking permit incentivizes EV ownership by allowing EV drivers to park for free in Residential Parking Zones and is an effective bridge policy to make it less expensive for EV drivers to park and charge in Aspen. Such an incentive is worthwhile to promote as EV ownership continues to rise. However, a sunset date should be built into the existing policy, as the incentive may no longer be necessary or effective at that time.

Operations Responsibility Outlines

Action Responsibilities

Operations Responsibility Outline #1 The City departments and external partners in this outline have committed to being responsible for the listed actions required to install new charging stations and maintain existing stations. Actions are listed in the left column of the table and the City department(s) or external partner(s) responsible for the action is listed in the right column.	
Maintain Existing Network of Public Charging Stations	
Maintain and extend warranties	Climate Action Office, Parking
Regular station check-ups	Parking
Receive notice of station service needs	Parking
Perform initial diagnoses and minor repairs when station is down*	Parking
Schedule and manage significant repairs	Parking
Build relationships/contracts with local and national service providers for repairs*	Parking
Snow removal	Streets
Maintain parking spot striping	Streets
Maintain and update EV-specific signage	Parking
Enforce parking and charging regulations	Parking
Upgrade Existing Network of Public Charging Stations	
Follow industry trends	Colorado Energy Office ReCharge Coach
Maintain information and data on station inventory	Climate Action Office
Identify replacement/update opportunities	Climate Action Office, Parking
Locate funding for replacements/updates	Climate Action Office

Installation of New Public Charging Stations	
Project Management	*Climate Action Office*
Identify site and timing for installation	Climate Action Office
Coordinate all involved parties	
Manage funding applied to installation	
Installation Management	*Engineering*
Procurement of station and relevant materials	Engineering
Obtain relevant permits	Engineering
Create and manage bid for construction	Engineering
Manage electrical requirements	Electric Utility
Neighborhood communications	Communications
Station installation	Engineering, Contracted Electrician
Connect station to power	Electric Utility, Contracted Electrician
Connect station to charging network	Parking, Contracted Electrician
Parking spot striping	Streets
EV-specific signage	Parking
Wrap-up Management	*Climate Action Office*
Pin station on charging station network map	Climate Action Office
Celebrate installation and inform community	Climate Action Office, Communications
Add station information to internal inventory	Climate Action Office
Measure Usage and Analyze Data from Stations	
Regularly pull usage data and organize	Climate Action Office, GIS
Produce quarterly reports and share internally	GIS

Compile community-wide station data (HCE stations, private stations, etc.) when available for future planning	Parking, Climate Action Office, GIS
Communications	
Provide information for new EV drivers	Parking
Receive customer complaints	Parking
Provide information for residential chargers	Building
Receive all other incoming EV questions	Parking
Update website, update partners	Climate Action Office, Communications
Liaise with automotive dealers to provide utility information re: charging and liaise with the DMV to provide charging information to drivers	ReCharge Coach, Electric Utilities, CORE, Parking
Manage EV parking permits	Parking
Electric Management	
Set and manage rate structures for electricity provided to stations and rates for the drivers' cost of charging	Electric Utility, ReCharge Coach, Climate Action Office

**New Resources Required to Support Action Responsibilities*

- Parking Department
    - The Parking Department will explore training to make a staff member a Certified ChargePoint Installer. Staff who complete the Certified ChargePoint Installer program can further support the installation of new ChargePoint charging stations and better maintain existing charging stations, thus requiring less of external contractors.
    - In order to develop relationships with local and national service providers for repairs, the Parking Department will coordinate with the City's Capital Asset Department, which may already maintain some of these relevant relationships and contracts.

Budget Responsibilities

Operations Responsibility Outline #2

The City departments listed in this outline have committed to being responsible for the designated budget items associated with the installation of new charging stations or the maintenance of existing charging stations.

Budget Item	Department Responsible for Budget Item	Budget Item Currently Funded?	Funding Secured for Future?	When Will Future Funding be Needed?
Network Connection	Climate Action Office in the near-term	Yes	Need funds for new stations	2023
Warranties	Climate Action Office in the near-term Parking in the long-term	Yes	Need funds for new stations	2023
Maintenance	Parking	No	No	2022
Electricity	Climate Action Office until a rate is applied at charging stations. Once a rate is applied, responsibility shifts to the Aspen Electric Utility if station is located on the Aspen Electric grid. Climate Action Office retains responsibility if station is located on the Holy Cross Energy grid.	Yes	Need funds ongoing, can recoup from charging rate	2022
Installation: New Station Purchases	Climate Action Office	Yes, Capital Budget	Will need more, depending on future installations	2023
Installation: Electrical Labor and Materials	Engineering	No	No, but could be included in adjacent project budgets	2023
Installation: Excavation Labor and Materials	Engineering	No	No, but could be included in adjacent project budgets	2023

Note: The “Charging Station Cost Estimates” portion of the “Supporting Information” section contains an overview of the costs associated with installing new charging stations and an explanation of the variables that affect cost from site to site. Attachment D in the Appendix contains a more detailed breakdown of all of the expected costs associated with installing new charging stations.

The departments listed as responsible for a component of the budget to install and/or maintain charging stations should collectively coordinate with the City Finance Department during the implementation of this Masterplan to ensure these budgets are effectively established and managed.

Topics for Further Consideration

The topics in this section are related to EV charging infrastructure but were either not fully addressed by the stakeholder subgroups or were outside of the scope of this Masterplan. These topics are worthy of further discussion and City staff should pursue these conversations upon the implementation of this Masterplan.

Public-Private Partnerships

The stakeholders of this Masterplan generally support the installation of charging stations through public-private partnerships (PPPs) in the public Right of Way (ROW). In such an instance, a private entity would cover the cost of a new charging station and its installation in the ROW if given approval by the City. Given the high price tag associated with installing new charging stations, PPPs are a valuable tool to advance EV charging infrastructure in Aspen while minimizing costs to the City. Accordingly, City staff, specifically the Engineering Departments, Aspen Electric Utility, Parking Department, and City Attorney’s Office, should collaborate to develop robust and uniform protocols for these PPPs. The terms of the agreement for a PPP should be well established, including terms regarding charging station data access, paid charging fee restrictions, charging station upkeep, and charging station transfer of management.

Regional Approaches

While regional partners, and the insights they provided, were referenced throughout this Masterplan, collaboration between the City of Aspen, other jurisdictions, and partner organizations should continue in areas related to EVs. In particular, the relevant parties in the local region should continue to coordinate on electric utility approaches to EV charging, implementing more electric mass transit (electric buses), and creating pathways to share updates on EV policies.

Fleet Electrification

The City should continue to advance the electrification of its internal fleet of vehicles. While a select number of City departments have EVs, they should be far more pervasive across the organization. The Climate Action Office intends to engage City staff in a process to determine the best approaches to EV adoption in the City fleet during summer 2021.

Main Street, Aspen Traffic

Supporting Information

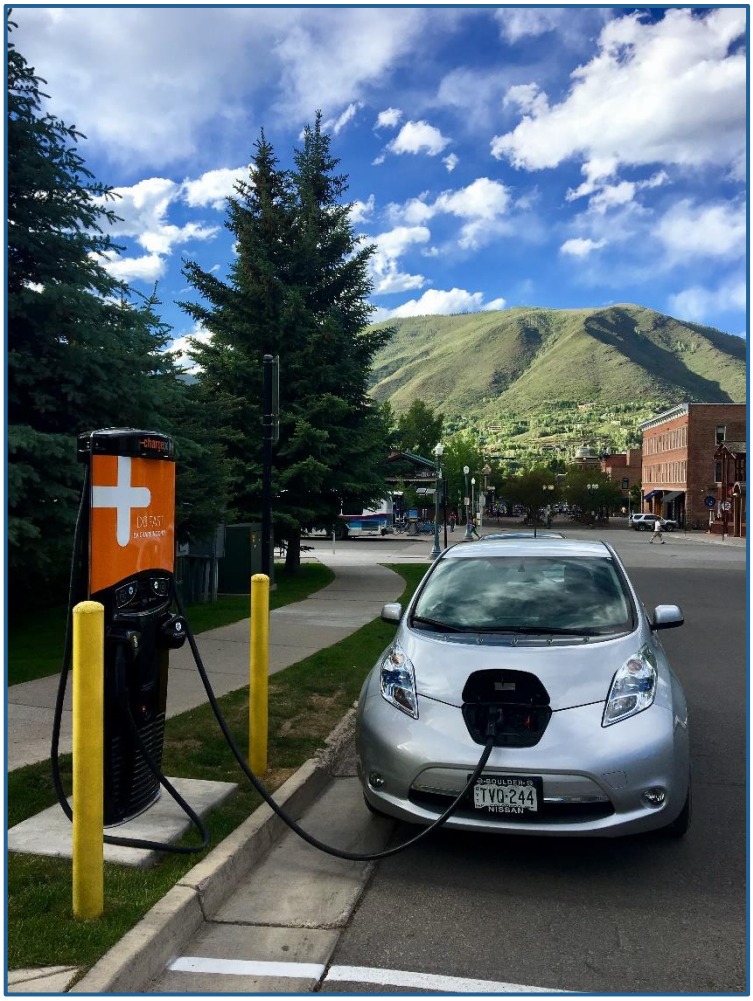
Current State of Electric Vehicles and Charging Infrastructure

Aspen's Existing EV Charging Stations

The City of Aspen installed its first EV charging stations in 2015 and has since expanded the charging stations it provides to the public. As of spring 2021, the City of Aspen owns and operates eight publicly available EV charging stations (two DCFC chargers and six dual-cord, Level 2 chargers) for a total of 14 charging plugs. Currently all City charging stations operate on the Aspen Electric Utility, with the exception of a single station at the Brush Creek Park and Ride, which operates on Holy Cross Energy. All City charging stations are currently free to use, with the exception of the cost of parking when applicable. See Attachment E in the Appendix for a map of the City's EV charging stations and Attachment F in the Appendix for background information regarding the different types of EV charging infrastructure.

In addition to the inventory of City-owned charging stations, there are numerous privately-owned charging stations available for patrons of businesses, hotels, or other organizations in Aspen and its Urban Growth Boundary (UGB). As of winter 2021, there were 21 private plugs within City limits and 29 additional plugs located within the UGB, amassing a total of 50 plugs in the Aspen area. These plugs are predominantly Level 2 chargers. These figures do not include charging that takes place at private residences.

Charging Plugs in the Aspen Area	
City of Aspen	14
Private (within City Limits)	21
Private (within the UGB)	29
Total Plugs in the Aspen Area	64



S Galena Street DCFC Charging Station with Nissan Leaf

Local EV Charging Station Usage Trends

In late 2020 and early 2021, City GIS created a GIS Insights webpage that creates visualizations of the data collected by the City's EV charging stations and parking meters. Below are some examples of the key information produced by the insights webpage that informed this Masterplan.

Notes:

- This data comes from nine of the City of Aspen's 14 publicly available plugs, as only nine plugs are capable of gathering data.
- Figures 1, 2, and 3 use a color key wherein dark red colored months are periods of high usage and light blue colored months are periods of low usage.

Figure 1

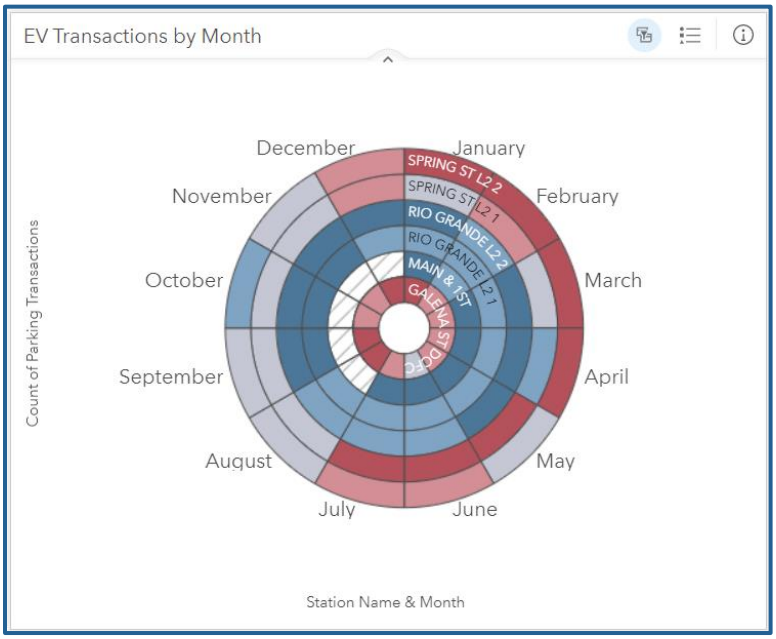


Figure 1 highlights the patters of usage the City's charging stations experience on a month-to-month basis. This figure indicates that charging stations are used most frequently during Aspen's peak season months in the winter and summer.

Figure 2

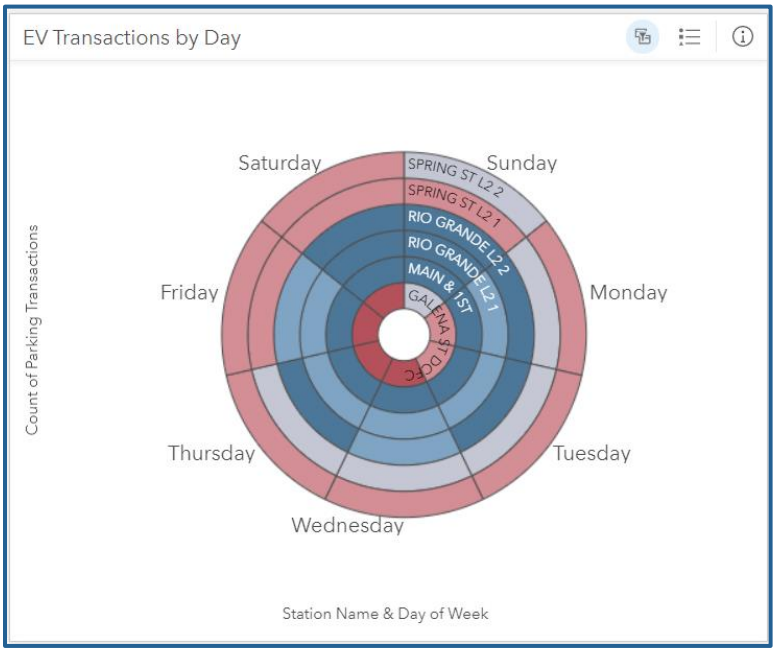


Figure 2 demonstrates what days of the week charging stations are most frequently used. Charging stations tend to be utilized the most on the weekends but are also utilized consistently throughout the week.

Figure 3

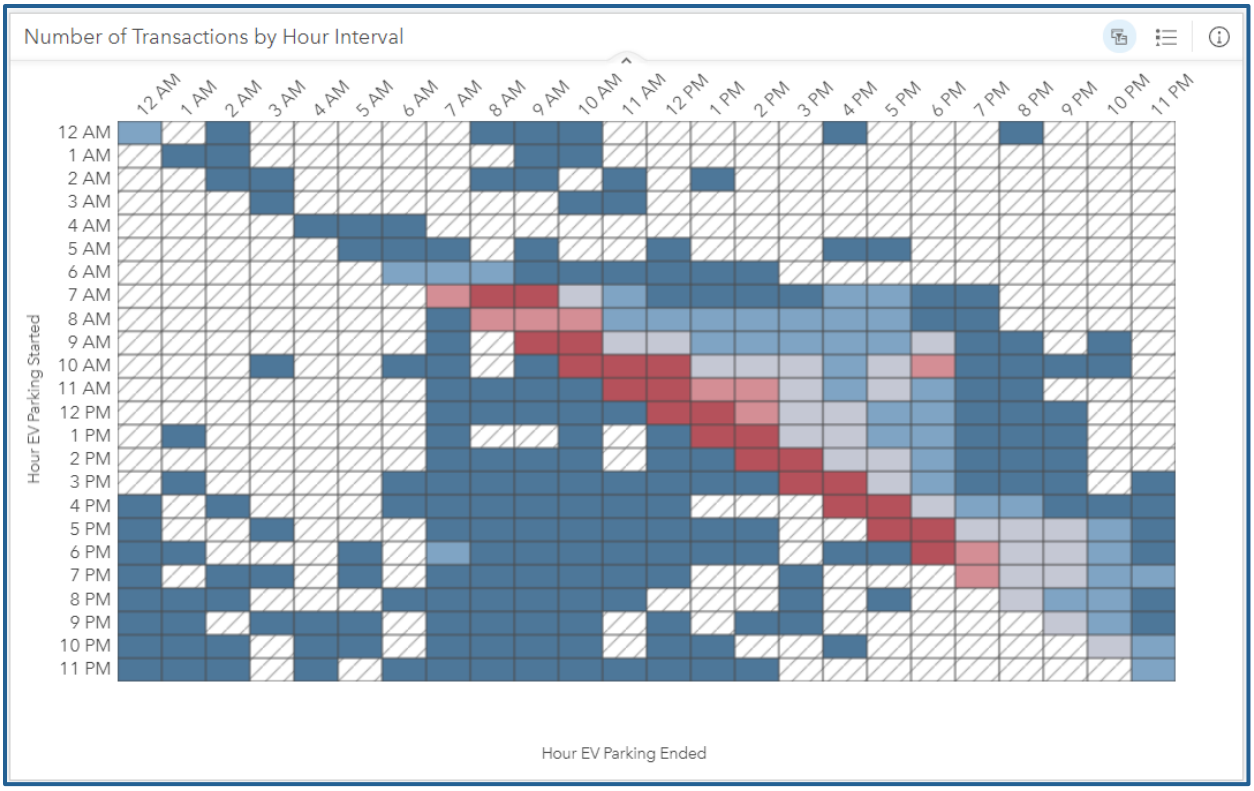


Figure 3 explains the typical durations of charging sessions at the stations. Most charging sessions last between 2-3 hours and take place during the peak business hours of 7am and 6pm.

Spring Street Level 2 Charging Station

Figure 4

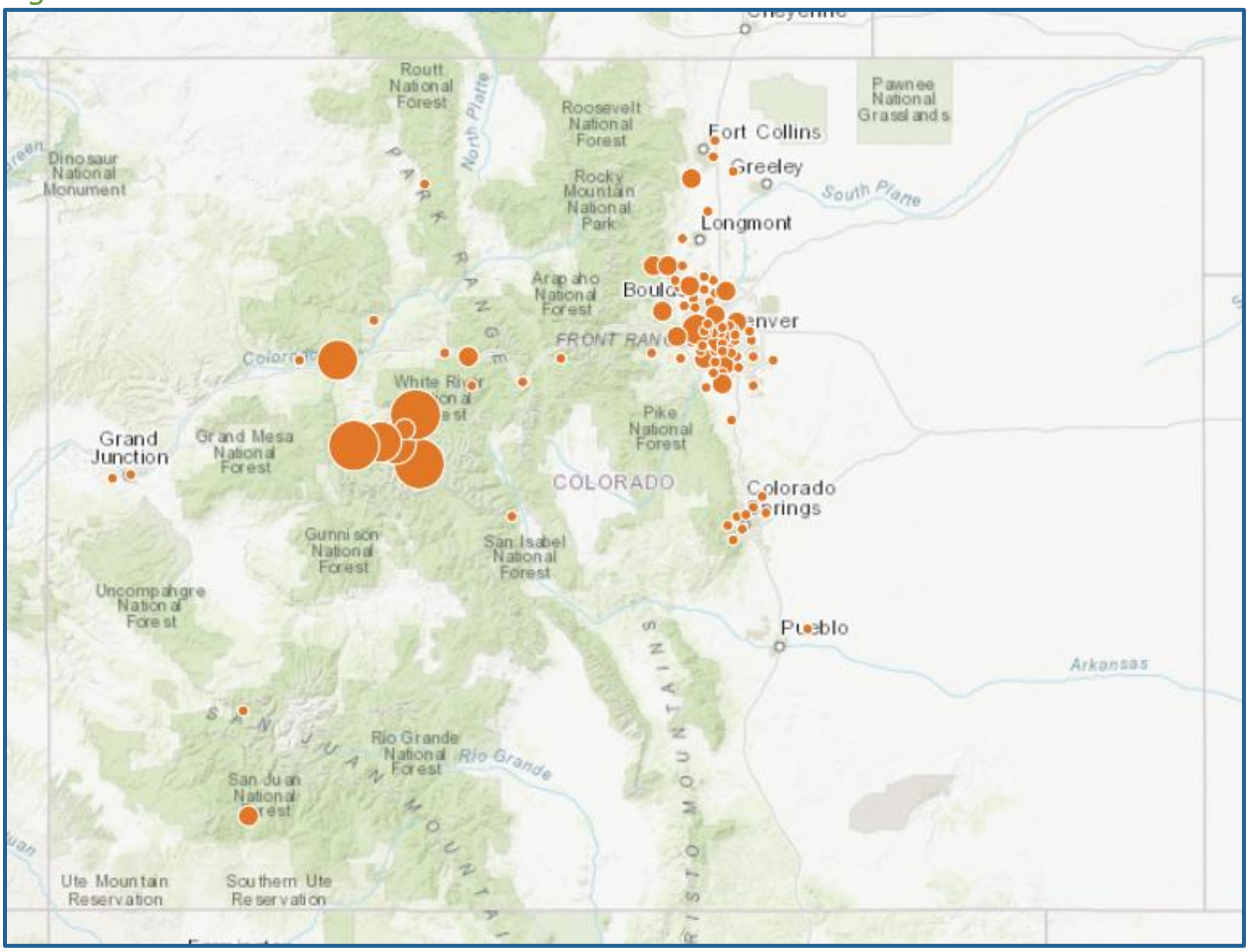


Figure 4 provides a snapshot of where the EVs that are charging at the City's stations are coming from within Colorado. The larger the size of the orange bubble on the map, the more EVs originated from that location. While most EVs are coming from the Roaring Fork Valley, a significant amount are also coming from the Front Range region. The City's charging stations have also recorded EVs from across the country, with most of those EVs originating in California, Washington, Arizona, Texas, and Florida.

EV-only Parking Spot. Photo by Jane Wilch.

Regional EV Registration Trends

EV ownership is on the rise across Colorado and the local, tri-county region is experiencing that trend as well. The trends in the growth of EV ownership, both battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), are available from county-specific vehicle registration data. The graphs below illustrate the increases in EV ownership of BEVs and PHEVs combined at the regional (Figure 5) and Pitkin County-specific (Figure 6) levels.

Figure 5

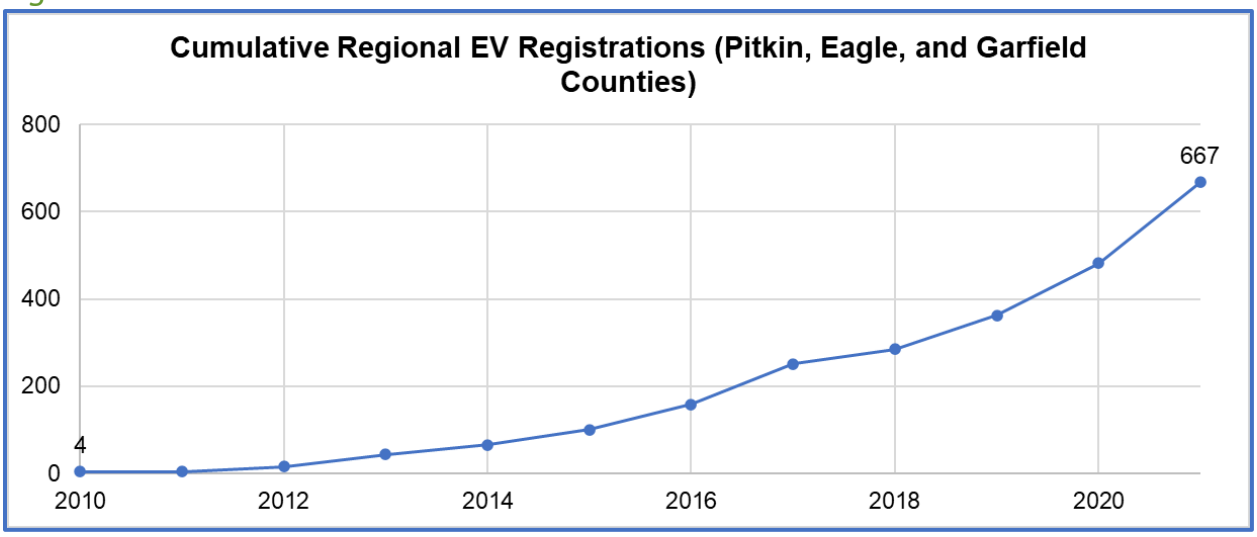
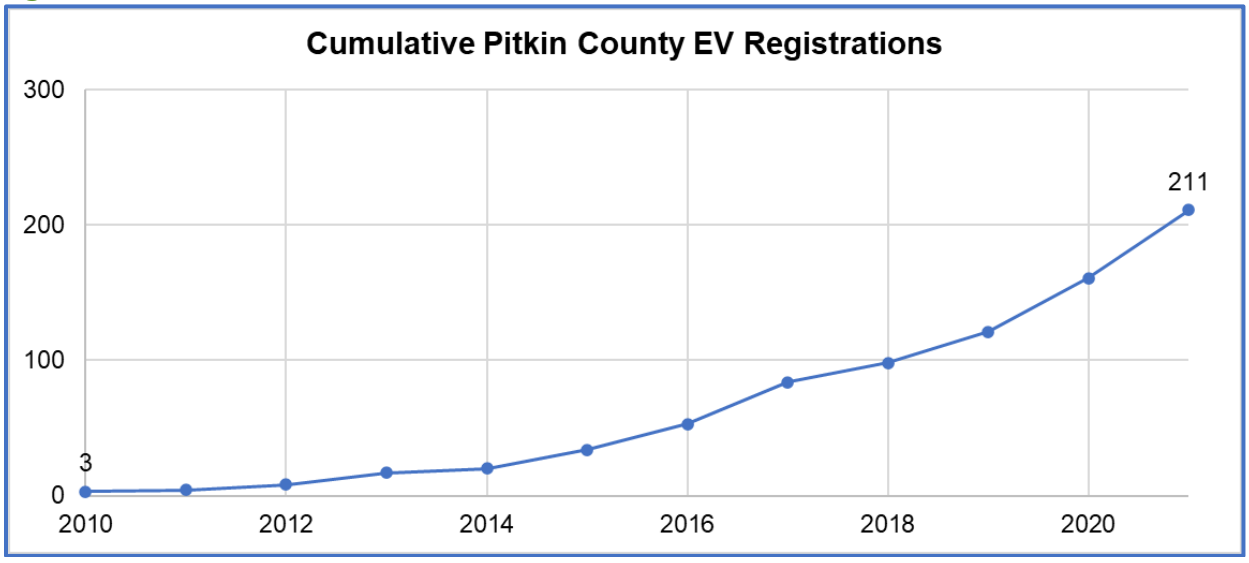


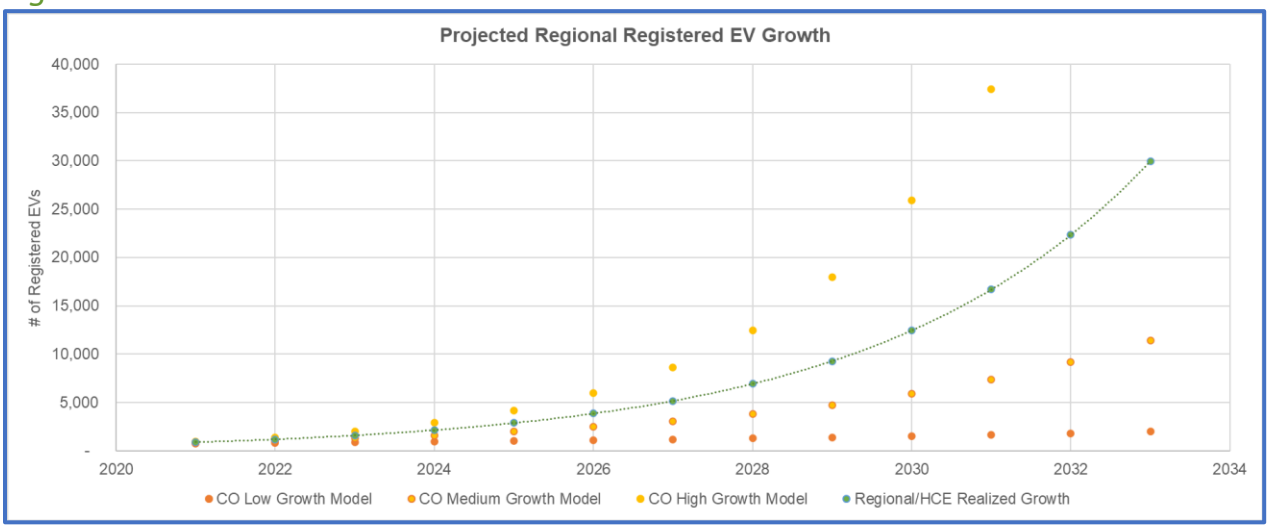
Figure 6



	Regional YOY EV Registration Growth	**Pitkin County-Specific YOY EV Registration Growth**
Since 2010	68%	50%
Past 5 Years	34%	33%

EV ownership has grown substantially in recent years and is expected to continue to increase. The State of Colorado set a goal of having 940,000 light duty EVs on the road by 2030, along with a series of growth projections for EV ownership in Colorado in coming years. Using this data and the historical growth in the local region, Holy Cross Energy (HCE) created their own projection for EV ownership in the local region. Both the State's and Holy Cross Energy's growth projections are highlighted below (Figure 7).

Figure 7



The State's Low Growth, Medium Growth, and High Growth Models assume a 9%, 24%, and 44% YOY growth rate, respectively. Holy Cross Energy's growth model for the local region assumes a 34% YOY growth rate. This level of anticipated growth is substantial. The local region currently has under 1,000 registered EVs, but under the Holy Cross Energy growth projection, it can be anticipated that there would be nearly 30,000 EVs registered in the local region by 2033**. That projection indicates that there would be 4,000 – 5,000 registered EVs in the local region by 2026**, which is the timeline for the longevity of the action items and responsibility outlines listed in this Masterplan. Stakeholders recognized the need to continue advancing Aspen's EV charging infrastructure at a pace that is close to projected EV ownership growth. This pace is generally reflected in the action items and responsibility outlines put forth in this Masterplan.

Charging Station Cost Estimates

Overview of Costs

The costs associated with installing new EV charging stations can vary significantly depending on the station type and the proximity of the station to an appropriate electrical source. Below is an overview of the average costs that the City and other regional partners have incurred when installing new charging stations. These costs encompass the equipment, labor, and permits/fees required to install charging stations. Attachment D in the Appendix contains a more detailed breakdown of the costs to install new charging stations.

	Average Cost to Install	Average Cost to Install with ECI
Level 2	$22,918	$29,918
DCFC	$61,416	$76,416

Cost Variables

Electric Community Investment Fee (ECI)

One variable cost when installing a new EV charging station is whether or not the station incurs an Aspen Electric Utility ECI fee. This fee will apply when an electrical panel service upgrade is required to put in a new charging station. Not every charging station installation will incur the ECI fee (for example, stations installed in a parking garage or associated with a large building may not require a panel upgrade). As such, the cost of installation with and without the ECI fee were separated in the table above. The ECI fee is also not a fixed rate and is dependent on the level of infrastructure upgrade required. For the sake of simplicity, the table above incorporates an actual ECI fee that was applied to a recent City charging station installation that required a relatively average infrastructure improvement.

Beneficial electrification, such as electric vehicle charging infrastructure, has impacts on the overall demand that the community places on the electric utility grid. Thus, it is a prudent policy for these new demands to be captured and accounted for with the ECI fee. This allows the Aspen Electric Utility to account for incremental increases in demand and upgrade the supporting infrastructure accordingly.

Labor and Materials

Another variable cost is that of excavation labor and materials. The cost of excavation rises as the distance between a charging station and the electric transformer grows. A general rule of thumb that can be used to estimate future excavation costs is: $100/foot of trenching distance.

Equipment

The significant difference between the cost to install a Level 2 charging station and a DCFC station can primarily be attributed to the cost of the unit itself and the station's associated warranty cost. DCFC units (approximately $30,400 - $34,700) can be seven times more expensive than their Level 2 counterparts (approximately $4,900 - $5,300), while warranties follow a similar cost structure wherein costs are three times higher for DCFC stations compared to Level 2 stations (approximately $6,800 vs. $2,200).

Appendix

Attachment A: Stakeholder Group

Project Manager
Seamus Crowley, Project Analyst, City of Aspen Climate Action Office

Project Management Support
Laura Armstrong, Sustainability Programs Administrator, City of Aspen Climate Action Office
Ashley Perl, Climate Action Manager, City of Aspen Climate Action Office

Primary Stakeholders
Chris Bilby, Research and Program Engineer, Holy Cross Energy
Tyler Christoff, Director of Utilities, City of Aspen Utilities
Ron Christian, Electric Superintendent, City of Aspen Utilities
Jack Danneberg, Project Manager, City of Aspen Engineering
Justin Forman, Field Operations Manager, City of Aspen Utilities
Bridgette Kelly, GIS Program Manager, City of Aspen Engineering
John Kreuger, Director of Transportation, City of Aspen Transportation
Stefan Johnson, Transportation Program Manager, CLEER & ReCharge Colorado Coach
Willy McFarlin, Assistant Street Superintendent, City of Aspen Streets
Mitch Osur, Director of Parking and Downtown Services, City of Aspen Parking
Pete Rice, Division Manager, City of Aspen Engineering
Andy Rossello, Utilities Engineer, City of Aspen Utilities
Jeffrey Winter, Transportation Technician, City of Aspen Transportation
Josh Zeeb, GIS Analyst, City of Aspen Engineering

External Partners who Provided Discrete Input
Ryland French, Director of Facility Operations and Energy, Aspen Skiing Company
David Pesnichak, Regional Transportation Administrator, Pitkin County EOTC
Jason White, Assistant Planner, RFTA

Attachment B: Charging Station Siting Criteria

The Recommended Site List was developed using the following process:

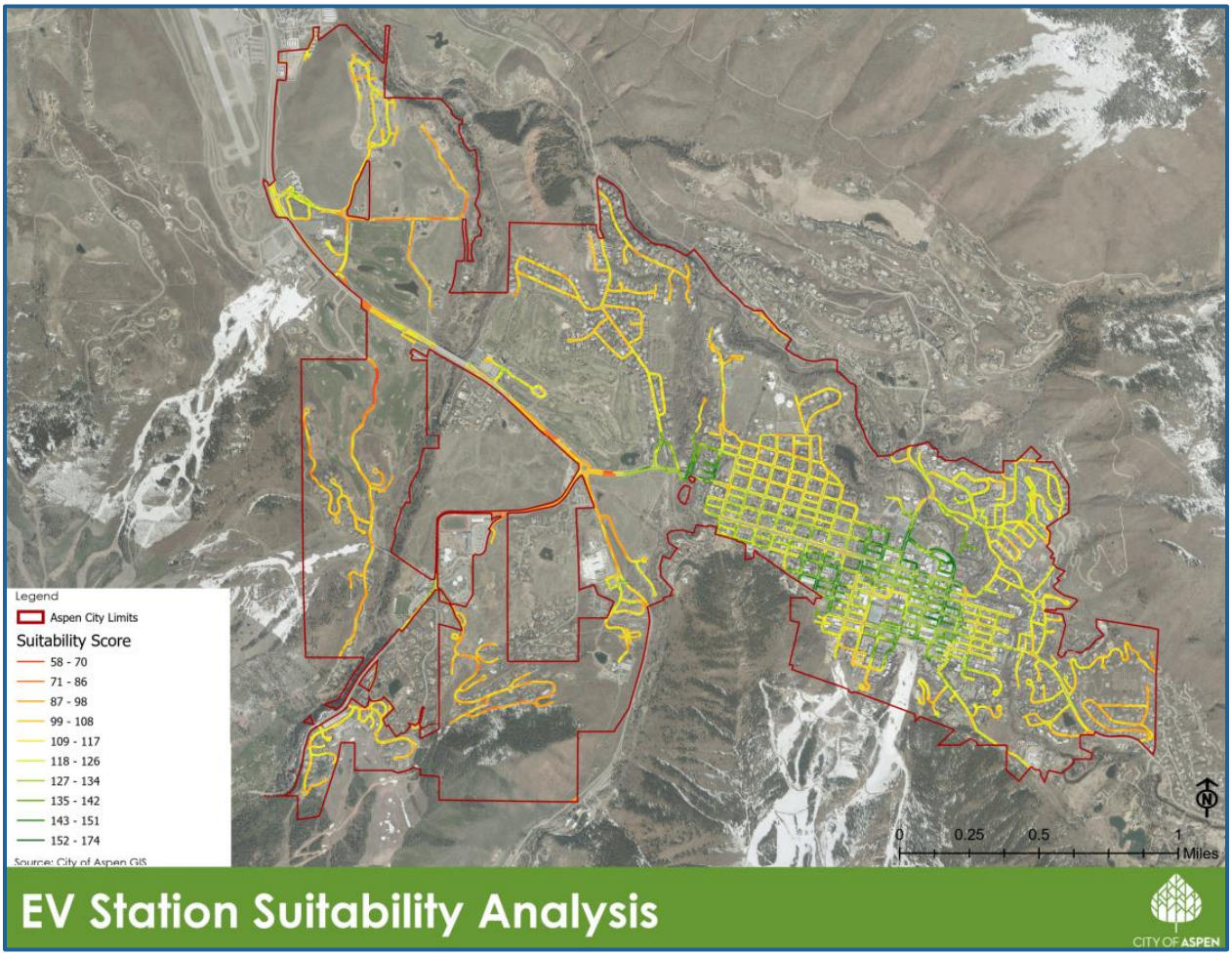
1. A weighted siting scoring criteria was developed by stakeholders. Stakeholders determined what constitutes a good charging station location and then each applied a weight of 1 – 5 (1 being the least important and 5 being the most important) to each criterion. An average weight for each criterion was then created. A list of all criteria and the associated weights assigned to the criteria can be found at the bottom of this attachment.
2. Stakeholders assigned metrics for the scoring of the quantitative criteria based on the following scoring scale:
    - 5: Site meets criteria extremely well
    - 4: Site meets criteria well
    - 3: Site meets criteria
    - 2: Site could meet criteria with effort
    - 1: Site will not meet criteria
3. Stakeholders shared locations that they believed would be well suited for new charging stations. Community members' suggested locations for new charging stations were included in this list as well.
4. City GIS staff analyzed the assigned scores, in conjunction with the weights assigned to the criteria, and identified the top scoring sites, which make up the Recommended Site List. City GIS staff also created a "heatmap" of the best potential areas for new charging stations using the weighted siting criteria and scores assigned to quantitative criteria, which can be found in Attachment C.

The qualitative weighted criteria, as listed below, were not included in the analysis to develop the Recommended Site List because of the subjective nature of these criteria. It was not feasible to assess sites for these qualitative criteria without knowing the exact location of a potential new charging station and evaluating that location in person. The qualitative weighted criteria should be used when comparing potential installation sites in the future to determine the best location for a given charging station.

Criteria Weight (1-5 range)	**Siting Criteria**
	Quantitative Criteria
4.6	Close proximity to suitable electrical point of connection (transformer)
4.3	Electrical connection (transformer) has sufficient capacity for a charging station
4.0	Suitability to maintain safe sidewalk passage
3.7	Potential to utilize/partner with projects that involve excavation to reduce costs of installation
3.6	Suitable for a block of multiple chargers
3.1	Proximity to connection points for other modes of transportation

3.0	Proximity to multi-family housing
2.9	Not located in the downtown core (to avoid cars parking in tow away zones overnight)
2.6	Suitable for workplace charging (proximity to commercial spaces)
2.5	Proximity to APCHA workforce housing
	Qualitative Criteria
4.0	Site Safety (includes lighting, snow removal, ease of access)
3.9	Potential to be compliant with zoning and ROW requirements at the time of installation
3.8	Minimal trenching required through paved areas (low asphalt and curb costs)
3.5	Americans with Disabilities Act (ADA) accessibility compliance potential
3.4	Highly visible (to incentivize and educate others)
3.2	Proximity to desirable locations and services

Attachment C: Charging Station Siting "Heatmap"



An interactive version of this "heatmap" will be made available to City staff during the implementation of this Masterplan. City staff can use this tool to plan the siting of new charging stations more strategically. The "heatmap" provides information on site suitability with a level of specificity that is more refined than one city block.

Attachment D: Detailed Charging Station Installation Costs

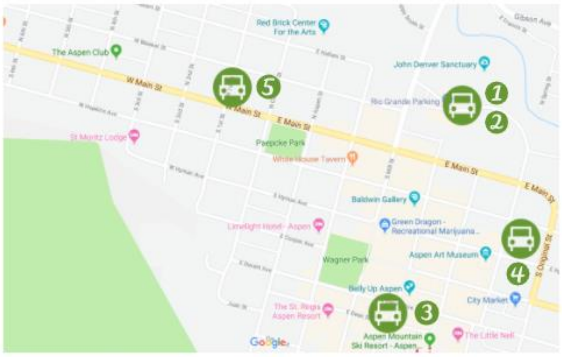
Level 2 Estimate							
Station		**Permits/Fees**		**Installation**		**TOTAL**	**TOTAL with ECI**
Level 2 Charger	$4,903	Electrical Permit	$200	Electrical Labor + Materials	$3,500	**$22,918**	**$29,918**
Activation + Validation	$0	ROW + Permanent Encroachment	$950	Excavation Labor + Materials	$9,000		
Network	$2,132			Signage	$50		
Warranty	$2,183						
Sum	**$9,218**	**Sum**	**$1,150**	**Sum**	**$12,550**		
DCFC Estimate							
Station		**Permits /Fees**		**Installation**		**TOTAL**	**TOTAL with ECI**
DCFC Charger	$34,680	Electrical Permit	$300	Electrical Labor + Materials	$6,000	**$61,416**	**$76,416**
Activation + Validation	$0	ROW + Permanent Encroachment	$950	Excavation Labor + Materials	$9,000		
Network	$3,655			Signage	$50		
Warranty	$6,781						
Sum	**$45,116**	**Sum**	**$1,250**	**Sum**	**$15,050**		

Note: Activation and validation costs have typically been free to the City of Aspen through its purchasing agreements with National Car Charging. If the City changes its charging station provider, this service may no longer be free and could cost approximately $1,000 per station.

Attachment E: Existing City EV Charging Stations Map

PUBLIC EV CHARGING STATION LOCATIONS

1. Rio Grande Garage: One fast charging station (1 plug)
2. Rio Grande Garage: Three charging stations (6 plugs)
3. 528 S Galena St: One fast charging station (1 plug)
4. 208 S Spring St: One charging station (2 plugs)
5. 208 E Main St: One charging station (2 plugs)



Note: 12 out of the 14 charging plugs in the City's inventory are listed in the map here. The additional two plugs are located at the Brush Creek Park and Ride lot.

Attachment F: EV Charging Infrastructure Basics

There are three types of charging stations, or plugs, that EVs can use to charge. Descriptions of the basic characteristics of the different types of charging are listed below:

Level 1

- Power Required: standard, 120 Volt (V) wall outlet
- Charging Speed: 5 miles of charge per hour, 20 hours to reach a full charge
- Typical Use: home charging or infrequently used fleet vehicles (entails plugging into a three pronged outlet and does not require installation of a charging station)

Level 2

- Power Required: 240V outlet
- Charging Speed:10-20 miles of charge per hour, 2-5 hours to reach full charge
- Typical Use: home charging, public parking, workplace charging

Level 3 or DCFC

- Power Required: 480V current
- Charging Speed: 60-80 miles of charge per 20 minutes
- Typical Use: transportation corridor charging, public parking, short-term commercial parking