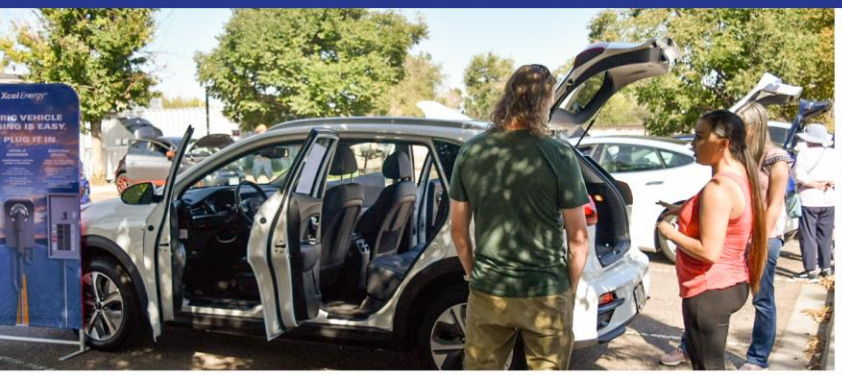
City of Lafayette

An Electric Vehicle Action Plan for

City of Lafayette

February 2023



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ACKNOWLEDGEMENTS

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

The content of this plan is derived from a series of planning workshops hosted by Xcel Energy's Partners in Energy. Xcel Energy is the main electric utility serving the City of Lafayette. Partners in Energy is a two-year collaboration to develop and implement a community's energy goals. In 2019, Partners in Energy launched an EV-specific planning process to help communities develop plans to meet their EV goals.

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This EV Plan was funded by and developed in collaboration with Xcel Energy's Partners in Energy. Partners in Energy shall not be responsible for any content, analysis, or results if the City of Lafayette has made modifications to the plan.

TABLE OF CONTENTS

ACRONYMS

Acronym	Term
BEV	Battery Electric Vehicle
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
EVSI	Electric Vehicle Supply Infrastructure
GHG	Greenhouse Gas
HEV	Hybrid Electric Vehicle
ICE	Internal Combustion Engine
$MTCO_2e$	Metric Tons of Carbon Dioxide Equivalent
PHEV/PEV	Plug-In Hybrid Electric Vehicle

City of Lafayette
Electric Vehicle Action Plan

About this Plan

The City of Lafayette understands that widespread fleet electrification is around the corner, and will intentionally plan for the necessary related infrastructure, vehicle, and policy adjustments. By planning ahead and acting with urgency, the City can ensure the transition to electric vehicles (EVs) is completed in a fiscally responsible manner by taking advantage of available resources from Xcel Energy, the State of Colorado, and federal funding. The transition to EVs will not only save the City money on fuel and vehicle maintenance but will also uphold the City's commitment to environmental stewardship. Throughout this transition, the City hopes that leading by example will encourage businesses and residents in Lafayette to transition to EVs by magnifying the positive impact on local air quality and greenhouse gas emissions (GHGs).

EV Vision and Goals

The intent of this plan is to support the larger regional EV efforts and support the vision outlined in the Regional Transportation Electrification Plan for Boulder County Communities (below). The City will lead the way by electrifying its fleet vehicles and demonstrating EV benefits to the broader community.

Boulder County communities will work with regional partners to implement solutions that support the large-scale and equitable transition to zero emission vehicles.

Working together, the team set near-term and long-term goals to measure plan success:

- By 2025, the City will pilot two vehicle consolidation projects and order 5 hybrid electric vehicles (HEVs) and 10 battery electric vehicles (BEVs) to replace current internal combustion engine (ICE) vehicles, reducing fleet emissions by 5%.
- By 2030, the City will transition 30% of the fleet to BEVs or HEVs[1] to align with Boulder County's GoEV resolution goal, reducing fleet GHG emissions by 18%
- Stretch Goal: Electrify 100% of the City fleet by 2050.

[1] A total of 15 vehicles, not including any impacts of City fleet growth or fleet consolidation efforts.

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Strategies

To achieve our fleet electrification goals, the following short-term strategies were identified to be implemented between now and 2025. The impact of these goals will be reviewed to identify goals to continue our fleet electrification goals.

	Strategy	Desired Outcomes
 INFRASTRUCTURE	Strategy I.1: Develop an Inventory of Charging Needs and Implement Findings	• 1 long-term charging needs assessment complete by 2024 • 5 EV charging ports installed by 2025 to support new BEVs
	Strategy I.2: Develop a Time-of-Use Charging Plan	1 EV charging controls program installed by 2025
	Strategy I.3: Determine Spatial Needs of Chargers	Spatial needs assessment for 5 EV charging ports by 2024
	Strategy I.3: Determine Spatial Needs of Chargers	• 1 EV charging policy for City owned chargers by 2025 • Signage installed at all EV charging ports by 2025
 VEHICLES	Strategy V.1: Identify Opportunities to Consolidate	2 vehicle consolidation pilots implemented by 2025
	Strategy V.2: Vehicle Replacement Decision Tree	1 vehicle replacement decision tree complete by end of Q3 2023
	Strategy V.3: Purchase Electric Fleet Vehicles	5 BEVs and 10 HEVs integrated into City fleet by 2025
 STAFF TRAINING	Strategy T.1: Educate Current City Staff on EV Driving and Care	Develop 3 EV training videos for employees by 2025
	Strategy T.2: Develop EV Training for New Employee Orientation	Incorporate training videos into training for new employees by 2025
	Strategy T.3: Identify EV Training Program for Fleet Maintenance Staff.	All fleet maintenance staff attend 1 EV training by 2025

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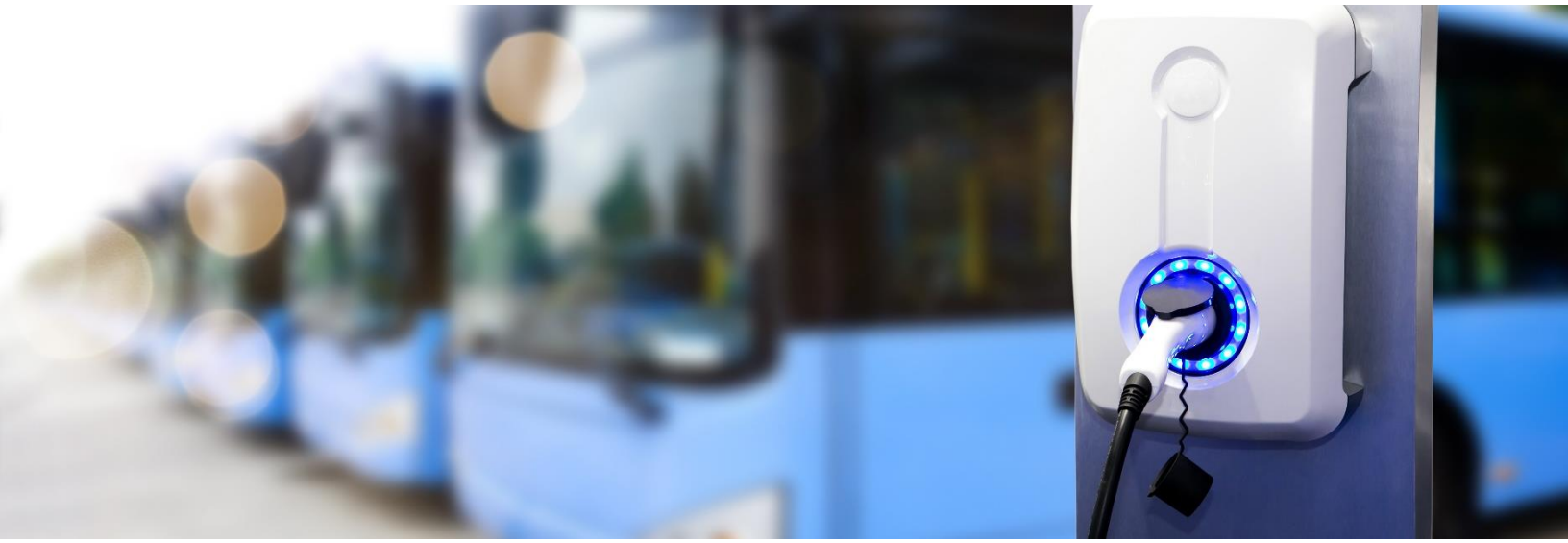
INTRODUCTION



The City of Lafayette (the City) chose to engage with Xcel Energy to build a roadmap for the electrification of its City fleet in 2022. The City understands that widespread fleet electrification is around the corner and will therefore intentionally plan for the necessary infrastructure, vehicle, and policy adjustments. By planning ahead and acting with urgency, the City can ensure the transition to electric vehicles (EVs) is completed in a fiscally responsible manner by taking advantage of available resources from Xcel Energy, the State of Colorado, and federal funding. The transition to EVs will not only save the City money on fuel and vehicle maintenance but will also uphold the City's commitment to environmental stewardship. Throughout this transition, the City hopes that leading by example will encourage businesses and residents in Lafayette to transition to EVs, increasing the positive impact on local air quality and greenhouse gas emissions.

CITY OF LAFAYETTE SUSTAINABILITY PLAN VISION

Through community-wide sustainable actions, Lafayette is committed to being a leader in social, economic, and environmental responsibility.

What Is an EV Action Plan?

This EV Action Plan is a roadmap to strategically guide the City of Lafayette's action in a manner that supports strategic municipal fleet electrification so the City can lead the way in community transportation electrification initiatives.

The EV goals and strategies outlined in this plan were developed collaboratively with a stakeholder team (EV Action Team) through two planning workshops conducted in August 2022 and January 2023. Since successful deployment of many EV strategies relies on collaboration between the City and Xcel Energy, representatives from both

organizations were included, as well as a representative from Drive Clean Colorado. The City of Lafayette's internal steering committee included representatives from municipal fleets, facilities, planning, and sustainability departments. Members coordinated throughout the process to share information and identify potential opportunities for partnership during implementation.

The City of Lafayette joined more than 35 other Colorado communities that have developed EV and Energy Action Plans through Xcel Energy's Partners in Energy, an offering that provides resources for community energy planning. Partners in Energy also supports 18 months of plan implementation in the form of marketing and communications, data tracking and analysis, program expertise, and project management.

The components of City of Lafayette's EV Plan are detailed below:

Error! Reference source not found. A look at City of Lafayette's motivations for d eveloping an EV Action Plan.

Where Are We Now Outlines the relevant characteristics of the City of Lafayette's electric vehicle landscape.

Where We Are Going Describes the City of Lafayette's EV vision and goals through a planning horizon of 2025.

How We Are Going To Get There Identifies focus areas and strategies to achieve the defined goals, along with targets and metrics that quantify success in each focus area.

How We Stay On Course Outlines how the City will track progress toward targets, goals, and vision, and how it will adapt to a changing landscape during the coming 2-year implementation period.

Appendices Provide additional information about the planning process, next steps, EV basics, and current Xcel Energy Programs.

Why an EV Action Plan?

This EV plan is one of several initiatives by City staff to promote sustainability throughout municipal operations. Some of the main motivations for promoting EVs in the community are shown below.

Lower Fuel and Maintenance Costs

While cost savings vary based on vehicle type, driving patterns, and geographic region, the average driver spends about half as much money in maintenance costs by driving an EV compared to traditional ICE vehicles, as shown in Table 1. Over its lifetime, an EV tends to cost 50% less to own and operate as compared to its ICE counterpart (US DOE, 2019). Though the used EV market is still developing, the gap between upfront costs for EVs and ICE vehicles is already decreasing as batteries become more cost-efficient.

Table 1: Estimated maintenance costs per mile from Consumer Reports data (Harto, 2020)

Powertrain Type	0-50k miles	50-100k Miles	100-200k Miles	Lifetime Average
Battery Electric Vehicle	$0.012	$0.028	$0.043	$0.031
Plug-in Hybrid Electric Vehicle	$0.021	$0.031	$0.033	$0.030
Internal Combustion Engine Vehicle	$0.028	$0.060	$0.079	$0.061

Energy Independence and Cost Stability

Over 65% of the petroleum imported to the US in 2018 was used for transportation fuel. Transitioning to EVs shifts the fuel source to more domestically available sources such as coal, nuclear, natural gas, and renewable energy. Integration of EVs is an important strategy for reducing dependence on fuel imports and also isolating transportation costs from the volatile petroleum market (Office of Energy Efficiency and Renewable Energy, 2018). Figure 1 illustrates the fluctuations in gasoline and diesel prices compared to electricity prices from 2012 to 2022. By converting fleet vehicles to EVs, the City can help reduce fuel costs and protect the fleet budget from price fluctuations.

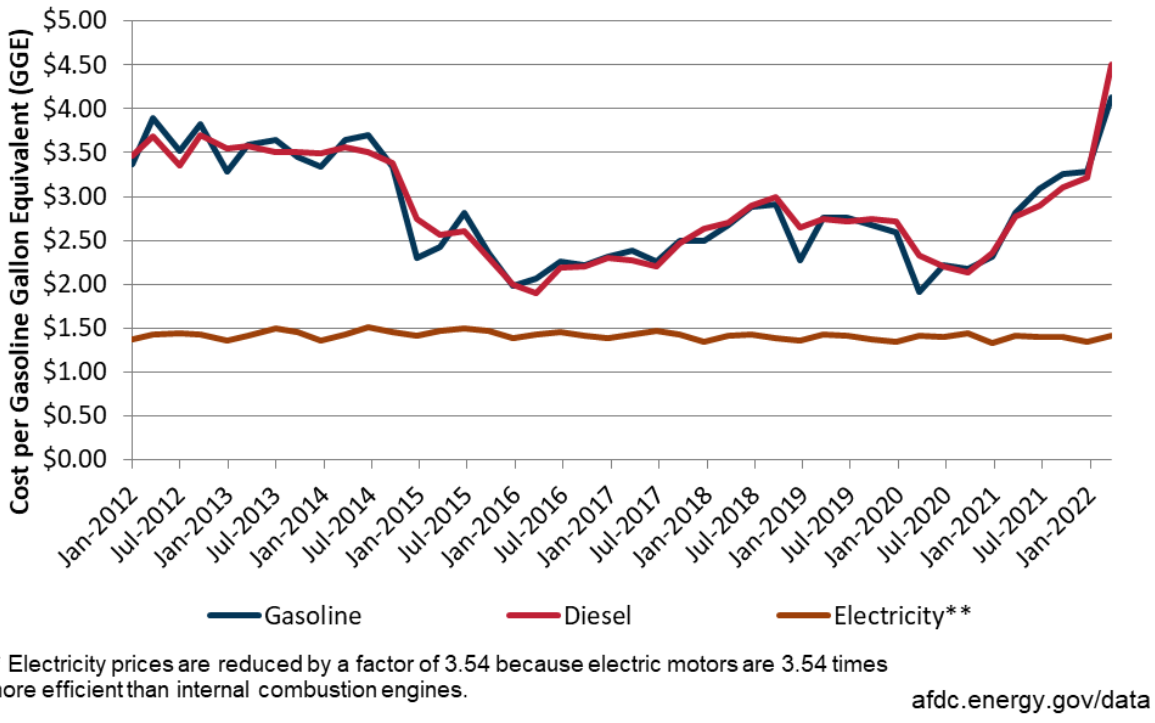


Figure 1. US Average Retail Fuel Prices. Adapted from: (Office of Energy Efficiency and Renewable Energy, 2022)

Greenhouse Gas Emissions

On December 12, 2015, at the United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement was reached to "combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future" (UNFCCC, 2019). In support of this effort, the Intergovernmental Panel on Climate Change (IPCC) published a report in 2018 identifying potential solutions to keep global temperature change below 1.5°C and the vital role that cities have in the urban transition. Among other strategies, the IPCC states that "the transport sector must reduce its final energy use by 30% and must supply the majority of energy with low carbon fuels like electricity, hydrogen, and biofuel by 2050 in order to limit global warming to less than 1.5°C and mitigate the worst impacts of climate change" (IPCC, 2018). In 2016, transportation emissions accounted for 31% of the total Scope 1 & 2 emissions for Boulder County, as shown in Figure 2, so transportation electrification is a key strategy for regional greenhouse gas (GHG) emissions reduction. EV adoption should be paired with other transportation strategies such as convenient and reliable public transportation, safe active transportation options, and smart development patterns for a holistic low carbon transportation future.

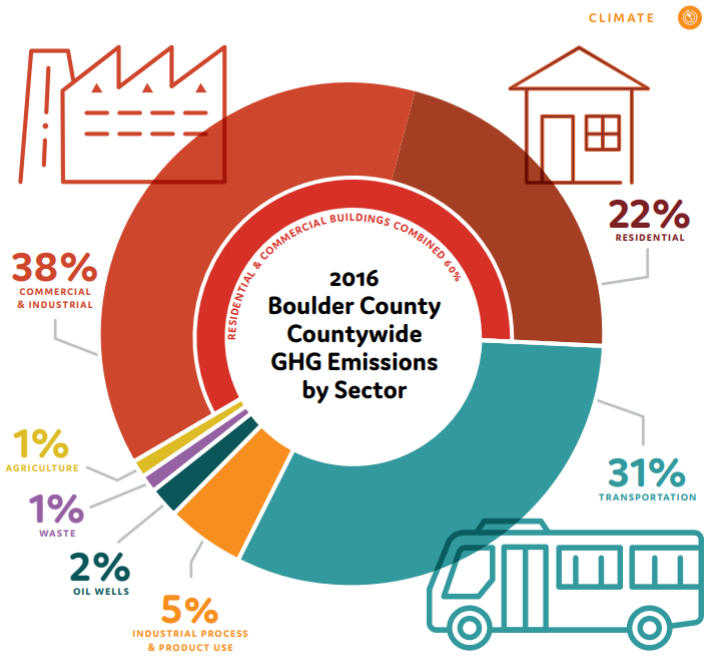


Figure 2: Boulder County 2016 GHG Emissions by Sector (Boulder County Office of Sustainability, Climate Action & Resilience, 2018)

The City of Lafayette has aspirational GHG reduction goals for achieving an 80% reduction in GHG emissions by 2050, as well as 100% renewable energy by 2030. Transportation electrification is a vital component in achieving this goal.

Xcel Energy Carbon-Free Electricity

Transportation electrification has the potential to significantly reduce greenhouse gas (GHG) emissions. In 2021, 39% of Xcel Energy's Colorado electricity supply was generated from carbon-free sources, as shown in Figure 3, and that percentage is increasing (Xcel Energy, 2021). Research by the Union of Concerned Scientists showed that even in 2015, in every U.S. state, EVs resulted in lower lifecycle GHG emissions than did new gas- and diesel-powered vehicles (Union of Concerned Scientists, 2015). Xcel Energy's Carbon Reduction Plan establishes a commitment to reduce carbon emissions

from electricity supplied to Colorado by 85% from 2005 levels by 2030, supplying 80% of electricity from carbon-free sources. This is anticipated to cut nearly 5 million tons of carbon emissions across 1.5 million electric vehicles (Xcel Energy, 2019).

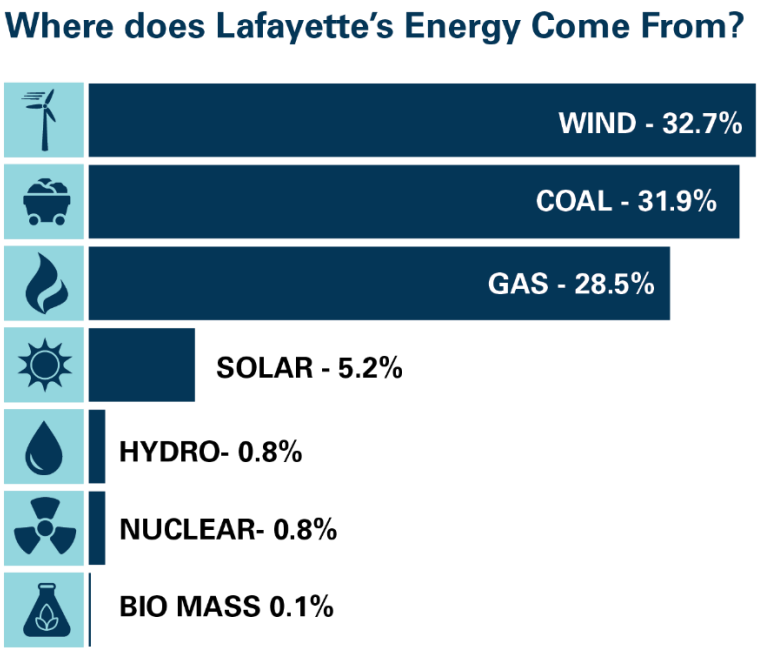


Figure 3: Lafayette's Energy Mix

Air Quality

Boulder County Air Quality

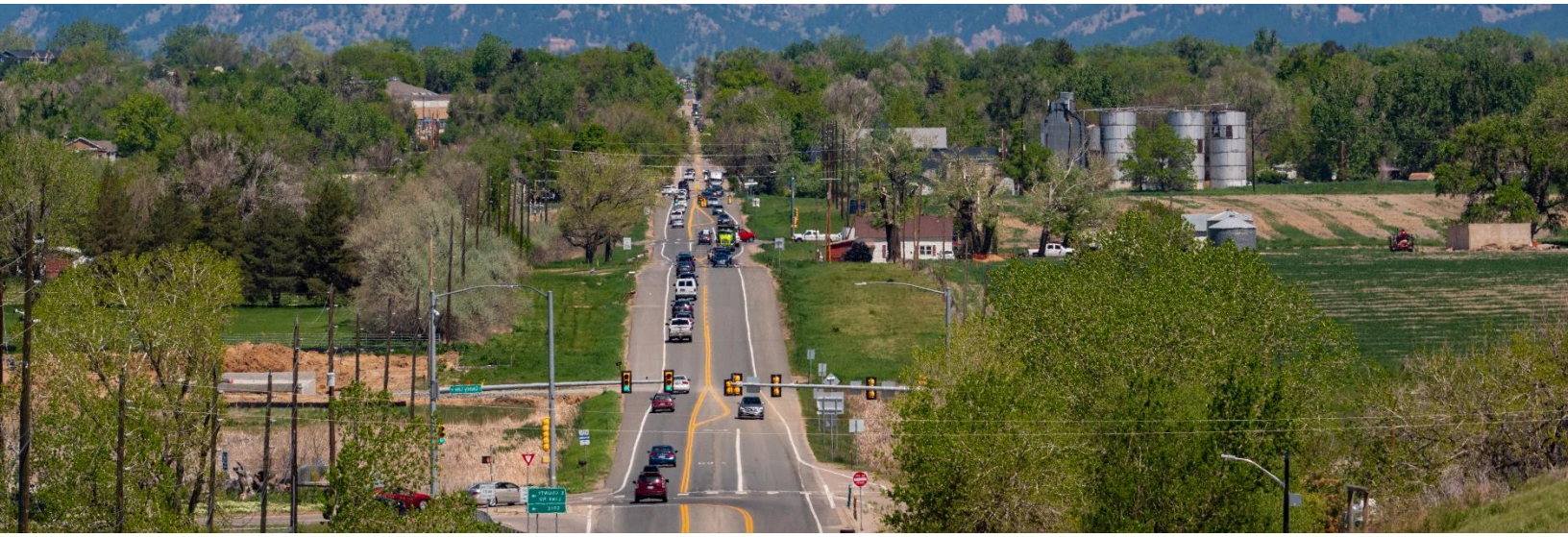
21

Days with AQI Index Exceeding 100 in 2020[1] (Earth Lab, 2021)

In addition to contributing a significant portion of the greenhouse gas emissions, the transportation sector also produces pollutants such as particulate matter (PM), nitrogen oxides (NOx), Carbon monoxide (CO), and volatile organic compounds (VOCs). Pollutants like NOx and VOCs contribute to ground-level ozone, which in addition to PM and CO are harmful to respiratory health. In general, EVs produce fewer pollutants as compared to their ICE counterparts (Office of Energy Efficiency & Renewable Energy, 2020). As the fuel mix for electricity continues to decarbonize, the magnitude of air quality benefits associated with electrifying transportation will increase. Boulder County is part of the Denver-Metro region that is rated moderate to severe for ozone non-attainment by the EPA. Ozone and particulate matter smaller than 2.5 microns ($PM_{2.5}$) contribute to a substantial number of days when the air is unhealthy for at least a portion of the population.

[1] Any air quality ranking over 100 means the air is unhealthy for sensitive groups including children, active adults, and people with respiratory disease; values over 150 are considered unhealthy for all groups.

WHERE WE ARE NOW



To better understand the opportunities for EV adoption in the City of Lafayette's municipal fleet, basic fleet data are outlined below. Factors such as vehicle location, class, and use patterns were analyzed to inform opportunities. More specific data is included in each focus area.

Fleet Vehicle Analysis

Lafayette's municipal fleet is comprised of 211 total assets, 62 of which are off-road vehicles. Of the 149 on-road vehicles, 141 are ICE vehicles, and 8 are hybrids. Of the on-road vehicles, 74% are light-duty, as shown in Figure 4, and all light-duty vehicles average less than 50 miles driven per day. There are many light-duty EV models available with battery range well above 50 miles, presenting significant opportunities for electrification.

Off-road vehicles may present opportunities for electrification as well, as some technology, such as electric lawn mowers, is already quite developed.

Medium- and heavy-duty vehicle technologies are somewhat less developed; the vehicles are more expensive to purchase and have lower ranges than smaller vehicles. As the technology progresses, there will be opportunities to integrate heavier duty EVs into Lafayette's fleet.

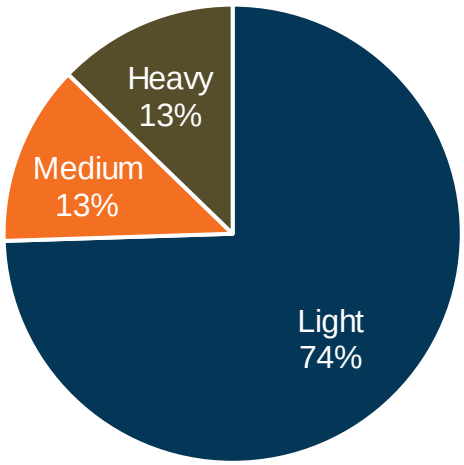


Figure 4: On-Road Vehicles by Vehicle Class

Vehicle Location

Vehicles are stored and used by departments at a variety of City facilities. The police station and service center have the most vehicles at single sites, demonstrating significant charging infrastructure needs if all those vehicles are electrified. Other facilities have comparatively small numbers of vehicles per site but will still need charging capacity in order to electrify those vehicles, as shown in Figure 5.

Figure 5: Number of Vehicles by Location[2]

[2] Note: not all vehicles analyzed had a specific associated facility. This figure represents only those vehicles that did have a specific associated facility.

Chargers

There are currently three chargers at City facilities: one at the Lafayette Public Library, one at City Hall, and one at the Bob L. Burger Recreation Center. These are currently public-facing chargers but could also be used for municipal fleet charging.

Related Planning Efforts

Below is a short summary of other planning efforts that have been reviewed in the development of this plan.

Lafayette Sustainability Plan 2021

The Lafayette Sustainability Plan 2021 is the culmination of a 20-month process, involving community engagement, research, and collaboration. As the City of Lafayette's first sustainability plan, it is a guiding framework for City leaders, staff, residents, businesses, and other community partners to build a culture of sustainability in Lafayette and achieve the City's sustainability goals.

Legacy Lafayette Comprehensive Plan

The City's comprehensive plan was adopted in 2021 and includes policies and strategies around sustainable infrastructure, including:

- Policy 7.3 (Development): The City will pursue sustainability in its provision of infrastructure, as outlined in the City's Sustainability Plan, including increased utilization of green energy, water conservation and reuse, and other infrastructure strategies to reduce Lafayette's carbon footprint.

Lafayette Multimodal Transportation Plan

The City of Lafayette is in the process of writing a Multimodal Transportation Plan, which will help address GHG emissions from transportation across the community.

Lafayette Building Code Update

The City of Lafayette is in the process of updating its building codes to align with the 2021 International Building Code. These code updates include requirements for EV-ready infrastructure in new construction. Municipal new construction aligns with the most current building codes, so all new municipal facilities will, at minimum, be EV-ready, including a percentage of parking stations with installed EV stations, EV-ready spaces, and EV-capable parking spaces.

Boulder County Communities Regional Transportation Electrification Plan

The Regional Transportation Electrification Plan for Boulder County Communities is a strategic plan to reduce GHG emissions in Boulder County through strategies in four focus areas:

- Community EV Adoption
- Public Charging
- Home and Work Charging
- Plans, Codes, and Policies

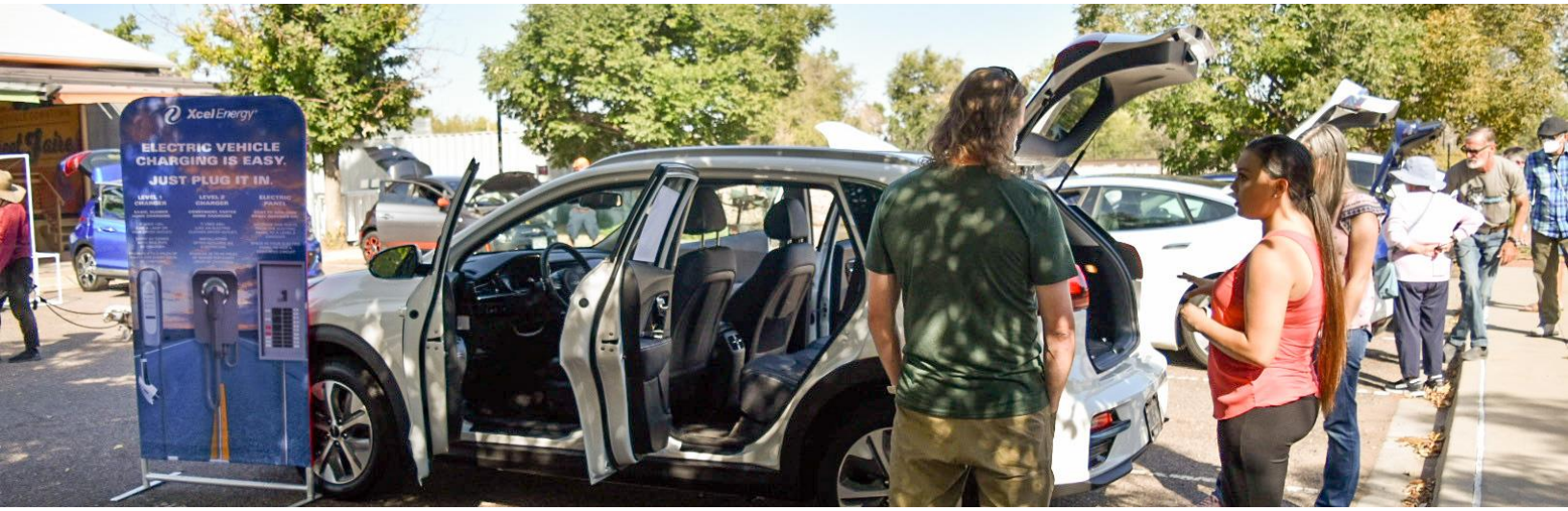
The City of Lafayette participated in the development of this regional plan and is currently an active participant in the Community Adoption and Public Charging implementation subgroups. This regional effort enables Boulder County communities, including Lafayette, to leverage resources and align on EV efforts that promote communitywide EV adoption efforts.

Colorado EV Plan 2020

The Colorado EV Plan 2020 is an update to the state's 2018 plan and sets clear EV goals and actions. The plan establishes a goal of 940,000 light-duty EVs by 2030 and a long-term vision of 100% electric light-duty vehicles and 100% zero emission medium-duty vehicles. Actions to reach the State's EV goal were identified in four focus areas:

1. **Policy, Planning and Guidance**: how the state and its partners will set the stage by developing and supporting policy, guidance, and planning to electrify the transportation sector
2. **Programming and Funding**: steps the state will take to tackle adoption barriers, providing funding and programming to address market gaps
3. **Supporting Emerging EV Technology and Innovation**: how the state will connect its activities with those of Colorado research collaboratives to support transportation electrification innovation, foster emerging EV technology development, and identify data gaps
4. **Engaging People**: approaches to communicating and educating the people of Colorado on the benefits of transportation electrification and how they can access these benefits

WHERE WE ARE GOING



Our Vision Statement

During the planning process, the EV Action Team decided that the intent of this plan is to support the larger regional EV efforts and support the vision outlined in the Regional Transportation Electrification Plan for Boulder County Communities. Lafayette will lead the way by electrifying its fleet vehicles and demonstrating EV benefits to the broader community.

Boulder County communities will work with regional partners to implement solutions that support the large-scale and equitable transition to zero emission vehicles.

EV Action Plan Goals

Working together, the team set near-term and long-term goals to measure plan success:

1. By 2025, the City will pilot two vehicle consolidation projects and order 5 HEVs and 10 BEVs to replace current ICE vehicles, reducing fleet emissions by 5%.
2. By 2030, the City will transition 30% of its fleet to BEVs or HEVs[3], to align with Boulder County's GoEV resolution goal[4] of reducing fleet GHG emissions by 18%[5].
3. By 2050, 100% EV stretch goal.

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[3] A total of 15 vehicles, not including any impacts of City fleet growth or fleet consolidation efforts.
[4] Boulder County GoEV Goal: Working with the entire Boulder County community on programs, policies, incentives, and regulatory approaches to transition 30 percent of all vehicles within the county to zero emissions by 2030, and 100 percent of all vehicles to zero emissions by 2050. (Fryar, 2018)
[5] Assuming vehicles are charged using expected Xcel Energy electricity grid mix. Savings will be higher if renewable energy is purchased for vehicle charging.

Focus Areas

The EV Action Team decided to focus internally on electrifying the City fleet before launching external EV outreach action. The team identified the following focus areas to prioritize strategies and resources.

Infrastructure: Install the necessary electrical infrastructure and charging stations to support fleet electrification.

Vehicles: Transition vehicles used by City staff to no- or low-emissions vehicles.

Employee Training: Ensure that all vehicle operators and maintenance staff feel comfortable using, charging, and maintaining electric vehicles.

These focus areas were chosen to help the City lead the way in the regional-scale and equitable transition to zero emissions vehicles. For each focus area, strategies were identified for short term implementation designed to help the City meet its 2025 goal and to be supported through the Partners in Energy implementation support. To help the City plan for these strategies, the estimated financial costs and staff time commitments for each strategy is included based on the key below. A summary of all strategy resource requirements can be found in **How We Stay On Course**.

Resource Table Icon Key

Implementation Costs	
$	From existing budget
$$	Requires a budget request
$$$	Will required an RFP ($25k and up)

Staff Time Required	
	Within current responsibilities
	Requires shifting tasks
	Additional staff required

HOW WE ARE GOING TO GET THERE

For each focus area, a thorough analysis of baseline conditions was completed. Based on this analysis, the EV Action Team identified targets and metrics to help evaluate success within the focus area. The EV Action Team then identified potential barriers to success and developed strategies to overcome those barriers.

The following sections detail the baseline data, potential barriers, identified targets, and strategies selected to achieve those targets for each focus area. Collectively, each focus area serves as a work plan of actionable steps to achieve the City of Lafayette's EV Action Plan overarching vision. A summary of each focus area and strategies included is below.

Strategies by Focus Area

Focus Area	Strategy
Infrastructure	Strategy I.1: Develop an Inventory of Charging Needs and Implement Findings
	Strategy I.2: Develop a Time-of-Use Charging Plan
	Strategy I.3: Determine Spatial Needs of Chargers
	Strategy I.4: Establish and Enforce Parking Rules
Vehicles	Strategy V.1: Identify Opportunities to Consolidate
	Strategy V.2: Vehicle Replacement Decision Tree
	Strategy V.3: Purchase Electric Fleet Vehicles
Employee Training	Strategy T.1: Educate Current City Staff on EV Driving and Care
	Strategy T.2: Develop EV Training for New Employee
	Strategy T.3: Identify EV Training Program for Fleet Maintenance Staff

Infrastructure

Infrastructure is an area of significant importance when transitioning Lafayette's fleet to EVs. This focus area includes what the current municipal EV charger landscape looks like in Lafayette, a target for installation of the necessary infrastructure to support fleet electrification, and strategies to help achieve the target.

Background Data

The City of Lafayette currently owns and operates three Level II EV chargers: one at the library, one at City Hall, and one at the recreation center. Electrical capacity across all facilities is constrained and may require upgrades to support charging capacity needs. The City is currently undergoing a study to understand electrical capacity to inform infrastructure plans.

Code Update:

Lafayette is undergoing a code update process that includes adopting EV-Ready amendments that apply to municipal buildings, requiring a percentage of spaces with installed EV stations, EV-ready spaces, and EV-capable parking spaces. As such, code updates are not within the scope of this plan.

Strategies

The following strategies were identified as short-term opportunities to install EV charging infrastructure to support fleet electrification. An overview of the implementation timeline is shown in Table 2. More details on the strategy implementation action plans can be found by strategy below; a detailed work plan of all short-term strategies can be found in the **How We Stay On Course** section.

Table 2: Infrastructure strategies work plan

Strategy	Q2 2023	Q3 2023	Q4 2023	Q1 2024	Q2 2024	Q3 2024
Strategy I.1: Develop an Inventory of Charging Needs and Implement Findings						
Strategy I.2: Develop a Time-of-Use Charging Plan						
Strategy I.3: Determine Spatial Needs of Chargers						
Strategy I.4: Establish and Enforce Parking Rules						

Strategy I.1: Develop an Inventory of Charging Needs and Implement Findings

Use data about current fleet vehicle use to identify potential siting for EV charging stations and implement findings, in phases, to support new EVs.

STRATEGY LEAD	Elizabeth Szorad, Sustainability Manager
DESIRED OUTCOMES	• 1 long-term charging needs assessment complete by 2024. • 5 EV charging ports installed by 2025 to support new BEVs.
REQUIRED RESOURCES	Staff time  Budget **$$$**
AVAILABLE FUNDING	• Xcel Energy Electric Vehicle Supply Infrastructure (EVSI) and Electric Vehicle Supply Equipment (EVSE) programs • Charge Ahead Colorado grant funding
ROLES AND RESPONSIBILITIES	Partners in Energy Implementation Team 1. Assist City with connection to Xcel Energy's EVSI Program and rebate opportunities. 2. Facilitate charging plan development, including high level analysis of the number of chargers at each site, electrical capacity needed, and budgeting guidance. City Staff 1. Identify a project manager. 2. Representatives from fleet, facilities, and other departments provide necessary fleet data and input for analysis and prioritization. 3. Project manager, facilities staff, and fleet staff work with Xcel Energy to enroll in EVSI, apply for rebates, and communicate about timelines and grid capacity impacts. 4. Conduct preliminary site visits in conjunction with EVSI staff guidance to determine EVSI eligibility, outside contractor feasibility, or no feasibility. 5. Coordinate all design, quotes, and construction of infrastructure with Xcel Energy representative or outside contractor. 6. Consider phasing as impacted by budget. 7. Create building permit file where relevant for charging.
TIMELINE	<u>Initial Data Intake</u> Q2 2023 • Identify a project manager • Consolidate fleet usage data. <u>Priority identification</u> Q2 2023

	• Identify key locations for City-owned charging sites. • Conduct preliminary site visits in conjunction with Xcel Energy EVSI staff guidance. • Select top four priority locations to move forward with charger installation. • Work with Xcel Energy to understand infrastructure needs at selected sites. • Solicit quotes through Xcel Energy EVSI or 3rd party and review budgetary considerations. <u>Priority Implementation</u> Q3 2023-Q2 2024 • Communicate with Xcel Energy about timelines of implementation. • Secure funding for selected infrastructure installation. • Implement necessary preliminary upgrades to site, including electrical capacity and panel upgrades. • Conduct design and construction process of top four key charging locations. • File building permits for chargers if relevant. <u>Continued Implementation</u> Q2 2024 • Continue design and implementation of charging infrastructure. • Continue communications with Xcel Energy account manager and EVSI representatives.

Strategy I.2: Develop a Time-of-Use Charging Plan

Optimize EV operations to take advantage of time-of-use electric rates by installing controls to ensure that EVs are charged during off-peak hours and charging is staggered as much as possible.

STRATEGY LEAD	Ernesto Chavez, Chief Technology Officer
DESIRED OUTCOMES	1 EV charging controls program installed by 2025
REQUIRED RESOURCES	Staff time  Budget **$$** + annual maintenance cost
ROLES AND RESPONSIBILITIES	Partners in Energy Implementation Team 1. Facilitate questions on developing a time-of-use charging plan. City Staff 1. Facility and fleet managers, IT department, and strategy lead work to identify desired controls software.

	2. Coordinate with Xcel Energy over any EVSI/EVSE requirements and limitations and interaction with hardware. 3. Communicate with Xcel Energy about metering and rate optimization. 4. Coordinate implementation of controls.
TIMELINE	<u>Controls Software</u> Q2 2023-Q4 2023 • Coordinate with Xcel Energy representatives to determine any EVSI/EVSE requirements or limitations and interaction with hardware. • Choose controls software. <u>Energy Rates and Meters</u> Q2 2023 • Determine optimized energy rates and separate metering requirements for priority charging locations. <u>Develop Controls Scheme Outline</u> Q2 2023 • Outline the controls scheme with the aim of minimizing costs. <u>Implement the Controls Scheme</u> Q4 2023-Q2 2024 • Implement controls scheme as infrastructure is installed through **Strategy I.1: Develop an Inventory of Charging Needs and Implement Findings.**

Strategy I.3: Determine Spatial Needs of Chargers

Determine spatial needs of charging infrastructure as it relates to lot and space size, parking needs, sidewalk width, proximity to building, and space needs of Xcel Energy infrastructure.

STRATEGY LEAD	Mike Nielsen – Facilities Manager	
DESIRED OUTCOMES	Spatial needs assessment for 5 EV charging ports by 2024.	
RESOURCES REQUIRED	Staff Time 	Budget n/a
ROLES AND RESPONSIBILITIES	Partners in Energy Implementation Team 1. Facilitate questions on and provide resources for determining the spatial needs of chargers. City Staff 1. Strategy lead maintain open communication with Xcel Energy staff around charging grid impacts and determining infrastructure size and location selection.	

	2. Facilities, public works, and planning staff assess sites' location potential for charging infrastructure. 3. Ensure that all charging infrastructure meets ADA accessibility requirements, local code requirements, and encourages accessibility and ease-of-use beyond ADA minimums, aligning with the Boulder County regional cohort on EV charging accessibility.
TIMELINE	<u>Assess Sites for Location Considerations</u> Q2 2023 • Assess sites for considerations on the location of charging infrastructure and integrate into prioritization of site selection as necessary. Coordinate with **Strategy I.1: Develop an Inventory of Charging Needs and Implement Findings**. <u>Determine Priority Location Needs</u> Q2 2023 • For priority sites, select siting location and identify spatial needs and modifications. • Ensure that all charging infrastructure meets ADA accessibility requirements as necessary.

Strategy I.4: Establish and Enforce Parking Rules

Establish and enforce consistent rules for EV parking spaces and develop signage.

STRATEGY LEAD	Callie Hayden, Public Works Operations and Maintenance Manager
DESIRED OUTCOMES	• 1 EV charging policy for City owned chargers by 2025. • Signage installed at all EV charging ports by 2025.
REQUIRED RESOURCES	Staff Time  Budget **$**
ROLES AND RESPONSIBILITIES	Partners in Energy Implementation Team 1. Facilitate questions on the establishment and enforcement of parking rules. City Staff 1. Planning and building, public works, and facilities determine desired rules for EV parking. 2. Communications and facilities, other relevant departments, to coordinate implementation of enforcement as well as sign generation and installation.

TIMELINE	Establish rules for EV parking spaces Q2 2023 • Determine desired rules for EV parking. Signage Installation Q3 2023-Q2 2024 • Incorporate installation of signage during implementation of charging as covered in **Strategy I.1: Develop an Inventory of Charging Needs and Implement Findings**. Coordinate with wayfinding signage in development for downtown. Enforcement Ongoing • Establish and implement a program to enforce EV parking rules.

Other Infrastructure Implementation Notes:

- EVSI has flexibility to downsize from initial design/quote as long as it meets minimums (50 kW load and 4 ports)
- Lafayette likely only needs Level 2 chargers, with one Level 3 charger for emergency, quick turnaround use.
    - A Level 3 charger would also act as a pilot and provide lessons learned and reassurance to police department and leadership for electrifying police fleet in the future.
- Departments can procure EVs without already having charging infrastructure in place if charging infrastructure is planned or there is Level 1 charging available that would meet the needs of the vehicle usage.
- Ensure selection of charging and controls equipment that supports demand management, scheduling and/or automatic balancing of charging across multiple chargers at a location.
- For cold weather and early use, having enough chargers to leave vehicle plugged in to retain range capabilities is a consideration.
- When considering desired rules for EV parking, consider time limits.

Vehicles

The vehicles focus area includes strategies to ensure that the vehicles in the City fleet are optimized for use patterns and identify the most environmentally responsible replacement of existing vehicles.

Background Data

To understand the potential for short term fleet electrification, the 142 on-road vehicles in the City's fleet were sorted by replacement year to identify the vehicles that are expected to be replaced before 2025 (Figure 6).

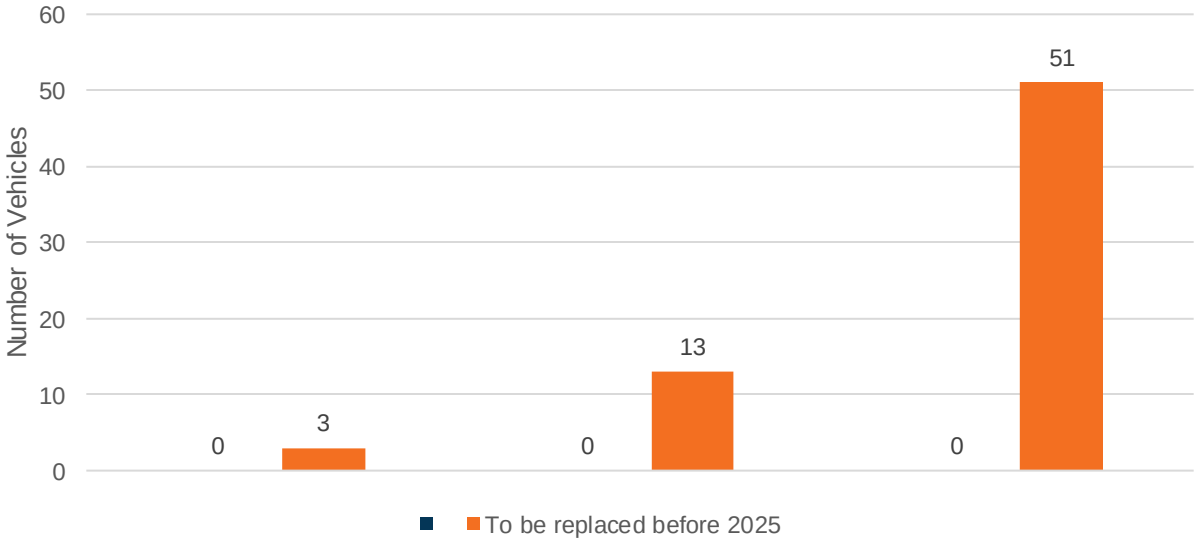


Figure 6: Short-term vehicle replacements compared to fleet totals.

The short-term replacement vehicles were sorted into three different replacement opportunity categories, and use data has been used to categorize all fleet vehicles into four categories:

1. **Consolidation Opportunity**: Six locations were identified where more than one vehicle had a low-use pattern. It may be possible to replace these vehicles with one pool vehicle, saving on vehicle purchase and maintenance costs. Each opportunity will be evaluated through strategy V.1 before finalizing replacement opportunities.
2. **Battery-Electric Vehicle Replacement:** Use patterns of this vehicle indicates it may be a good candidate for replacement by a BEV. These vehicles tend to have low daily mileage use and there are similar makes/models available in the EV market.
3. **Hybrid Electric Vehicle Replacement:** These vehicles may be more effectively replaced with an HEV or PHEV due to use patterns or availability of EV models. Note that all BEV candidates could also be replaced with an HEV or PHEV if desired.

4. **Future Electrification:** EVs of similar make/model are not readily available and electrification of these vehicles should wait for technology and availability to catch up.

Of the 67 vehicles to be replaced before 2025, 41 were identified as either HEV or BEV replacement candidates (Figure 7). These vehicles will be reviewed under strategy V.2 to determine the best candidates for EV replacement after vehicle consolidation.

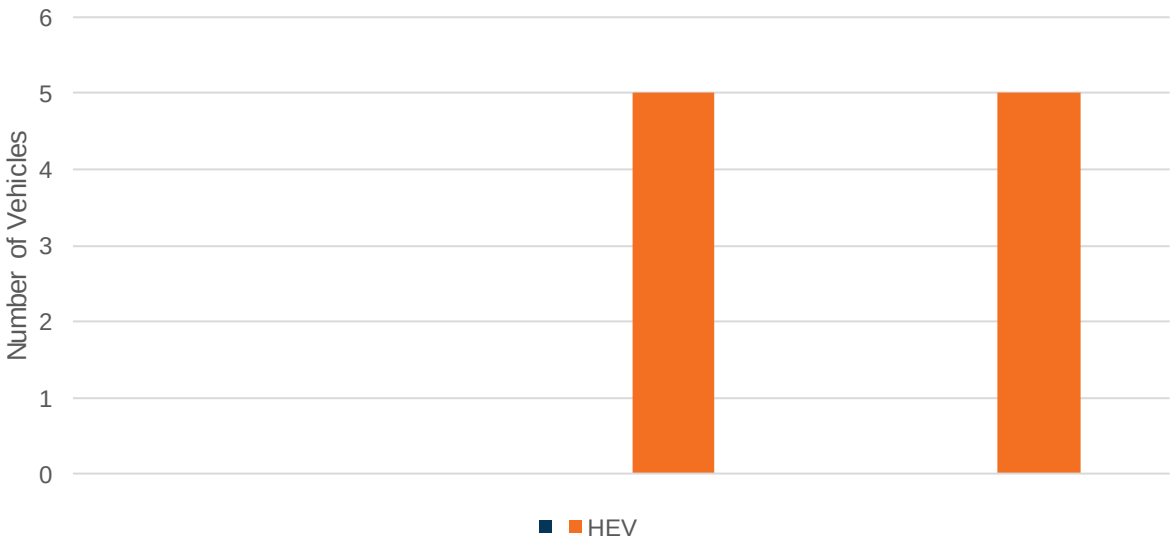


Figure 7: EV replacement candidates by vehicle type.

Strategies

The following strategies were identified as short-term opportunities to transition targeted fleet vehicles to EVs. An overview of the implementation timeline is shown in Table 3. More details on the strategy implementation action plans can be found by strategy below; a detailed work plan of all short-term strategies can be found in the **How We Stay On Course** section.

Table 3: Vehicle strategies work plan

Strategy	Q2 2023	Q3 2023	Q4 2023	Q1 2024	Q2 2024	Q3 2024
Strategy V.1: Identify Opportunities to Consolidate						
Strategy V.2: Vehicle Replacement Decision Tree						
Strategy V.3: Purchase Electric Fleet Vehicles						

Strategy V.1: Identify Opportunities to Consolidate

Review vehicle use patterns including frequency of use, miles traveled, and location parked to identify opportunities to consolidate low-use vehicles to a shared-pool electric vehicle.

STRATEGY LEAD	Callie Hayden, Public Works Operations and Maintenance Manager
DESIRED OUTCOMES	2 vehicle consolidation pilots implemented by 2025.
REQUIRED RESOURCES	Staff Time  Budget **$$**
ROLES AND RESPONSIBILITIES	Partners in Energy Implementation Team 1. Complete analysis to support consolidation conversations including: a. Calculations for fuel and emissions savings. b. User benefits for consolidation. c. Analysis of current and forecasted conditions. 2. Facilitate discussions with vehicle users and leadership to gain buy-in for consolidation. 3. Support user training for pool vehicles including: a. How to reserve the vehicle. b. How and where to charge if an EV is purchased. c. How to provide feedback on the pilot. 4. Develop a case study based on pilot opportunities, highlighting successes and lessons learned, for future opportunities. City Staff 1. Identify 3 preliminary opportunities for consolidation. 2. Work with vehicle users to understand opportunities. 3. Choose two consolidation opportunities to implement based on user feedback. 4. Complete consolidation logistics: a. What vehicle will be the pool vehicle? If a new EV, coordinate purchase of the vehicle and necessary charging infrastructure (coordinate with infrastructure initiatives). b. Reassign or sell unused vehicles. c. Reinvest the money from the sale of these vehicles in either an EV infrastructure fund or a vehicle replacement fund.
TIMELINE	Q1 – Q2 2023

	• Review preliminary opportunities for vehicle consolidation and complete analysis of consolidation options. • Schedule conversations with vehicle users. Q3 2023 • Identify the 2 pilot consolidation opportunities. • Choose the pool vehicle for each location. Submit a budget request for procurement. If an EV is chosen, ensure that the necessary charging is installed. Coordinate with **Strategy I.1: Develop an Inventory of Charging Needs and Implement Findings**. Q4 2023 – Q1 2024 • Implement pool vehicle pilots including vehicle procurement, infrastructure installation, and employee training, as necessary. Coordinate with **Strategy T.1: Educate Current City Staff on EV Driving and Care** Q3 2024 • Gather feedback from pool vehicle users and maintenance staff. • Complete pilot case study and share with leadership, sustainability staff, and pool vehicle users.

Strategy V.2: Vehicle Replacement Decision Tree

Develop a decision tree to guide vehicle replacement decisions at time of purchase. This tree will help purchasers determine if BEV or PHEV might be a good option as well as provide targeted opportunities for hybrids in specialized equipment such as bucket trucks.

STRATEGY LEAD	Callie Hayden, Public Works Operations and Maintenance Manager
DESIRED OUTCOMES	1 vehicle replacement decision tree complete by end of Q3 2023.
REQUIRED RESOURCES	Staff Time  Budget n/a
ROLES AND RESPONSIBILITIES	Partners in Energy Implementation Team 1. Refine draft of decision tree (**Appendix C**: Vehicle Replacement Decision Tree Draft) based on staff feedback. City Staff 1. Provide feedback on draft decision tree. 2. Determine the most efficient way to integrate decision tree into the procurement process.
TIMELINE	Q2 2023

	• Review draft decision tree and revise based on staff feedback. Q3 2023 • Test decision tree with identified pool vehicle opportunities from **Strategy V.1: Identify Opportunities to Consolidate**. • Refine decision tree based on test. • Implement decision tree for all future vehicle purchases.

Strategy V.3: Purchase Electric Fleet Vehicles

As indicated by Strategy V.2: Vehicle Replacement Decision Tree, purchase BEVs and HEVs for use throughout City fleet. Consider using a telematics study for any vehicles where the case for EVs is unclear or vehicle users need more information to feel comfortable with electrification.

STRATEGY LEAD	Callie Hayden, Public Works Operations and Maintenance Manager
DESIRED OUTCOMES	5 BEVs integrated into City fleet by 2025. 10 HEVs integrated into City fleet by 2025.
REQUIRED RESOURCES	Staff Time  Budget **$$**
ROLES AND RESPONSIBILITIES	Partners in Energy Implementation Team 1. Support conversations with vehicle users as necessary. City Staff 1. Use decision tree to determine most appropriate replacement option for vehicles due to be replaced. 2. Share findings with vehicle users and ensure decision tree outcome is appropriate for current and future vehicle use. 3. Procure identified vehicle based on outcomes of user conversations. Ensure proper training for EV use through employee training strategies.
TIMELINE	Q3 2023 • Using decision tree, review vehicles due for replacement in 2024. • Share results with vehicle users. • Submit budget requests for 2024 vehicle purchases. 2024 • Coordinate infrastructure and training needs for procured EVs. Ongoing • Utilize decision tree for all vehicles purchases; continue to electrify vehicle fleet as appropriate.

Employee Training

This focus area is designed to ensure that employees are prepared to operate and maintain electric fleet vehicles, to help ensure a positive experience with early fleet electrification pilots.

Background

Operating EVs effectively can require different knowledge and techniques than driving most ICE vehicles. Similarly, EVs and ICE vehicles do not have all the same maintenance requirements. To address these differences, the City of Lafayette will develop educational opportunities for City staff to learn how to operate and service EVs.

Currently, the City does not offer any educational opportunities focused on EVs. To address this gap, the City will develop content and a process for training all employees to drive EVs and Fleet Maintenance staff to service EVs.

Strategies

The following strategies were identified as short-term opportunities to promote EV training for City staff. An overview of the implementation timeline is shown in Table 4. More details on the strategy implementation action plans can be found by strategy below; a detailed work plan of all short-term strategies can be found in the **How We Stay On Course** section.

Table 4: Employee training strategies work plan

Strategy	Q2 2023	Q3 2023	Q4 2023	Q1 2024	Q2 2024	Q3 2024
Strategy T.1: Educate Current City Staff on EV Driving and Care						
Strategy T.2: Develop EV Training for New Employee New Employee Orientation						
Strategy T.3: Identify EV Training Program for Fleet Maintenance Staff						

Strategy T.1: Educate Current City Staff on EV Driving and Care

In some cases, a barrier to EV adoption is lack of knowledge of the technology. To address this barrier, the City of Lafayette will develop an educational opportunity that will allow all employees to learn how to operate and care for EVs. This will include the regenerative braking feature, how to charge an EV, locating chargers when away from City facilities, and operating the vehicle. Training will be developed in an online video format employees can reference on a regular basis. In-vehicle practice driving opportunities will also be offered.

STRATEGY LEAD	Elizabeth Szorad, Sustainability Manager	
DESIRED OUTCOMES	Develop 3 EV training videos for City of Lafayette employees by 2025.	
REQUIRED RESOURCES	Staff time	Budget **$**

	
ROLES AND RESPONSIBILITIES	Partners in Energy Implementation Team • Develop communications plan. • Develop content for training. Sustainability Department • Develop vehicle use system or policy. • Determine distribution method for training materials. • Review training content. Risk Management • Review vehicle use policy. Communications • Send information to staff, as outlined in communications plan.

TIMELINE	Q3 2023
	• Develop system or policy for City staff using vehicles, including information on:
	  ○ How to reserve vehicles.
	  ○ When to refuel vehicles (both ICE and electric).
	  ○ Technology that supports the policy.
	  ○ Parking locations by vehicle.
	  ○ Best practices for paying for offsite charging.
	  ○ Emergency contacts.
	  ○ Discounted charging opportunities for employees.
	• Create a communications plan to educate staff, including:
	  ○ Information on EVs purchased by the City.
	  ○ Why it is important.
	  ○ How it will affect employees.
	Q4 2023
	• Develop content for staff training, including:
	  ○ EV driving best practices.
	  ○ How to charge and read the battery level.
	  ○ Regenerative braking.
	  ○ Locating chargers and when to charge.
	  ○ Vehicle range, including impacts of extreme cold.
	  ○ Maps of EV chargers near common meeting locations.
	  ○ Recommended websites to use for locating chargers.
	  ○ City policy for vehicle use.

	• Create training videos. Q1 2024 • Pilot training program with select participants. ○ If possible, align with departments that already have or are purchasing EVs. • Assess feedback from training. Q2 2024 • Update training materials based on pilot program. • Expand training to all employees.

Strategy T.2: Develop EV Training for New Employee Orientation

New employees will also need EV knowledge when they begin working for the City of Lafayette. The City will incorporate EV information into existing training opportunities for new employees, such as the email new employees receive that includes links to tasks on NeoGov, using learnings from the pilot training program developed in

STRATEGY LEAD	Elizabeth Szorad, Sustainability Manager
DESIRED OUTCOMES	Incorporate training videos into training for new employees by 2025.
REQUIRED RESOURCES	Staff time  Budget n/a
ROLES AND RESPONSIBILITIES	Partners in Energy Implementation Team • Develop content for training. Sustainability • Review training content. • Identify how EV training will be incorporated into existing new employee training. Human Resources • Add training videos to NeoGov new employee training list.
TIMELINE	Q3 2024 • Using feedback from the pilot training in **Strategy T.1: Educate Current City Staff on EV Driving and Care**, incorporate the videos into the NeoGov resources for new employees to review when they start working at the City.

Strategy T.3: Identify EV Training Program for Fleet Maintenance Staff

To prepare for EVs being added to the City of Lafayette fleet, Fleet Maintenance employees will need to be prepared to service EVs. To do this, these employees will need to receive training on routine maintenance, preventative maintenance, and electric vehicle theory. Options for training could include regionally collaborative training, Automotive Service Excellence (ASE) EV training, or training from local community colleges or the Colorado Department of Transportation (CDOT).

STRATEGY LEAD	Callie Hayden, Public Works Operations and Maintenance Manager
DESIRED OUTCOMES	All fleet maintenance staff attend 1 EV training by 2025.
REQUIRED RESOURCES	Staff time  Budget **$**
ROLES AND RESPONSIBILITIES	Partners in Energy Implementation Team • Research training options. Fleet Maintenance staff • Determine best training option.

TIMELINE	Q2 2023
	• Research training options and develop list:
	  ○ Align with Boulder County regional workforce development research and initiatives.
	  ○ Identify skills and knowledge needed by in-house staff.
	  ○ Include costs and other necessary resources.
	  ○ Explore what other communities in the region are doing.
	• Select training for staff to attend.
	Q3 2023
	• Fleet Maintenance staff attend training.
	Q4 2023
	• Evaluate training results based on feedback from staff who attended.
	• Determine whether to send future staff to the same training or to choose an alternative option.
	• Highlight the training opportunity as a method for employee attraction and retention.
	• Develop budget request for additional training as needed.

Impact of EV Action Plan

The combined targets and strategies outlined in this plan will facilitate the implementation of 2 vehicle consolidation pilots and integrate 5 BEVs and 10 HEVs into the City fleet by 2025. Overall, achieving near-term targets laid out in this plan will reduce fleet GHG emissions by over 5%, which equates to 16 metric tons of carbon dioxide equivalent (CO_2e) per year. This reduction will continue to increase even without any further action, due to Xcel Energy's Net Zero commitment that will eliminate electricity emissions by 2050. In the meantime, renewable energy programs are available to allow 100% electricity to come from renewable sources. This would increase the reduction to 7% from current emissions, which equates to 21 metric tons CO_2e per year.

HOW WE STAY ON COURSE

This section provides an overview of the implementation period timeline supported through Partners in Energy. Over the next 18-months, Table 5 will serve as a work plan for the EV Action Team and Partners in Energy. Over this period, the PM team will meet monthly to coordinate strategy implementation and will coordinate directly with strategy leads as needed.

Table 5: Implementation timeline by strategy

Strategy	Q2 2023	Q3 2023	Q4 2023	Q1 2024	Q2 2024	Q3 2024
Strategy I.1: Develop an Inventory of Charging Needs						
Strategy I.2: Develop Time-of-use Charging Plan						
Strategy I.3: Determine Spatial Needs of Chargers						
Strategy I.4: Establish and Enforce Parking Rules						
Strategy V.1: Identify Opportunities to Consolidate						
Strategy V.2: Create a Vehicle Replacement Decision Tree						
Strategy V.3: Purchase Electric Fleet Vehicles						
Strategy T.1: Educate Current Staff on EV Driving and Care						
Strategy T.2: Develop EV Training for New Employee Orientation						
Strategy T.3: Identify EV Training Program for Fleet Maintenance Staff						

Implementation Resources Required

Based on the strategies outlined in this plan, the required capital budget and staff time for each strategy is estimated below to help inform City staff planning. For each strategy, the desired outcomes are listed to allow the implementation team to track progress toward implementation. Data used to track progress toward these desired outcomes will be provided by City staff overseeing strategy implementation.

Resource Table Icon Key

Implementation Costs	
$	From existing budget
$$	Requires a budget request
$$$	Will required an RFP ($25k and up)

Staff Time Required	
	Within current responsibilities
	Requires shifting tasks
	Additional staff required

Strategy	Costs	Staff Time	Staff Lead	Desired Outcomes
Strategy I.1: Develop an Inventory of Charging Needs and Implement Findings	**$$$**		Elizabeth Szorad	• 1 long-term charging needs assessment complete by 2024 • 5 EV charging ports installed by 2025 to support new BEVs
Strategy I.2: Develop a Time-of-Use Charging Plan	**$$**		Ernesto Chavez	• 1 EV charging controls program installed by 2025
Strategy I.3: Determine Spatial Needs of Chargers	n/a		Mike Nielsen	• Spatial needs assessment for 5 EV charging ports by 2024
Strategy I.4: Establish and Enforce Parking Rules	**$**		Callie Hayden	• 1 EV charging policy for City owned chargers by 2025 • Signage installed at all EV charging ports by 2025
Strategy V.1: Identify Opportunities to Consolidate	**$$**		Callie Hayden	• 2 vehicle consolidation pilots implemented by 2025
Strategy V.2: Vehicle Replacement Decision Tree	n/a		Callie Hayden	• 1 vehicle replacement decision tree complete by 2024
Strategy V.3: Purchase Electric Fleet Vehicles	**$$**		Callie Hayden	• 5 BEVs integrated into the City fleet by 2025 • 10 HEVs integrated into the City fleet by 2025

Strategy	Costs	Staff Time	Staff Lead	Desired Outcomes
Strategy T.1: Educate Current City Staff on EV Driving and Care	n/a	⏱	Elizabeth Szorad	• Develop 3 EV training videos for City of Lafayette employees by 2025
Strategy T.2: Develop EV Training for New Employee	n/a	⏱	Elizabeth Szorad	• Incorporate training videos into training for new employees by 2025
Strategy T.3: Identify EV Training Program for Fleet Maintenance Staff	$	⏱	Callie Hayden	• All fleet maintenance staff attend 1 EV training by 2025

It will be important to let the wider community know how things are progressing and to recognize the collaborative efforts of those involved in hitting the plan targets. At critical milestones, the City of Lafayette will publish updates on progress, share successes, and congratulate participants and partners through various local and regional communication channels.

Adapting to a Changing Landscape

Even though this plan outlines strategies to promote EV adoption over the next 18-months, an effective plan is cyclical in nature (see Figure 8). In addition, the nature of implementation requires staging, flexibility, and course adjustment, when necessary, to be successful and to sustain progress.

Figure 8: Actions and Tracking

Furthermore, the focus area work plans reflect the current situation for a rapidly evolving technology. It will be important that strategies are evaluated and updated throughout implementation to reflect advancements and new offerings from the automotive and transportation industry and Xcel Energy. Throughout the planning process, we worked to build relationships between City staff and Xcel Energy staff that will foster the collaboration and cooperation required to successfully navigate the changing EV landscape.

The Xcel Energy EV Toolkit can be a valuable resource for identifying new strategies to address unexpected barriers that may come up. Any adjustments will be documented and shared with the broader group and community as they occur.

APPENDIX A: ELECTRIC VEHICLES 101

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

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

Electric Vehicle Basics

EVs refer to any vehicle that uses an electric motor. An EV can have a fully electric motor or can contain an ICE that supports the electric motor. The travel range of each type is outlined in Table 6. Comparison of Types of Electric Vehicles and are described in more detail in the following sections.

Table 6. Comparison of Types of Electric Vehicles

Electric Vehicle Type	Power Source	Travel Range
Battery Electric Vehicle (BEV)	Electric Motor	80 – 345 miles
Plug-in Hybrid Electric Vehicle (PHEV)	Electric Motor + Gasoline Engine	350 – 600 miles
Hybrid Electric Vehicle (HEV)	Electric Motor + Gasoline Engine	350 – 600 miles

Battery Electric Vehicle (BEV)

A BEV is an all-electric vehicle that does not require gasoline and, thus, has no tailpipe emissions. BEVs are fueled by plugging into charging stations. Energy is stored in the battery to be used when the car is running. Distances that a BEV can travel on a single charge range from 80 to 345 miles, with longer distances promised in the future through continual advancements in battery technology. Recharging can take anywhere between 30 minutes to 12 hours depending on the type of charger, size of the battery, and level of depletion in the battery (Drive Change. Drive Electric., 2019).

Plug-In Hybrid Electric Vehicle (PHEV)

A PHEV provides a combination of both an electric motor and a gasoline engine and produces less tailpipe emissions than an internal combustion engine (ICE). PHEVs use energy from the electric motor until the battery charge is fully depleted, which can occur between 15 to 50 miles, at which point the gasoline engine takes over. The distance a PHEV can travel on a single charge and full tank of gasoline ranges between 350 and 600 miles. The battery is charged similarly to the BEV through a plug, and the fuel tank is filled by traditional gas station (Drive Change. Drive Electric., 2019).

Hybrid Electric Vehicle (HEV)

Similar to the PHEV, an HEV has both an electric motor and a gasoline engine. In an HEV, the gasoline engine is used to power a generator, which powers the electric motor. The benefit of this setup is that the ICE can run at a constant speed and greatly increase the vehicle's fuel efficiency compared to ICE vehicles. However, the battery cannot be charged by an external electricity source, which means that the vehicle always relies on the gasoline engine.

Charging Stations

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

Residential Charging Stations

Residents have two options for charging at home. Level 1 chargers use standard 120-volt AC outlets and can take 8 to 12 hours to fully charge a depleted battery. Level 2 chargers require a 240-volt AC outlet and can fully charge a depleted battery in 4 to 6 hours. Residents can charge during off-peak hours to reduce the impact on the grid. **Table 7** provides a brief explanation, along with the pros and cons of both types. All currently available EVs can use either charger type.

Table 7. Residential Electric Vehicle Charging Types

	LEVEL 1	LEVEL 2
		
Electric Current (AC) Charging Rate (miles range per hour of charging)	120 volts; 20 amps 4 to 6	208/240 volt; 30 amps 25 to 40
Benefits	• Uses standard residential wall outlet • Little to no investment in infrastructure required	• Quicker charging • Some models have available Wi-Fi controls to allow residents to take advantage of time-of-day electric rates • In the case of multifamily housing, the controls could be managed by a property manager
Drawbacks	Slower charging rate, but usually sufficient for residents who charge overnight	• Requires 240 Volt outlet or hardwired charger • Electrician likely required to install • Higher infrastructure cost investment
Estimated Installation Costs	Low to no cost	$500 to $2,000 (US DOE, 2019)

Commercial Charging Stations

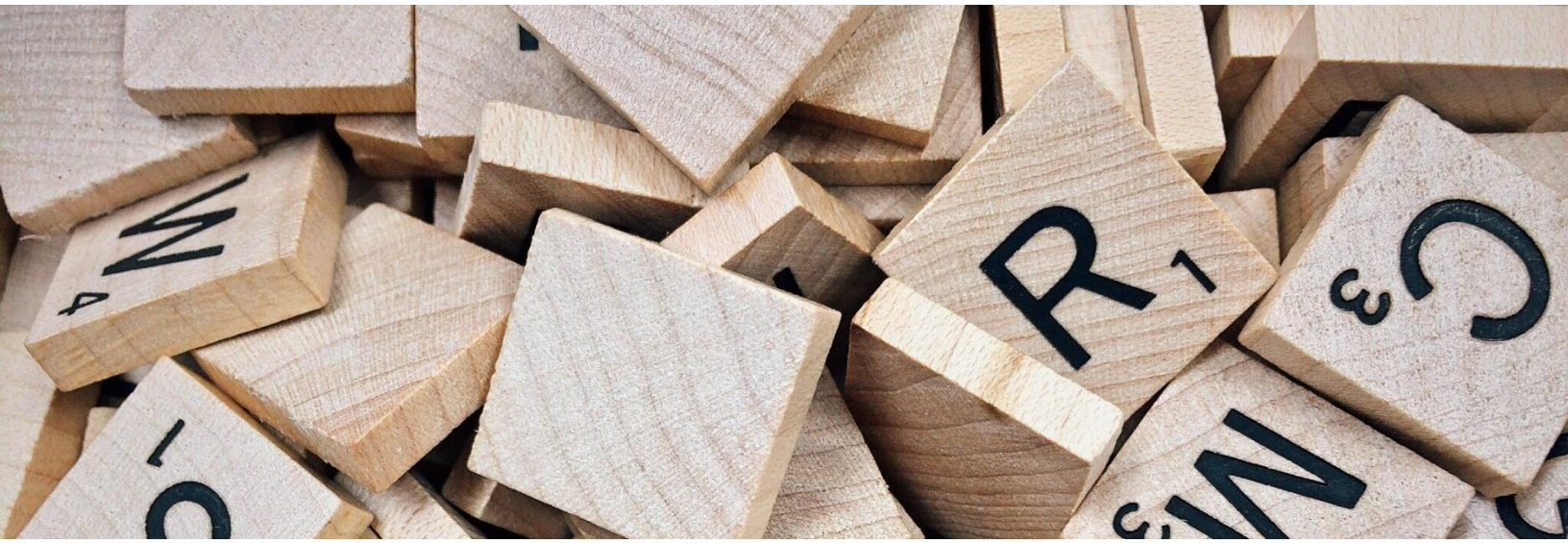
Commercial Level 2 and Level 3 chargers are most appropriate for commercial applications since the EVs are generally parked for shorter periods of time than in residential applications. Level 2 chargers are the same as the residential chargers, providing a full charge in 4-6 hours, and often have the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

Table 8 shows the advantages and disadvantages of Level 2 and Level 3 chargers.

Table 8. Levels 2 and 3 Charging Infrastructure

	LEVEL 2	LEVEL 3 (DC Fast Charger)
Electric Current	208/240 volt; 30 amps (AC)	480 volts DC
Charging Rate (miles range per hour of charging)	25 to 40	Up to 240
Benefits	• More economical than Level 3 • Safe for long-term use	• Fastest charging option available • Expensive to purchase and install
Drawbacks	• Slower charging	• Can cause degradation to EV batteries with frequent use
Use Case	Example locations include workplaces, recreation centers, libraries, movie theatres, transit centers, and parking lots.	Example locations include grocery stores, rest stops, gas stations, and urban parking lots.
Estimated Costs	$2,500 to $5,000	$50,000 to over $150,000

APPENDIX B: GLOSSARY OF TERMS



Amps: The measurement of the amount of electrical energy "flowing" through a charger. This is determined by the electrical load required by the equipment and can vary over time.

Battery Electric Vehicle (BEV): An all-electric vehicle, fueled by plugging into an external charger, that has no tailpipe emissions. Requires low maintenance costs.

Carbon-free: Carbon-free refers to sources of energy that will not emit additional carbon dioxide into the air. Wind, solar, and nuclear energy are all carbon free sources but only wind and solar are renewable.

Carbon-neutral: Carbon-neutral, also described as "net zero", could include carbon free sources but is broader and refers to energy that removes or avoids as much carbon dioxide as is released over a set period of time. Carbon-neutral is sometimes used to describe a site that produces an excess amount of electricity from a renewable energy source, such as solar, compared to what it consumes. That excess energy is put back into the grid in an amount that offsets the carbon dioxide produced from the electricity it draws from the grid when it is not producing renewable energy.

Community Data Mapping: A baseline analysis of energy data (in a geospatial map).

Direct Current (DC): The form of electricity where the current only flows in one direction. This is the type of electricity that batteries supply and require to charge. EV chargers must convert the supplied AC electricity to DC power.

Direct Installation: Free energy-saving equipment, installed by Xcel Energy or other organization for program participants, that produces immediate energy savings.

Electricity Consumption: Measured in kilowatt-hours (kWh) and represents the amount of electricity that has been consumed over a certain time period.

Electric Demand: Measured in kilowatts (kW) and represents the rate at which electricity is consumed. Most commercial energy rates incorporate a charge for electric demand as well as electric consumption.

Electric vehicle (EV): A vehicle that uses an electric engine for all or part of its propulsion.

Electric vehicle supply equipment (EVSE): Infrastructure required to support EVs such as chargers, electrical supplies, etc.

Greenhouse Gases (GHG): Gases in the atmosphere that absorb and emit radiation and significantly contribute to climate change. The primary greenhouse gases in the earth's atmosphere are water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3).

Grid Decarbonization: The current planned reduction in the carbon intensity of electricity provided by electric utilities through the addition of low- or no-carbon energy sources to the electricity grid.

Heavy-duty vehicles: Commercial vehicles over a minimum Gross Vehicle Weight Rating (GVRW) of 8,500 lbs.

Hybrid Electric Vehicle (HEV): Contains both an electric motor and a gasoline engine. The gasoline engine powers a generator that charges the electric motor. No external battery charger is used. Runs at a constant speed, which increases fuel efficiency.

Internal combustion engine (ICE): Traditional vehicle engine that uses the direct combustion of gasoline, diesel, or other fuels.

Kilowatt-hour (kWh): The amount of electricity being sent to the EV battery from the charger in one hour. This is calculated by volts times amps divided by 1,000.

Level 1 Charging Station: Uses a standard 120-volt AC outlet and can take 8 to 12 hours to fully charge a depleted battery; intended for residential use only.

Level 2 Charging Station: Uses a 220-volt or 240-volt AC outlet and can fully charge a depleted battery in 4 to 6 hours; can be used in both residential and commercial settings.

Level 3/DC Fast Charging Station: Uses an industrial 480-volt DC outlet and can charge a battery to 80% in 20 to 30 minutes; used in commercial settings where the anticipated charge time is limited (e.g., supermarket, gas station); will be used on Alternative Fuel Corridors – a national network of major thoroughfares supporting EVs and other alternative fuels.

Light-Duty Vehicles: Passenger cars with a maximum Gross Vehicle Weight Rating (GVRW) of 8,500 lbs.

Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$): A unit of measure for greenhouse gas emissions. The unit "CO_2e" represents an amount of a greenhouse gas with atmospheric impact that has been standardized to that of one unit mass of carbon dioxide (CO_2), based on the global warming potential (GWP) of the gas.

Megawatt (MW): A unit of electric power equal to 1 million watts.

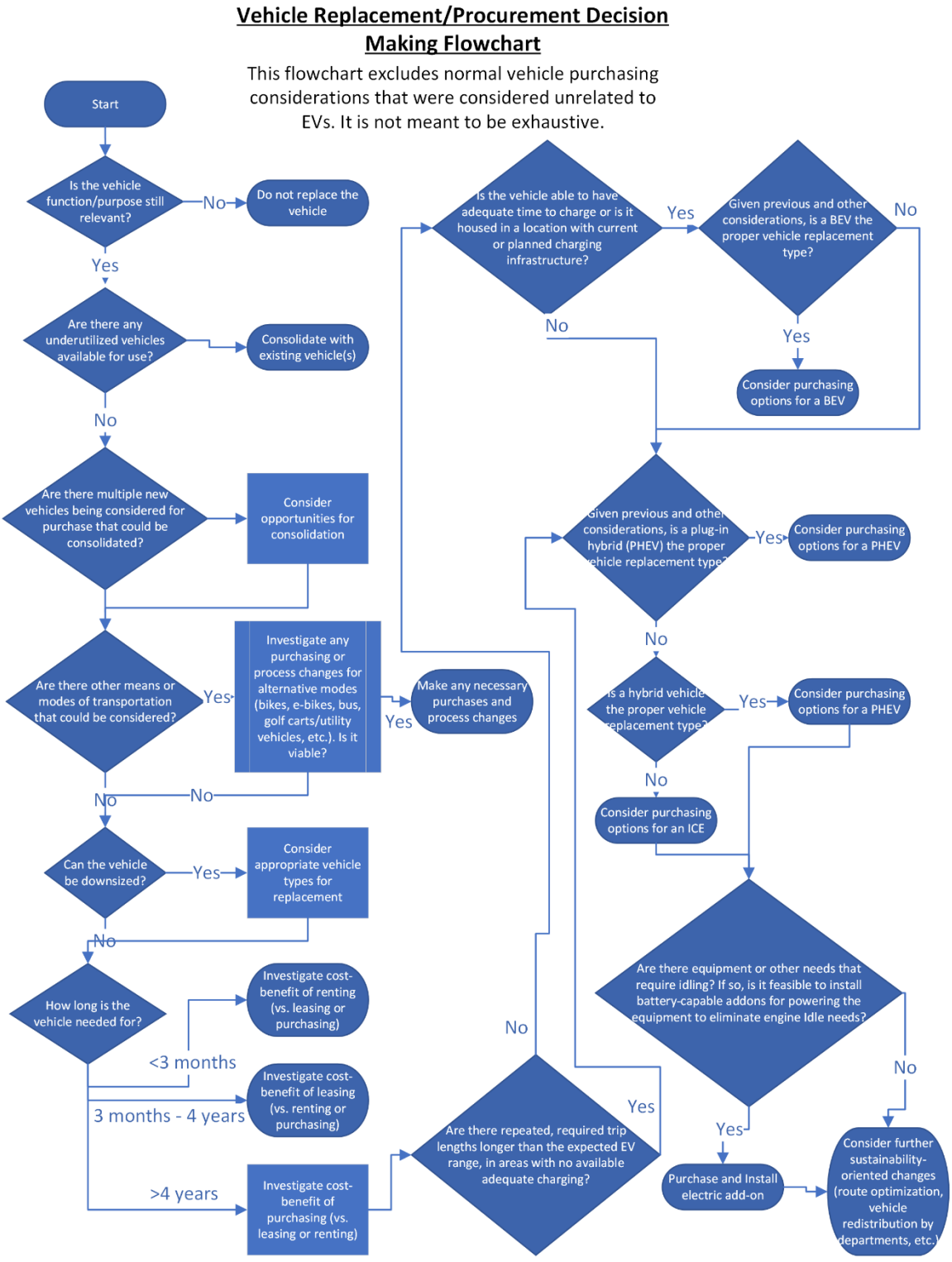
Plug-in Hybrid Electric Vehicle (PHEV/PEV): Contains both an electric motor and a gasoline engine. An external plug is used to fuel the electric motor. The electric motor is used until the battery is depleted; at this point the gasoline engine takes over. Offers lower tailpipe emissions than traditional ICE and longer ranges than most BEVs.

Range Anxiety: Fear of running out of power in an EV before reaching a charging station or desired destination.

Range per hour (RPH): A measurement of the miles an EV can travel on one hour of charge. This is generally applied to EV charging stations and expressed in terms of typical EV efficiency.

Volts: A measurement of the force pushing the flow of energy through a charger. This measurement is determined by electricity supply. Standard household outlets provide 120 volts; outlets for dryers or other high-powered household equipment supply 240 volts.

APPENDIX C: VEHICLE REPLACEMENT DECISION TREE DRAFT



APPENDIX D: XCEL ENERGY PROGRAMS

EV Supply Infrastructure (EVSI)

Xcel Energy will provide no- to low-cost turn-key construction services for infrastructure at public charging sites receiving Xcel Energy commercial electric service in Colorado.

EV Supply Equipment (EVSE)

For a monthly fee, Xcel Energy will provide a Level 2 charger for multifamily, fleet, and workplace customers.

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