

# Strategy for Electric Vehicle Transition



GSA FLEET SERVICES

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Exhibit 1

# Table of Contents

Introduction .....	1
Executive Summary.....	1
Current County Policy .....	2
State of California Milestones / Nationwide Funding and Rebate Opportunities.....	3
State of California Goals and Milestones.....	3
Funding, Rebate, and Incentive Opportunities.....	3
Considerations for Fleet Electrification .....	5
GSA Fleet Analysis.....	5
Vehicles .....	5
Current County Vehicle Makeup.....	6
Why the Central Motor Pool Is Ideal .....	7
High Utilization.....	8
Density and Captivity of Vehicle Demand.....	9
Current EV Availability .....	9
Vehicle Procurement Costs .....	10
Assumptions.....	11
Infrastructure .....	11
Charging Station Availability .....	11
EV Charging Infrastructure.....	12
Cost to install .....	12
Cost/Benefits Assessment .....	13
Environmental Benefits.....	13
Reduced Fossil Fuel Use.....	13
Net Reduction in GHG Production .....	13
Cost Considerations .....	14
Reductions in Maintenance Costs.....	14
Driver/Behavior Considerations.....	15
Range Anxiety .....	15
Driver Unfamiliarity.....	16
Technician Training .....	16

EV Selection Payback Periods .....	16
Transition Plans and Timelines .....	18
Central Motor Pool .....	18
Future Phases.....	20
Remote Motor Pools (RMP) .....	20
Light-Duty Truck Fleet .....	20
Other County Agencies and Departments .....	21
Emerging Technology .....	21
Closing/Summary .....	21

# List of Tables and Figures

<b>Table 1:</b> State of California Goals and Milestones to Address GHG Emissions Reductions .....	3
<b>Table 2:</b> Nationwide Funding, Rebate and Incentive Programs .....	4
<b>Figure 1:</b> GSA Fleet Services Fleet Vehicle Composition .....	6
<b>Figure 2:</b> GSA Fleet Services Sedan Vehicle Composition .....	7
<b>Figure 3:</b> GSA Fleet Services CMP Vehicle Composition .....	7
<b>Table 3:</b> GSA Fleet Services Motor Pool Utilization and Cost per Mile .....	8
<b>Table 4:</b> Motor Pool Light-Duty Utilization .....	8
<b>Table 5:</b> EV Compact Sedan Models .....	9
<b>Table 6:</b> EV Attributes by Type .....	10
<b>Table 7:</b> Internal Combustion Engine vs. EV Acquisition Cost Comparison .....	10
<b>Table 8:</b> CoV – EV Charging Station Location and Capacity .....	11
<b>Table 9:</b> CoV – EV Charging Station Location and Capacity .....	13
<b>Table 10:</b> CoV – EV Charging Station Location and Capacity .....	14
<b>Table 11:</b> Reductions in Maintenance Costs .....	15
<b>Table 12:</b> Inputs for TCO Calculation without Contribution .....	17
<b>Figure 4:</b> With: CVRP Rebate per Vehicle; without Contribution: Payback: Year 9 .....	17
<b>Table 13:</b> Inputs for TCO Calculation with \$4,500/Vehicle Contribution .....	17
<b>Figure 5:</b> With: CVRP Rebate per Vehicle; <i>with</i> County Contribution per Vehicle: Payback: Year 5 .....	18
<b>Figure 6:</b> Existing CMP Fleet .....	19
<b>Figure 7:</b> Proposed CMP Fleet .....	19

## Introduction

This report presents recommendations for the continuation of the transition of fleet vehicles for the County of Ventura (CoV) to electric vehicles (EVs) over the coming years. This report identifies current opportunities for vehicle electrification while also looking ahead for applicable EV solutions that are not yet market available. Also, while this report is structured specifically around electric vehicles, we recognize that other alternative fuel technologies are in development, such as hydrogen fuel cell technology, that could impact vehicle strategy in the future but will not be discussed in this report.

As there is near-constant change in this emerging technology field, it is anticipated that the technologies relating to EVs will continue to increase in capabilities while also becoming more affordable over the coming decade. Current EV options tend to skew to smaller vehicles with anticipated releases of larger SUVs and pickup trucks planned in the coming years.

## Executive Summary

General Services Agency (GSA) Fleet Services provides a variety of vehicle support services to County agencies, including vehicle acquisition services, collecting and analyzing data from vehicle telematics units, providing County fuel, and operating the County's Central Motor Pool (CMP) — located at the main Government Center campus — and Remote Motor Pool (RMP), among others. It is because of these specialties that GSA Fleet Services has researched alternative fuel propulsion systems and presents this strategy for transitioning portions the County vehicle fleet to electric vehicles (EVs) over time, with a specific focus on the Central Motor Pool in the near future.

A successful EV transition evaluates locations that are most suitable for the installation of EV infrastructure and charging units, finds the right vehicle to slot into the right need, and trains and supports drivers who might be hesitant to try a new technology, all while minimizing costs to our County taxpayers. As these items cross several fields of expertise, this strategy has been crafted by GSA Fleet Services with support from GSA Facilities and the CEO's Office of Sustainability.

Our research has found that the County's CMP is the ideal next step in the electrification of County vehicles. The vehicles in the CMP are the most highly utilized vehicles in the County fleet, are centrally located at the Government Center, and are largely compact general use sedans with no customization. For this strategy, the EV that GSA Fleet has selected is the 2019 Chevrolet Bolt EV.

Current prices of EVs are higher than equivalently sized internal combustion engine vehicles. While there are cost savings that can be recouped over time, including fuel cost savings and reduced maintenance costs, many factors continue to keep EVs out of range based on current County policy regarding vehicle acquisitions. High acquisition costs for EVs, the significant infrastructure investment required, and the current low price of oil are examples of costs that GSA has sought to mitigate through outside funding and investment opportunities.

There are three opportunities for the County to reduce the cost of fleet electrification. The first is a reciprocal investment opportunity with Southern California Edison (SCE) through their Charge Ready Program to install, at their expense, a significant EV infrastructure with an approximate value of over \$327,000; the second, also offered by SCE, is a 25% rebate on the purchase price of the actual charging station hardware (a value of approximately \$7,332.50); and the third is a State of California Clean Vehicle Rebate Program rebate of \$2,500 per new EV (a value of \$35,000). While these three incentives significantly help to reduce the high costs of electrification, further funding is required to make this project cost competitive to the equivalent internal combustion vehicle. As such, GSA is asking for a one-time contribution from the General Fund to further offset the cost per vehicle and to purchase the EV charging stations required to participate in the SCE Charge Ready program. In the event that GSA is unable to participate in the Charge Ready program, GSA requests that the County provide funds for a capital project to cover the full cost of the installation of the EV charging stations.

This strategy lays out a proposal to purchase 14 EVs and 7 dual-port EV charging stations for use in the CMP. Assuming the approval of the SCE Charge Ready Program, GSA is asking for the following contributions to enable this project to go forward:

- \$146,668 in total to offset the purchase of 14 EVs, and the purchase/installation 7 dual-port EV charging stations:
  - \$63,000, representing \$4,500 per new EV contribution, which moves the purchase price of each EV to be cost-equivalent to a similar-sized internal combustion vehicle. This will offset the purchase of 14 EVs.
  - \$83,668 to purchase and install 7 dual-port EV charging stations.

## Current County Policy

The 2018 Administrative Policy Manual Chapter III-01 titled “Asset Management of County Vehicles Including Acquisition, Assignment, and Use” contains a specific clause on page 2 paragraph 1 which states, “Alternate technology vehicles shall be purchased and used in the County fleet when such vehicles are cost-effective and meet performance requirements.” Additionally, section I of the policy states: “Purchase price is just one factor in the buying decision. Total life-cycle costs, including anticipated fuel, operating and maintenance costs, will be considered, as well as residual value at the end of service life. Acquisition of vehicles should be the most cost-effective source...” These policy provisions require that GSA Fleet Services evaluate the total cost of ownership (TCO) among differing vehicle propulsion technologies and purchase the most cost-effective option that fulfills the mission of the vehicle. This strategy contains a TCO analysis and asks for a contribution to bridge the gap between the lower priced internal combustion vehicle sedan and the chosen EV for this project, the Chevrolet Bolt. Currently, the cost of one Chevrolet Bolt, including tax, is \$34,933 compared to an internal combustion Ford Focus SE sedan, including tax, priced at \$22,804. Assuming a \$2,500 rebate on the Chevrolet Bolt from the CA Clean Vehicle Rebate Program, the price difference is \$9,629. Accounting for anticipated fuel and maintenance savings over the lifespan of these vehicles, GSA is asking for a contribution of \$4,500 per Chevrolet Bolt to adhere to this provision of County policy.

# State of California Milestones / Nationwide Funding and Rebate Opportunities

## State of California Goals and Milestones

California has adopted increasingly robust goals and mandates to accelerate greenhouse gas emissions reduction. These measures have been accompanied by increased funding from the State's Cap and Trade revenues to accelerate the shift to clean and renewable fuels in both the energy and transportation sectors. Table 1 describes key state goals and mandates that address these sectors.

**Table 1: State of California Goals and Milestones to Address GHG Emissions Reductions**

<b>Policy Basis</b>	<b>Objectives</b>	<b>Goals and Milestones</b>
<b>Assembly Bill 32</b>	GHG Reductions	Reduce statewide GHG emissions level to 1990 levels by 2020
<b>Senate Bill 32</b>	GHG Reductions	Reduce statewide GHG emissions level to 40 percent below 1990 levels by 2030
<b>Senate Bill 350</b>	GHG Reduction, Equity	Mandated low-income barriers study for clean transportation; established 2030 GHG reduction target of 40 percent below 1990 levels
<b>Low Carbon Fuel Standard</b>	GHG Reduction	Reduce carbon intensity of transportation fuels in California by 10 percent by 2020
<b>State Alternative Fuels Plan</b>	Petroleum Reduction	Reduce petroleum fuel use by 20 percent below 2003 levels by 2020
<b>Executive Order B-30-15</b>	GHG Reduction	Reduce GHG emissions to 80 percent below 1990 levels by 2050
<b>Executive Order B-16-12</b>	ZEV Mandate	Accommodate 1 million EVs by 2020 and 1.5 million by 2025
<b>Executive Order B-48-18</b>	ZEV Mandate Update	Deploy at least 5 million zero emission vehicles (ZEVs) in California by 2030. Install 250,000 EV charging stations, 10,000 direct current (DC) fast EV charging stations, and 200 hydrogen refueling stations by 2025

## Funding, Rebate, and Incentive Opportunities

Meeting these ambitious goals will require GSA Fleet Services to turn its focus to the retirement of high-polluting internal combustion engine vehicles and their replacement with zero emission vehicle (ZEV) technologies – including battery electric vehicles, plug-in hybrid electric vehicles, and fuel cell electric vehicles. To enable that transition, there is an expanding suite of incentives from local, County, SCE and federal funding programs. Table 2 describes only some of the programs. Fleet Services will be pursuing outside sources of funding to the maximum extent possible. This table is accurate as of the date of publishing of this strategy.

**Table 2: Nationwide Funding, Rebate and Incentive Programs**

<b>Funding Amount FY 19/20</b>	<b>Funding Program</b>	<b>Funding Agency</b>	<b>Project Type</b>	<b>Notes</b>
<b>\$25,000</b>	<b>VC Clean Air Fund</b>	VC APCD	Any project that reduces air pollution	GSA Fleet Services is reviewing grant application requirements for fleet EV charging station funding.
<b>\$5,700,000</b>	<b>Carl Moyer</b>	VC APCD	Heavy-Duty Truck Replacement	Grant details still in development. Planned to cover 50% to 75% of funding, could be used for hybrids and charging infrastructure for heavy-duty vehicles. GSA Heavy Equipment ISF is reviewing lower emission vehicles for potential use of this grant in the future.
<b>\$5,000,000</b>	<b>VW Mitigation Trust</b>	BAAQMD	Light-Duty ZEV Infrastructure	100% cost for government public EV charging stations, 60% non-public EV charging stations. Intended to fill physical gaps in infrastructure and funding gaps in specific low-income localities. Funding applications closed 6/30/2019. \$5M allocation for FY19 just ended. No data on new funding.
<b>\$22,000,000</b>	<b>SCE Charge Ready Bridge Funding</b>	SCE	EV Infrastructure - at least 10 ports	GSA has submitted "Intent to Apply." Covers electrical infrastructure from transformer to stub-out and potential rebate from \$769 - \$1,538 for approved equipment.
<b>\$760,000,000</b>	<b>SCE Charge Ready 2 Proposal</b>	SCE	EV Infrastructure	SCE still in discussions with PUC. Not yet approved to accept applications.
<b>\$356,000,000</b>	<b>SCE Charge Ready Transport</b>	SCE	Medium- and Heavy-duty Trucks	Similar to SCE Charge Ready but for medium- and heavy-duty electric vehicles. GSA Heavy Equipment ISF is evaluating heavy-duty vehicles for EV replacement and will consider this grant as an option when appropriate.
<b>\$1000/vehicle</b>	<b>Clean Fuel Rebate</b>	SCE	EV Fleet	Per SCE site: Residents only, not for businesses. Vehicle title must be in a



				person's name. Not applicable to this strategy.
<b>\$TBD after 9/30/2019</b>	<b>ARFVTP</b>	CEC	EV Blueprint Implementation Projects	Possible \$100M to become available at a future time. No other specific data available.
<b>Proposed \$32,700,000</b>	<b>ARFVTP</b>	CEC	EV Infrastructure	Possible funding to become available at a future time. No other specific data available.
<b>\$17,500,000</b>	<b>CVRP and HVIP</b>	CEC	Advanced Fleet Technologies	ZEV rebate \$2,500 per vehicle; this is part of GSA Fleet Services cost mitigation for current strategy.
<b>Potential \$200,000,000</b>	<b>CALeVIP</b>	CEC	EV Infrastructure	Rebate program for property owners for EV infrastructure and EV charging stations in select counties. Not applicable to Ventura County.

## Considerations for Fleet Electrification

Key points and considerations for electrifying the County fleet are summarized below:

- Due to the comparatively high acquisition costs of EVs, a higher vehicle utilization rate for EVs increases the return on investment of those vehicles.
- EVs may not be appropriate for all types of fleet vehicles at this time, including public safety vehicles and large vehicles/heavy equipment.
- There is uncertainty surrounding the end-of-life cost considerations for EVs, including low resale value, battery replacement costs and cost of battery disposal.
- Available monies from grants, tax credits, rebates, etc. to help offset higher EV acquisition costs are changing and have specific requirements that the County may or may not qualify for.
- EV charging infrastructure is recommended to be placed at a 1:1 ratio with the number of EVs at each location, so that all vehicles can be charged adequately overnight. In most cases, the cost of installing infrastructure to support EV implementation is a significant factor in economic analyses, even when amortized over the expected life of the charging station.

## GSA Fleet Analysis

### Vehicles

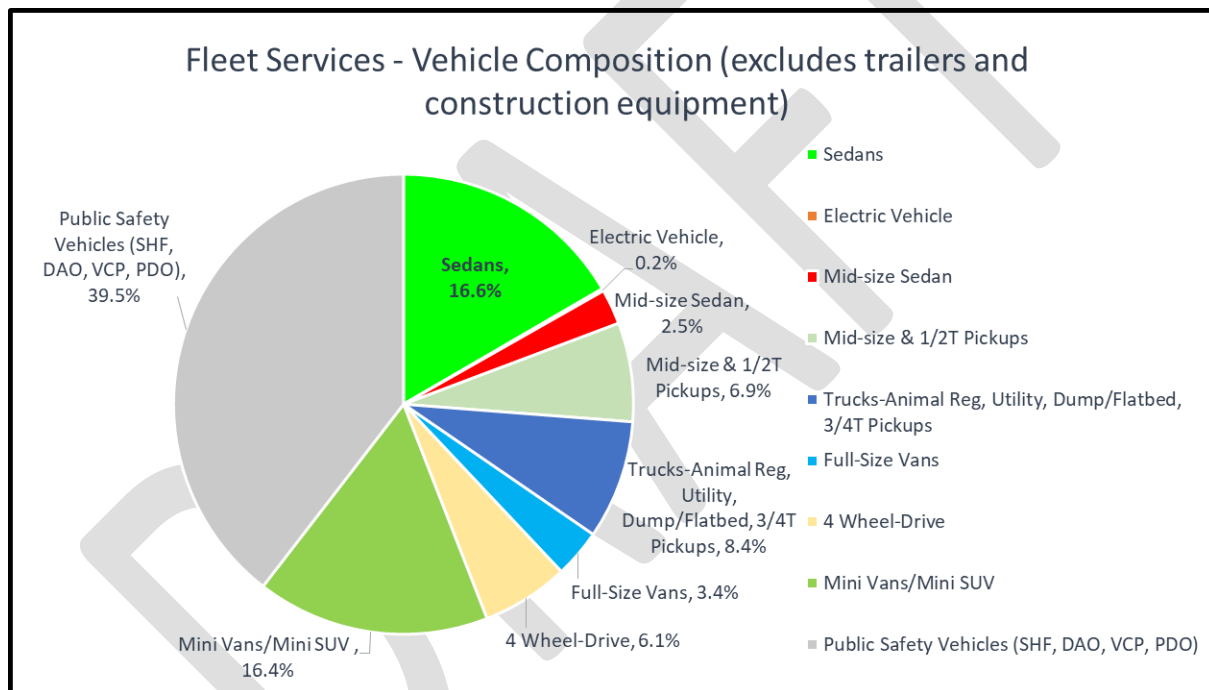
GSA Fleet Services and GSA Heavy Equipment departments currently manage over 2,100 cars, light-, medium-, and heavy-duty trucks, as well as light- and heavy-construction equipment. As mentioned above, not all vehicles and equipment would necessarily be appropriate candidates

for consideration to electric propulsion. Going forward, and with technology continually advancing, there may come a point in time where EV propulsion becomes available for most vehicle and equipment use.

### Current County Vehicle Makeup

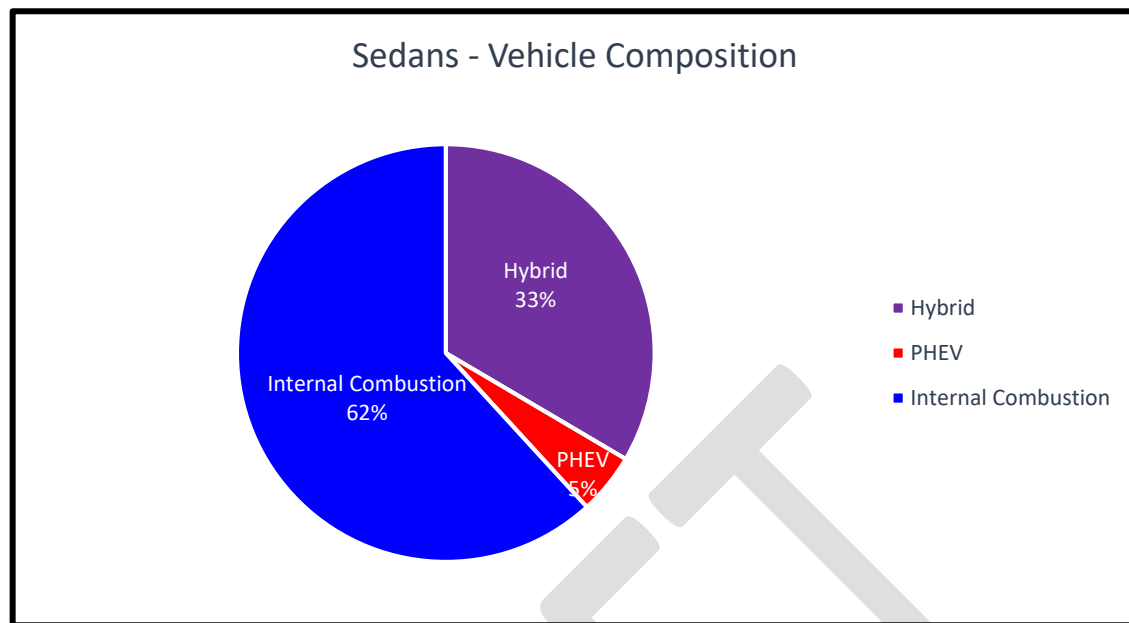
For Phase 1, staff looked at those vehicles that are most prevalent in the current fleet and are most likely candidates to consider for EV conversion in the near future, with consideration given to the market availability of vehicle model as well as the near-term prospects for newer models. Staff also considered different segments of the fleet and compared light-duty EV options in the CMP as well as the overall fleet. Figure 1 below shows the composition of the general Transportation fleet, excluding trailers and heavy construction equipment. This includes all vehicles in these classes estimated for replacement within the fleet. Figure 1 also shows that sedans are the best choice for consideration to EV transition.

**Figure 1: GSA Fleet Services Fleet Vehicle Composition**



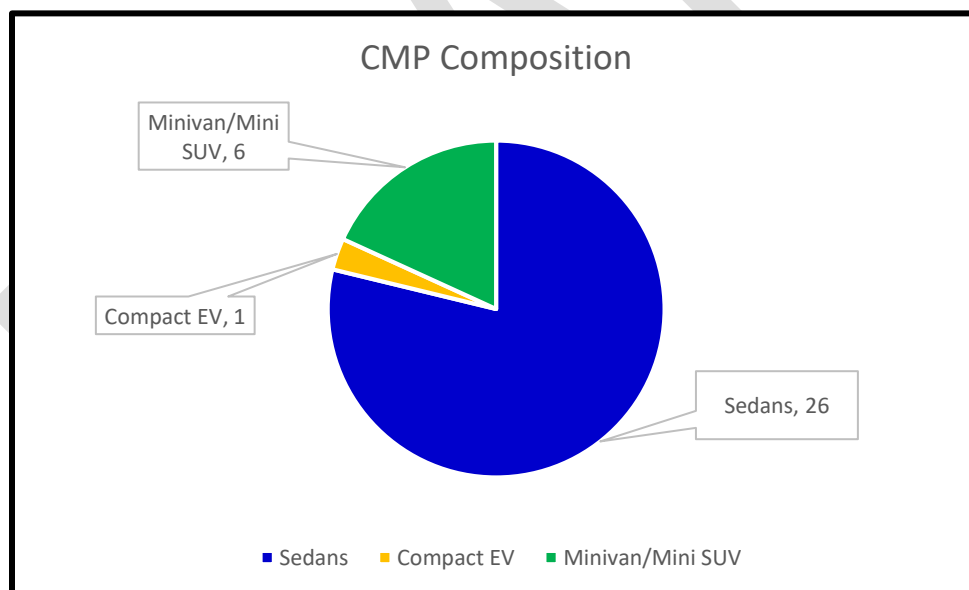
Of the sedans, the current composition in Figure 2 shows 95% of vehicles are internal combustion or internal combustion hybrids. This is the target for EV transition.

**Figure 2: GSA Fleet Services Sedan Vehicle Composition**



The composition of CMP vehicles is included in Figure 3 (sedans includes both compact and mid-size).

**Figure 3: GSA Fleet Services CMP Vehicle Composition**



### Why the Central Motor Pool Is Ideal

The CMP offers four key advantages over the County fleet in general:

- High Utilization
- Density of Demand
- Captivity of Demand
- Available EV Vehicle Options

## High Utilization

When choosing to transition fleet vehicles from internal combustion to EV, with the inherent cost premiums currently involved, it's vital to understand the utilization of vehicles being considered for transition to EV. Solely converting to EV for the sake of showing an increase in EVs in the fleet can have large and possibly detrimental economic effects on the departments that are assigned these EVs.

GSA Fleet Services employs telematics to collect vehicle data, including daily utilization. GSA Fleet Services has compiled this reporting into a rolling 12-month utilization review that provides GSA management as well as participating agencies with vehicle-by-vehicle utilization on a monthly basis. Telematics implementation is a rolling project with many agencies already having the telematics hardware installed. We have excluded the bulk of law enforcement and other public safety vehicle models as well as the heavy-duty vehicles and construction equipment from consideration at this time as their severity of use and power supply requirements preclude them from consideration for EV conversion due to the lack of current market availability of models that meet these requirements. This enabled Fleet to focus on the motor pool, and more specifically, the CMP, as the most logical group of vehicles to target for EV transitions. Table 3 shows utilization and cost per mile data for the 67 light-duty motor pool vehicles that were considered in our analysis.

**Table 3: GSA Fleet Services Motor Pool Utilization and Cost per Mile**

Utilization and Cost per Mile – Motor Pool	Average Utilization %	Vehicle Count	% of Vehicles	CAP Cost per Mile	TOTAL Cost per Mile
<b>CMP</b>	72.2%	33	49%	\$ 0.21	\$ 0.40
<b>RMP</b>	63.0%	34	51%	\$ 0.25	\$ 0.57
<b>Overall Motor Pool</b>	<b>67.6%</b>				

The cost per mile is lower for those vehicles with higher utilization, for example, in the CMP. Additionally, higher utilization helps reduce the payback period for those vehicles that are transitioned to EV. Overall utilization is a key component in the decision-making process as to which vehicles make the most financial sense to replace with an EV. The higher the utilization rate of an EV, the greater the return on the investment on those vehicles. The utilization of the most prevalent light-duty vehicles for the motor pool is shown in Table 4.

**Table 4: Motor Pool Light-Duty Utilization**

Vehicle Utilization	Sedans	Minivans/Mini SUVs
Motor Pool Vehicle Count	53	11
Motor Pool Utilization %	65.8%	70.8%

## Density and Captivity of Vehicle Demand

The logical, most efficient and cost-effective use of EVs is where vehicle demand is most prevalent and as captive as possible. The CMP represents the clearest density and captivity of demand, particularly when compared to the County fleet. While the County fleet is spread across all parts of the County, the CMP is in a single location positioned in the Government Center, in parking lot E, and in close proximity to both the Hall of Justice (HOJ) at the Hall of Administration (HOA). The parking locations, key boxes and current charging infrastructure presents ease of access to the densest population of County employees for whom travel is a necessary part of their job duties. GSA Fleet Services' Remote Motor Pools (RMP) also provide captivity of demand, though it is certainly less dense, as these RMPs are located at remote County work locations where the demand is highest and the departments working from these locations need access to vehicles, and additional assigned vehicles are too cost prohibitive.

## Current EV Availability

Domestic and foreign manufacturers have made gains in the availability and selection of EVs. For example, in 2012 there were only a limited number EV models available, all of which were small sedans with a range under 40 miles per charge, and a very high acquisition price. In the last seven years, there are more consumer and multipurpose EVs available, with some models exceeding hundreds of miles of range. Ventura County covers over 1,800 square miles, from sea level to 8,835 feet of elevation, with wildly variable weather conditions between locations. It is not uncommon for the temperature to be near 70 along the coast and over 100 degrees at inland locations such as Piru and Simi Valley. CMP services are available to all County agencies, each with differing transportation needs and locations of operations. Due to these factors, Fleet Services has limited the available EVs for evaluation to those EVs with 200 miles of range and greater. This allows for a vehicle to be used throughout the County for a full day, while using full climate control systems, without range anxiety. It also allows for the vehicle to be used by multiple customers during the same day when there is no time to recharge in the middle of the day. Our goal is to eliminate range anxiety as a potential limitation to widespread EV adoption. GSA Fleet Services reviewed the following EV compact sedan models in Table 5 for this strategy.

**Table 5: EV Compact Sedan Models**

Model	Est. MPGe
2019 Nissan Leaf (62kw)	226
2019 Hyundai Kona	258
2019 Chevrolet Bolt	238
2019 Kia NIRO	239

Table 6 summarizes the attributes of the Countywide fleet vs. the CMP as evaluated by GSA Fleet Services and represents the best vehicle attributes for EV conversion. Based on this information, and as illustrated in the table, sedans in the CMP represent the most complete vehicle type for EV conversion.

**Table 6:Error! Bookmark not defined. EV Attributes by Type**

<b>EV Attributes by Type: Countywide</b>	<b>Sedans</b>	<b>Minivans/Mini SUVs</b>
<b>Utilization (60%+)</b>	NO	NO
<b>Density of Demand</b>	NO	YES
<b>Captivity of Demand</b>	YES	NO
<b>Available EV Option</b>	YES	NO

<b>EV Attributes by Type: CMP</b>	<b>Sedans</b>	<b>Minivans/Mini SUVs</b>
<b>Utilization (60%+)</b>	YES	YES
<b>Density of Demand</b>	YES	YES
<b>Captivity of Demand</b>	YES	NO
<b>Available EV Option</b>	YES	NO

### Vehicle Procurement Costs

While EV acquisition costs have been moderating somewhat as more vehicles become available, EV acquisition costs continue to be priced above currently available internal combustion engine vehicles. The vehicles listed in the previous section are shown in Table 7 at their current price points as compared to a current GSA Fleet Services standard internal combustion replacement.

**Table 7: Internal Combustion Engine vs. EV Acquisition Cost Comparison**

<b>Model</b>	<b>Est. MPG(e)</b>	<b>Acquisition Cost*</b>
2019 Ford Focus SE (Internal combustion) Sourcewell**	30	\$22,804
2019 Nissan Leaf EV 62kw (Sourcewell)	226	\$36,550
2019 Hyundai Kona EV (Sourcewell)	258	\$36,950
2019 Chevrolet Bolt EV (State Contract)	238	\$34,933
2019 Kia Niro EV (MSRP)	239	\$38,500

\*Prices are exclusive of any potential rebates, manufacturers' incentives, or tax credits, but include applicable sales tax. \*\*Sourcewell is a GSA Procurement cooperative purchasing source.

Using current acquisition costs, the premium represented between the current internal combustion vehicle price and the EV price would generate an average acquisition cost increase of \$13,929 per vehicle. Assuming replacement of one-eighth of the compact sedans annually (for planning purposes eight years was used as the predicted useful life), this represents

approximately \$432,000 per year in increased vehicle acquisition costs alone. This would be in addition to any additional infrastructure costs associated with charging capacity.

## Assumptions

At the writing of this report, GSA Fleet Services made the following assumptions:

- Conversion to EVs will be a rolling-project with assumptions/conclusion being updated as new technology and data becomes available
- Purchase of vehicles is the current and preferred model of vehicle acquisition
  - Vehicle leases can be considered but tend to increase total cost of ownership over time
  - Leasing to gain the federal tax credit is complicated for both Fleet and vendor and more costly to the County when considering total life-cycle costs
- As a municipality, the current federal EV tax credit is unavailable with direct acquisition
- The current CA Clean Vehicle Rebate Project rebate *may* be available

## Infrastructure

### Charging Station Availability

There are EV charging stations within the CoV. GSA Fleet Services has 14 currently in Lot E at the Hall of Administration for use in charging plug-in hybrid vehicles in the CMP. Other EV charging stations are located throughout the County at various sites – both Fleet-owned for motor pool use, or available to the public for public use. See Table 8 for CoV charging capacity and locations.

**Table 8: CoV – EV Charging Station Location and Capacity**

Charging Station Location	EV Charging Capacity	Public/Fleet
Gov't Center - Lot 'E' CMP	14	Fleet
Gov't Center - Lot 'E'	3	Public/Fleet
Gov't Center - Service Bldg.	2	Public
669 County Square Drive	2	Public
1400 Vanguard	2	Public
4651 Telephone Road	2	Public
1911 Williams Drive	2	Public
Todd Road Jail	2	Public
855 Partridge Drive	2	Public

Harbor	2	Public
Inactive - ECCH / JC	4	Inactive
<b>Total Current Charging Capacity</b>	<b>37</b>	

## EV Charging Infrastructure

### Cost to install

GSA Facilities and Materials is developing plans to construct 7 dual-port EV charging stations in Lot E of the Government Center to support EVs in the County CMP. The infrastructure for the EV charging stations can be funded in one of two ways: 1) through the Southern California Edison Charge Ready Program (if approved) at no cost to the County as described below (with the exception that the County is responsible for the cost and installation of the actual EV charging stations), or 2) through a capital project funded by the County.

GSA has submitted an intent to file with SCE for the Charge Ready Program. Under this program, SCE will install the infrastructure necessary to install new EV charging stations on County property. The cost for installing this infrastructure has been a significant hurdle in the past. Once SCE has approved the site, they will implement a design/build contract using one of their contractors. County personnel are involved in the design and give final approval for the installation. SCE's contractor will install new electrical service, including a step-down transformer, electric meter and electrical switchgear. The contractor will also install the branch wiring to the point of connection for the EV charging stations.

In order to participate in SCE's program the County will need to agree to the following:

- The County will be required to grant SCE a property easement where the infrastructure is installed. SCE currently has an easement for other infrastructure and granting a new easement should not present any issues.
- The County will also need to agree to prove that we are purchasing appropriate EVs to utilize the new charging stations and to purchase EV charging stations that have been approved by SCE.
  - SCE published a list of approved EV charging stations; this list contains units that GSA Fleet Services finds acceptable for our purposes.
- The County will need to agree to a new electrical service account dedicated to the EV charging stations. This requires:
  - The County to be responsible for the account
  - The County accept participation in a demand response program for the new account
  - The new EV charging stations must be networked, and the County will need to allow SCE to access trend data from the network
- GSA is presenting this program to the Board of Supervisors for approval concurrently with the presentation of this EV strategy.



- Fleet Services will coordinate with GSA Facilities and Materials to select an SCE-approved EV charging station as specified by the SCE Charge Ready Program.

GSA Facilities and Materials’ estimate to install the supporting infrastructure and EV charging stations, if GSA Facilities and Materials performs the work using County funds, is \$418,000. Using our estimate, we estimate SCE’s cost to provide the infrastructure to be about \$327,000, and an SCE rebate on the EV charging stations of about \$7,332. We estimate GSA’s costs for the EV charging stations and their installation to be about \$83,668.

## Cost/Benefits Assessment

### Environmental Benefits

Some things to evaluate when considering the benefits of EVs include:

- Reduced fossil fuel use
- Reduction in greenhouse gas (GHG) emissions
  - Zero vehicle emissions
    - Charging power source
    - Power mix from source

### Reduced Fossil Fuel Use

Using a three-year average for fuel consumption for the 14 internal combustion vehicles to be replaced by EVs, the fuel cost savings provided by replacing with EVs is shown in Table 9.

**Table 9: CoV – EV Charging Station Location and Capacity**

<b>CMP Vehicles to be Replaced with EV</b>	
Average Annual Miles per CMP Sedan	9,444
Average MPG per CMP Sedan	28
Average Gallons of Fuel per CMP Sedan	337
Estimated Fuel Price per Gallon (PPG)	\$3.29
<b>Estimated Annual Savings per Vehicle</b>	<b>\$1,110</b>

Replacing 14 internal combustion vehicles with EVs will generate an annual reduction of 4,721 gallons of fossil fuel use and an annual fuel cost savings of \$15,540.

### Net Reduction in GHG Production

Driving an EV has obvious climate benefits, most notably zero tailpipe emissions. But because EVs are charged by power grids that may burn fossil fuels, they aren’t necessarily zero-carbon. The emissions-reduction potential of EVs will be affected by the charging source’s power mix. The “cleanliness” of the power mix when charging EVs is based on the availability and composition of “clean” power being provided from sources other than fossil fuels. Based on data

provided by CoV CEO's office regarding the CoV's power mix as well as the Clean Power Alliance, it's estimated that CoV will produce zero carbon emissions when charging the EVs. The 14 EVs should produce zero GHG emissions (see Table 10).

**Table 10: CoV – EV Charging Station Location and Capacity**

<b>COMPACT SEDAN Fuel Economy Estimates</b>	<b>Fuel Economy</b>	<b>Annual Avg. CMP Sedan Miles</b>	<b>CO<sub>2</sub> Emissions (g/mile)</b>	<b>Est. CO<sub>2</sub> Annual emissions (grams/vehicle)</b>	<b>Est. CO<sub>2</sub> Annual emissions (lbs./vehicle)</b>
Internal Combustion	27 mpg	9,444	410	3,872,040	8,536
EV (MPGe)	118 mpg(e)	9,444	0	0	0
		<b>CO<sub>2</sub> Reductions (per vehicle):</b>	<b>-410</b>	<b>-3,872,040</b>	<b>-8,536</b>

The amount above is per vehicle. We are projecting to replace 14 internal combustion vehicles with EVs in CMP. For the 14 replacements, the County will realize an estimated decrease of 119,504 pounds of CO<sub>2</sub> emissions annually. That converts to a reduction of over *54 metric tons* of annual CO<sub>2</sub> emissions.

### Cost Considerations

As detailed earlier, the costs of EVs are still significantly higher than a comparable internal combustion vehicle. It is difficult to place a dollar amount on GHG reductions, but we can detail the other cost savings components of transitioning from internal combustion vehicles to EVs.

### Reductions in Maintenance Costs

An EV will contain about 30% fewer parts that need to be maintained compared to an internal combustion vehicle. Industry standards provide an estimate for the cost related to maintaining internal combustion vehicles and EVs. This maintenance reduction factor varies between fleets in multiple studies from less than 20% to over 60%. For this report, we used 3 industry studies\* of 4 sets of actual historical maintenance costs as well as GSA Fleet Services' own costs, comparing internal combustion vehicles and EV costs. We averaged the cost reduction factors from these studies and arrived at a *maintenance reduction factor* of 37%. Using this factor, the estimated savings from a reduction in maintenance costs is shown in Table 11.

**Table 11: Reductions in Maintenance Costs**

Average Annual Maintenance Estimates	Sedans
GSA Fleet 3-Year Internal Combustion Average	\$1,083
Electric Vehicle (37% reduction factor applied)	\$682
<b>Potential Annual O&amp;M Savings</b>	<b>\$401</b>

\*Electric Power Research Institute (EPRI), 2013; University of Michigan's Transportation Research Institute, 2018; InsideEVs "CAP HPI EV Servicing Costs Report", 2018; GSA Fleet Services 3 YR Avg. Costs

Replacing 14 internal combustion vehicles with EVs will generate an estimated average annual savings of \$5,614 relating to operations and maintenance costs.

### Driver/Behavior Considerations

A successful EV program engages the drivers with the vehicles to understand the differences in their operations and to answer any questions and concerns the drivers may have.

In this report, we will look at the concerns County employees have regarding EVs and strategies to overcome these concerns. We recognize that County vehicles are tools that allow County employees to complete their jobs, and when a vehicle is unable to transport the employee to their destination, that job goes unfulfilled. The two largest areas of concern for our County drivers are range anxiety and being unfamiliar with how an EV operates.

### Range Anxiety

Range anxiety of the County workforce is the largest obstacle to overcome for the successful adoption of EVs. Understanding that Ventura County is a widespread county with differing climates and topographies, our County vehicles must be able suit the needs of a wide array of different services offered by County government.

The County of Ventura purchased 3 Ford Focus EVs in 2015. New, these vehicles had a range of 100 miles on a full charge, but as batteries degrade over time the range of these vehicles has reduced to mid-70-mile ranges. Other factors, such as use of climate control, heated seats, aggressive driving and the previous day's driver forgetting to plug in the vehicle further reduce the vehicle range.

We have implemented a selection criteria for a new EV to have a range of 200 miles or greater when placed in a shared vehicle motor pool. This will allow for the battery to degrade over time while still having a useful range for the vast majority of County business. The longer range also allows for employees to feel more comfortable by using climate control systems and allows mistakes to be more forgiving, such as an employee forgetting to plug in at the end of the day. Additionally, all EV charging stations installed will be Level 2 or greater, which allows for a full vehicle charge via off-peak overnight charging.

## Driver Unfamiliarity

Electric vehicles can be unfamiliar and somewhat intimidating to new drivers. Some things that can confuse a new driver is the lack of vehicle startup noise, adjusting to a range meter instead of a fuel gauge, regenerative braking (and one-pedal operation on some models) feeling different than conventional brakes, instant torque power upon vehicle launch, and plugging in the vehicle upon arrival at a parking space with an EV charging station, among others.

As we did with the rollout of the Chevrolet Volts in the CMP, Fleet Services will provide operator videos available from the CMP website showcasing overall vehicle operation and specific functions that may be unknown or confusing to the new EV driver. Fleet personnel will be available during the rollout to answer any questions our customers may have, and Fleet Services is also available to help with any issues by calling the central office line at (805) 672-2060.

## Technician Training

GSA Fleet Services is a certified warranty repair facility for Ford and General Motors. This allows Fleet Services to repair vehicles under warranty for credit when the turnaround time for a dealership repair is too lengthy. These programs also allow Fleet Services to purchase vehicle repair library materials and vehicle-specific tools from the manufacturer. There are non-original equipment manufacturer (OEM) training courses available that go over generic repair procedures for EVs but do not provide vehicle-specific information.

There is a risk involved with purchasing vehicles that cannot be repaired in-house by Fleet Services. Those risks include increased repair costs and the potential for lengthy delays in service. It is a goal of Fleet Services to be able to repair all general use vehicles in-house.

GSA Fleet estimates that they will need to purchase approximately \$11,000 of necessary tools and equipment that GSA Fleet currently does not own in order to complete in-house repairs on the Chevrolet Bolt. GSA Fleet Services has also started the process of requiring technician training for EVs. When completed on-site by non OEM vendors, these training classes cost \$3,500 per class (regardless of the number of technician participants). GM offers 5-7 OEM classes to become fully trained on this new technology. These classes are offered both online and in a hands-on environment, and there is no limit to the number of technicians who can access the training. This is already part of Fleet Services' annual maintenance and diagnostic subscription contract with GM each year. The estimate for the total cost for tools and training for GSA Fleet technicians is approximately \$14,500-\$18,000.

## EV Selection Payback Periods

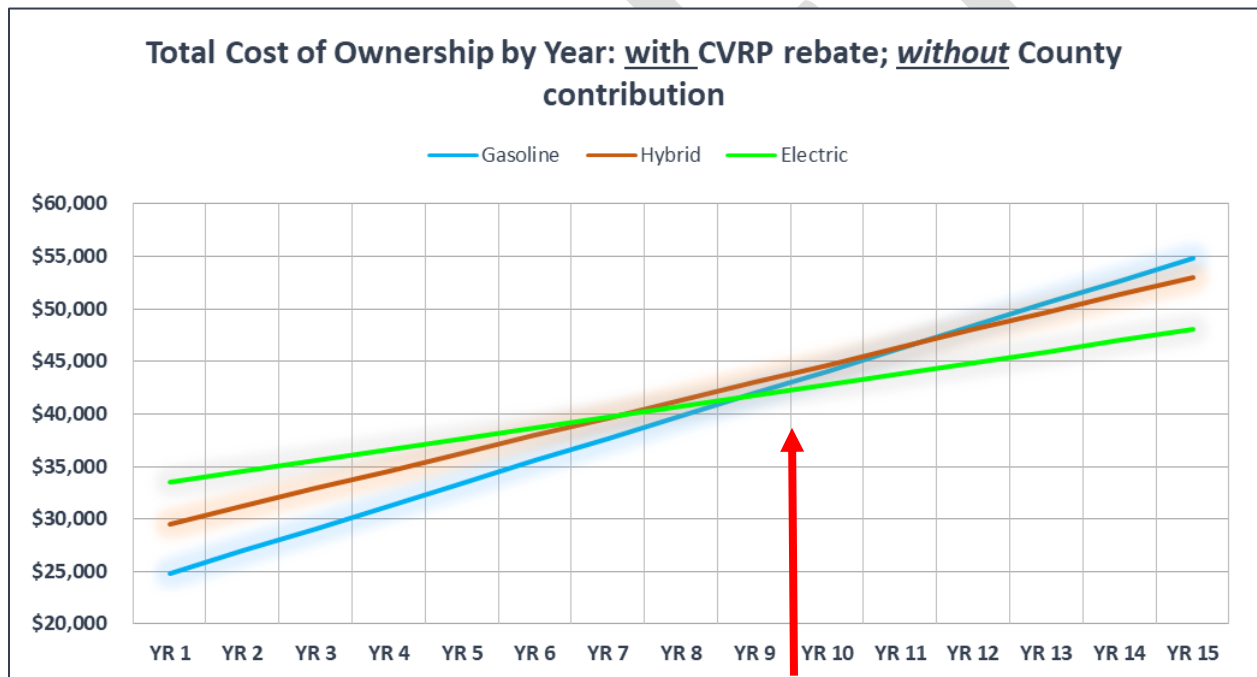
After the review and analysis above, GSA Fleet has selected the 2019 Chevrolet Bolt EV for our vehicle of choice for this initial EV purchase. While its features and battery range are comparable with the other EVs we reviewed, the fact that GSA Fleet is already a GM-Certified Repair Facility has placed the Bolt above the other vehicle options. This decision allows GSA Fleet Services to quickly access vehicle-specific training materials and tools from the manufacturer, allowing our technicians to safely work on these vehicles in-house as opposed to becoming reliant on outsourcing repairs and maintenance to local dealerships. Using all of the data above, along with the purchase price of the Chevrolet Bolt, we have constructed Total Cost of Ownership (TCO)

figures for estimated payback timeframe *with* the State of California's Clean Vehicle Rebate Project (CVRP) rebate, and *with* and *without* a contribution from the County (see Tables 12 and 13, and Figures 4 and 5). Please note that these figures do not estimate costs associated with EV end of life, such as resale value and the potential for battery replacements.

**Table 12: Inputs for TCO Calculation without Contribution**

Inputs	
CVRP Rebate	\$ (2,500)
Contribution	\$ 0
Fuel Cost	\$ 2.77
Electricity Cost (kWh)	\$ 0.15
Miles Driven per Year	9,444

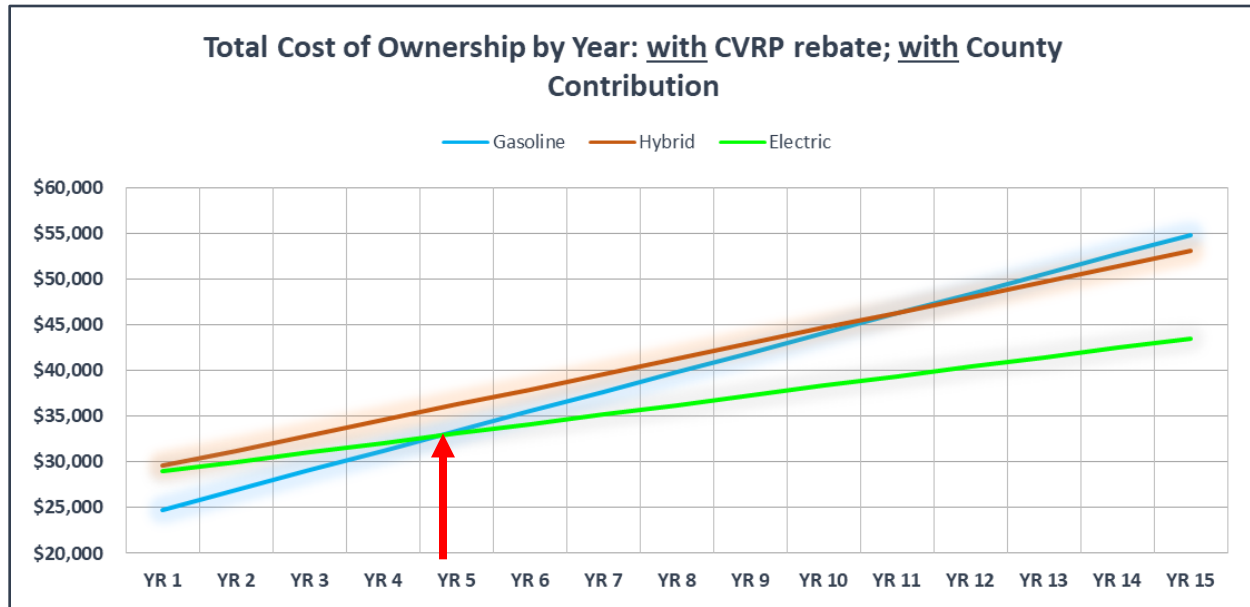
**Figure 4: With: CVRP Rebate per Vehicle; without Contribution: Payback: Year 9**



**Table 13: Inputs for TCO Calculation with \$4,500/Vehicle Contribution**

Inputs	
CVRP Rebate	\$ (2,500)
Contribution	\$ (4,500)
Fuel Cost	\$ 2.77
Electricity Cost (kWh)	\$ 0.15
Miles Driven per Year	9,444

Figure 5: With: CVRP Rebate per Vehicle; with County Contribution per Vehicle: Payback: Year 5



## Transition Plans and Timelines

GSA Fleet Services proposes a targeted and phased approach to the electrification of the County fleet, with multiple work streams operating concurrently to address EV transition obstacles. This phased approach prioritizes vehicles with high utilization, parking locations with high vehicle density, and parking locations with existing or easily installed charging infrastructure.

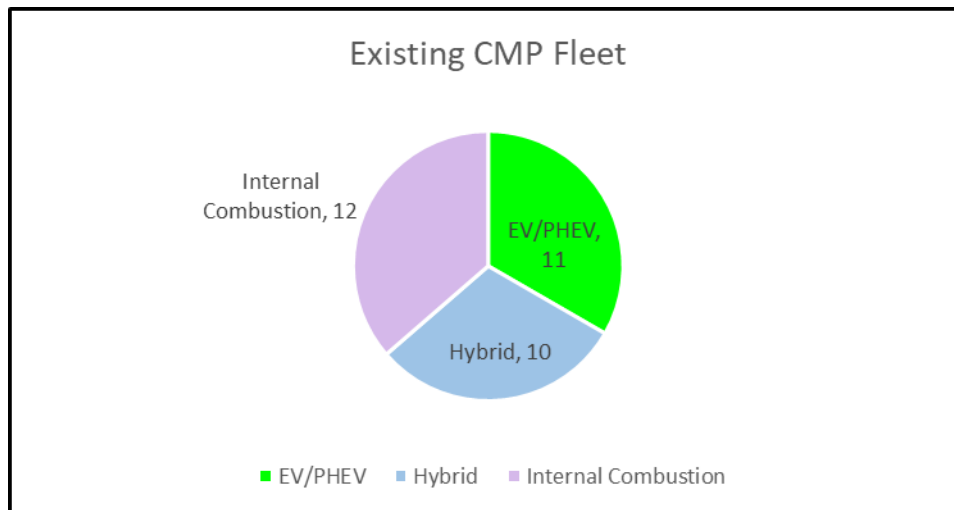
Our analysis highlights the County CMP, located at the Government Center, as the logical location to start this project. The CMP has a very high utilization rate of ~70%, existing charging infrastructure, and the ability to expand charging infrastructure relatively easily.

### Central Motor Pool

The timeline for electrification of the CMP is largely dependent on the installation of the charging infrastructure and County funding. The process to order and take delivery of a vehicle takes 12-18 weeks whereas infrastructure improvement timelines are lengthier, with current estimations at 28 weeks. Ideally, we would work these project streams concurrently so that vehicle deliveries coincide with new EV charging stations coming online.

The current composition of the CMP fleet is detailed below. It is a mix of compact vehicles, compact hybrid vehicles, mid-size vehicles, mid-size hybrid/PHEV vehicles, minivans and a hybrid mini SUV. The existing and proposed future composition of CMP vehicles can be found in the Figure 6 and Figure 7.

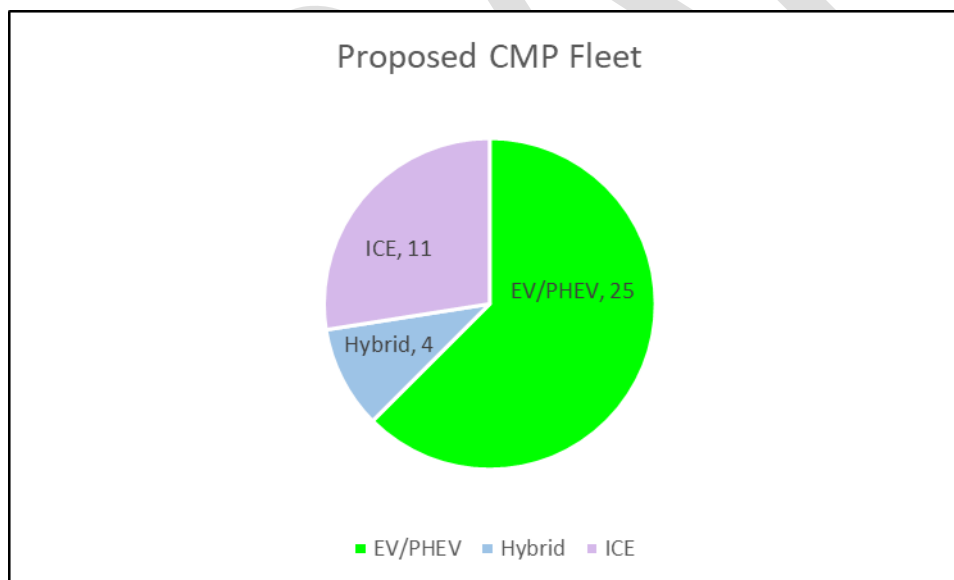
**Figure 6: Existing CMP Fleet**



Existing CMP Composition – 33 Vehicles

- 1 - EV Vehicle
- 10 - PHEVs
- 9 - Hybrid compacts/sedans
- 1 - 4WD Mini SUV Hybrid
- 3 - Compact (internal combustion)
- 6 - Minivans (internal combustion)
- 3 - "Travel" sedans (int. combustion)

**Figure 7: Proposed CMP Fleet**



Proposed CMP Composition - 40 Vehicles

- 15 - EV Vehicle (+14)
- 10 - PHEVs (unchanged)
- 1 - 4WD Mini SUV Hybrid (unchanged)
- 3 - Mid size Hybrid sedans (unchanged)
- Replace 12 older vehicles
- Add two (2) additional EV sedans
- 8 - Minivans (+2)
- 3 - "Travel" sedans (unchanged)

A plan to replace some of the current internal combustion vehicles with EVs, as well as adding additional EVs into the CMP would represent forward progress towards adding EVs to the County fleet.

## Future Phases

### Remote Motor Pools (RMP)

Electrification of the RMP is more challenging than electrification of CMP; however RMP electrification is the next ideal candidate due to high utilization of the current vehicles. None of these challenges are insurmountable with proper research and planning.

- The most noteworthy is the ownership of the property on which charging infrastructure must be installed.
  - The County leases multiple locations where remote motorpool vehicles are located which presents a challenge for investing in charging infrastructure.
  - Infrastructure modifications may not be approved for non-County owned locations
  - The terms (length, etc.) of a given lease may make the County reluctant to invest in the infrastructure necessary at leased facilities.
- RMPs, by their nature, are mobile. Vehicles from a lower-performing location can be moved to an RMP location that needs more vehicle access. Once we invest in EV charging stations at a given location, we will be less able to move vehicles to another site.
- For County owned property, the same timeframe as CMP would apply from acquisition to in-service, subject to the installation of the infrastructure.

### Light-Duty Truck Fleet

Other electrification technology is emerging to equip the small- and medium-size truck market. While the fully electric truck is still in the research and development phase, plug-in hybrid (PHEV) technology is available as a third-party upfit item on Ford F150 and F250 model trucks as well as the Chevrolet cargo/passenger vans and the Ford Transit cargo/passenger vans via XL Hybrids. GSA Fleet is currently reviewing the technology provided by XL Hybrid's electrification solutions. XL Hybrid's technology allows hybridization without interrupting the OEM powertrain, while improving vehicle MPG and helping to meet sustainability goals. Currently, this option is not economically viable. We will continue to review this option, but GSA Fleet is hesitant to dedicate a portion of the light-duty truck fleet to a long-term (8-10 year) hybrid solution when there are projections for a factory-built hybrid coming available in 2020 and a full EV option projected in the next 2-5 years.



## Other County Agencies and Departments

Fleet Services will investigate other agencies to determine if they have any vehicles that may be candidates for transition to EV. Factors that will be considered, include vehicle density, vehicle utilization rates, vehicle mission/purpose and overall agency vehicle utilization.

## Emerging Technology

In the near term, vehicles in development include a 5-passenger minivan and a half-ton pickup truck. Current manufacturers' projections are that these vehicles may be available sometime after 2020 for the minivan and 2022 for the pickup truck.

Heavy construction equipment conversions are also in the research and development phase where hybrid electric motors are powered by a diesel engine and power to the tracks and implements are powered by the electric motor.

## Closing/Summary

The General Services Agency supports the electrification of the County fleet through a data-driven methodological approach that prioritizes highly utilized vehicles in centralized County-owned locations, while also watching this emerging market for future electrification options. We strive to procure these vehicles/equipment within the constraints of County policy and ISF limitations by asking for a contribution when the current market offerings are not cost-effective. As prices for EVs and EV charging stations continue to come down, and as we are able to collect more robust data on County EVs, this contribution ask should reduce over time and will need to be re-evaluated at each individual phase of the electrification plan.