Electric Vehicle Accelerator Plan for the City of Oxnard

July 5, 2019

Prepared by Ventura County Regional Energy Alliance, Community Environmental Council, and EV Alliance

Funded by the EV Ready Communities Challenge Grant from the California Energy Commission

Contents

Introduction and Context

Electric vehicles (EVs) powered by renewable electricity have major benefits and the potential to make a significant impact on the City of Oxnard's emissions and sustainability goals. EVs represent a transformative opportunity for clean mobility for many reasons:

- **Emissions:** EVs produce zero tailpipe pollution, providing clean air benefits. When charged from Clean Power Alliance's 100 percent Green Power tariff, which is the default option in the City of Oxnard, EV owners will be able to drive on electricity that is either emissions-free or for which emissions have been offset.[1] When charged on Southern California Edison's (SCE) current grid mix, EVs reduce greenhouse gas (GHG) emissions by approximately 75 percent per mile compared to a gasoline car, and emission reductions will increase as SCE makes progress toward California's 100 percent clean energy by 2045 mandate.
- **Cost savings:** When charged during off-peak hours on Clean Power Alliance's or SCE's Time-Of-Use (TOU) rate plan, fuel costs for EVs in the City of Oxnard are approximately one-third the cost of diesel or gas. Reduced spending on gasoline is associated with increased local economic development, as fuel cost savings are often spent at local businesses.
- **Maintenance:** EVs have fewer moving parts, resulting in a lower maintenance burden and costs.
- **Driving Experience:** With plentiful torque and quiet, powerful acceleration, EVs provide an excellent experience for passengers, whether in electric sedans or electric buses.
- **Grid Benefits:** By charging when electricity is inexpensive, renewable, and abundant, and reducing charging during times of peak load, EVs can help balance the electric grid.

The State of California recognizes these benefits. In Executive Order B-48-18, Governor Brown established a goal of 5 million Zero Emission Vehicles (ZEVs) on California's roads by 2030.[2] The State also recognizes the many challenges to early EV adoption and has incentives and extensive programs and funding opportunities for all sectors. As additional Cap and Trade funding and other revenue sources become available, the State is developing new and innovative programs to surmount barriers to EV adoption. Prepared cities can win much of this first come, first served funding, in addition to supporting their residents in leveraging the multitude of benefits of EVs. It is also worth noting that cities like Oxnard with significant Disadvantaged Communities are eligible for special funding carve-outs through State of California programs.

To bring the benefits of EVs to the City of Oxnard, this fleet transition plan addresses two critical nexuses of change:

- **Community Electrification:** Governor Brown set a goal of 5 million ZEVs on the road by 2030. This section explores EV uptake among residents and businesses of Oxnard, and how close the community of Oxnard is to meeting its portion of this goal. We also examine what level of growth and annual uptake in EV purchases will be required to meet this goal. Finally, this section explores what level of charging infrastructure will be required to support expected levels of EV adoption and how the City of Oxnard can support anticipated community demand for charging stations.

[1] "Ask Ventura City Hall: Who is my new energy provider?" Ventura County Star, January 20, 2019. https://www.vcstar.com/story/news/2019/01/20/ventura-city-hall-clean-power-alliance-renewable-energy-electricity-southern-california-edison/2628151002/

[2] Full text of Executive Order B-48-18 available at https://www.gov.ca.gov/2018/01/26/governor-brown-takes-action-to-increase-zero-emission-vehicles-fund-new-climate-investments/.

- **City of Oxnard Fleet Transition:** The second component of this plan explores opportunities for electrification within the City of Oxnard's fleet. The city has 850 vehicles and equipment and has made initial strides towards electrification with an investment in 38 hybrids and 20 plug-in electric vehicles. The fleet plan explores additional 'quick wins' for electrification, through which the city can take advantage of the cost savings of EVs without deviating from existing vehicle duty cycles. The plan also explores how the city could electrify one eighth of its fleet, in line with California's 2030 goal, given the availability of electric pickup trucks in 2020. Finally, this section explores what barriers would need to be overcome for 100 percent fleet electrification.

Community Electrification

EV usage by community members of the City of Oxnard is crucial to enabling California to achieve its ZEV goals. This section of the City of Oxnard EV Transition Plan explores the current status of EV adoption within the city and levels of adoption required to meet Oxnard's portion of California's 2030 goal. Critical to widespread EV uptake is the availability of ample charging infrastructure. This plan surveys existing charging infrastructure and compares it to state projections for levels required by 2030.

Proposed targets to implement the City of Oxnard EV Accelerator plan include:

- 26,562 ZEVs registered in the City of Oxnard by 2030 (an increase of over 26,100)
- Adding at least one DC Fast Charger port per year in the City's jurisdiction, beginning in 2019 to reach 2025 minimum charging infrastructure targets, with significant emphasis on DC Fast Charger stations development along major travel corridors other than U.S. 101 (such as Fifth Street, CA-1, Ventura Road, C Street, Hueneme Road)
- Adding an average of 82 Level 2 charging ports per year from 2019 to 2025 to reach the proposed 2025 minimum charging infrastructure targets, with significant emphasis on station development that will close large gaps in the city's charging network
- Transition one eighth of the City fleet to EVs by 2030; based on the number of vehicles in the City fleet as of 2019, the City would needs to transition at least 63 of their 665 vehicles to meet the one-eighth target since there are already 20 EVs in the City fleet)

Proposed polices and actions to support attainment of these targets include:

- Institute a "One Mile, One Charger" policy to prioritize infrastructure development that will close gaps in the charging network and ensure equitable access to EV charging
- Establish a ZEV policy requiring departments to purchase light-duty vehicles according to the following priority structure, as modeled after the state Department of General Services vehicle procurement policy: (1) pure ZEVs, (2) plug-in hybrid EVs, and (3) hybrids. This will ensure that ZEVs and hybrids are the first option considered for new vehicles. To make the ZEV first policy binding, the City should implement additional policies to:
    - Require that the proposed procurement for each non-ZEV or hybrid option includes a written justification explaining why the department was unable to select a ZEV for the fleet vehicle
    - Centralize fleet procurement authority for the City with an appropriate department head, so they can review the selected vehicles proposed for procurement, approve vehicles as

appropriate, and require revisions of selected vehicles if the justification for non-ZEV or hybrid options is lacking

- Engage with or become a local government member of Electric Drive 805, the region's electric vehicle collaborative.
- Track the California Division of Measurement Standards updates to proposed regulations for electric vehicle charging systems since this could impact options for charging rate strategies

EV Adoption in Oxnard

To date, City of Oxnard have been slow to embrace EVs, and sales within the city have lagged behind California as a whole. As of January 2018, Oxnard was home to 129,825 vehicles. Of these, only 208 were full battery electric, with an additional 252 plug-in hybrid electric vehicles. These vehicles, in addition to the two fuel cell vehicles registered in the city, compose the 462 ZEVs in the City of Oxnard overall.

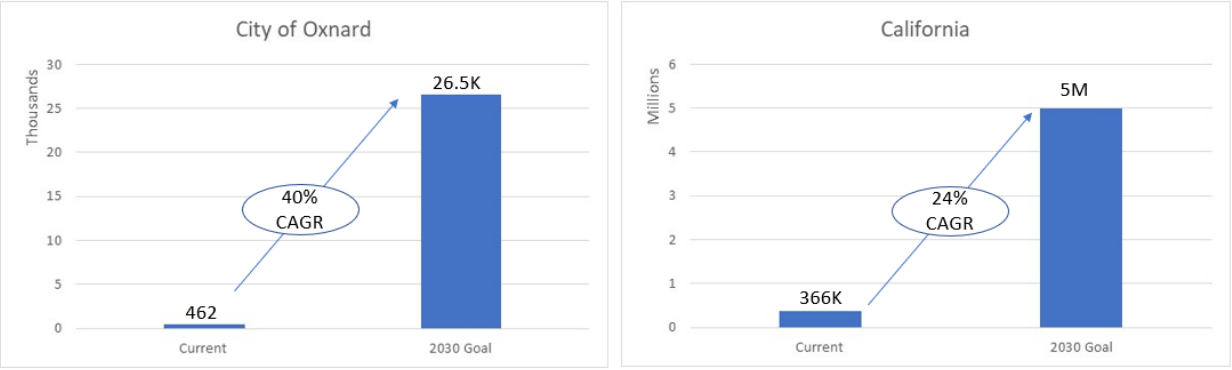
City of Oxnard Vehicle Inventory

Fuel Type	Count	Percent
Battery Electric	208	0.2%
Diesel	4,195	3.2%
Diesel Hybrid	0	0.0%
Ethanol	7,265	5.6%
Gasoline	115,465	88.9%
Fuel Cell	2	0.0%
Hybrid Gas	2,273	1.8%
Plug in Hybrid	252	0.2%
Butane	0	0.0%
Compressed Natural Gas	51	0.0%
Methanol	48	0.0%
Methane	0	0.0%
Natural gas	55	0.0%
Propane	11	0.0%
Total Plug-in EVs	460	0.4%
Total Zero-Emission Vehicles	462	0.4%
Total Vehicles	129,825	

Source: DMV statistics of vehicles by fuel type by city, as of 1/1/2018. Available online at: https://www.dmv.ca.gov/portal/dmv/detail/pubs/media_center/statistics

While this progress in EV adoption should be acknowledged, EVs compose only .4 percent of total vehicles within the City of Oxnard. If Oxnard is to achieve its share (based on population) of California's goal, the city will need to be home to at least 26,562 ZEVs by 2030, an increase of over 26,000. In order to achieve this number, the quantity of ZEVs in Oxnard will need to grow by at least 40 percent annually. As can be seen in the chart below, this required growth rate is significantly higher than that of the State of California as a whole, which has a required annual growth rate of at least 24 percent. It is also worth noting that Oxnard has lower vehicle ownership compared to other cities across Ventura County (Oxnard has about twice the population of Ventura, but only 25 percent more vehicles) and California, so Oxnard's EV goal might be lower if the goal is calculated on a vehicle ownership basis rather than by population.

Oxnard vs. California EV Growth Needed to Achieve 2030 Goal



Source: EV Alliance analysis, using data from DMV statistics of vehicles by fuel type by city, as of 1/1/2018 and Governor Brown's EXECUTIVE ORDER B-48-18. Available online at: https://www.dmv.ca.gov/portal/dmv/detail/pubs/media_center/statistic and https://www.gov.ca.gov/2018/01/26/governor-brown-takes-action-to-increase-zero-emission-vehicles-fund-new-climate-investments/.

Between 2012 and 2016 in the County of Ventura, 2.37 percent of new vehicle sales were plug-in EVs.[3] If this composition of new vehicle sales remained constant, the city would have only approximately 2,980 EVs by 2030. In order for Oxnard to achieve its portion of the California goal – 26,562 vehicles – the percentage of new vehicles sold that are EVs needs to increase dramatically.

Fortunately, with the widespread release of the Tesla Model 3, as well as other longer-range EVs, 2018 was a remarkable year for EV adoption. According to the California New Car Dealers Association, in 2018, 7.8 percent of new vehicles sold in California were EVs.[4] Assuming that this holds true for City of Oxnard, the City will actually exceed the 40 percent annual growth rate in EV adoption in 2018, leading to approximately 480 new vehicles instead of 212.

Some would argue that this rate of 7.8 percent will be followed by a decline once advanced orders of the Tesla Model 3 are fulfilled, satisfying pent-up demand. However, early results of 2019 U.S. vehicle sales demonstrate a strong trend, with January and February 2019 sales increasing over comparable 2018 sales.[5] Additionally, in 2019 and 2020, many new vehicle models, including SUVs, will be commercially available, satisfying previously unmet needs. For purposes of this analysis, we assume that the 7.8 percent EVs of new vehicles sold is plausible in the near future.

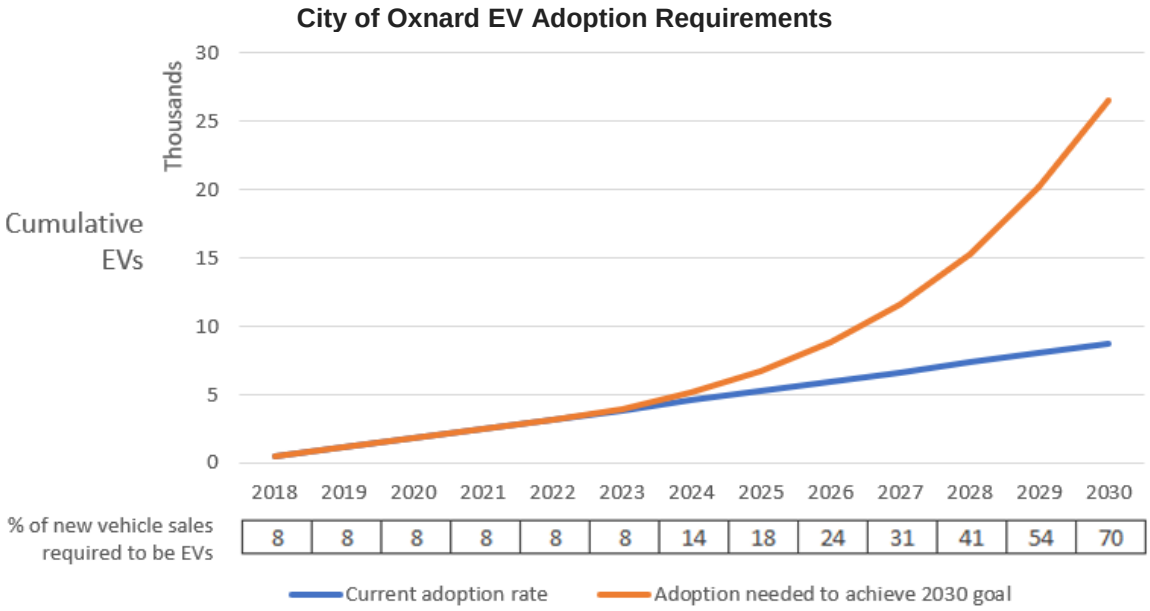
The EV Adoption Requirements chart below shows how the percentage of new vehicle sales that are EVs needs to increase in order to support the goal of 26,500 EVs by 2030. Once the annual growth rate of 40 percent requires that more than 7.8 (rounded to 8 below) percent of new vehicles sold are EVs, the chart below projects vehicle growth needed to achieve 26,500 EVs in the City of Oxnard. By 2029 and 2030 respectively, EVs must compose 54 percent and 70 percent of new vehicles sold. If a greater portion of EVs were sold in the early 2020s, EVs could compose a smaller portion of new vehicle sales in later years.

[3] Bedir, Abdulkadir, Noel Crisostomo, Jennifer Allen, Eric Wood, and Clément Rames. 2018. *California Plug-In Electric Vehicle Infrastructure Projections: 2017-2025.* California Energy Commission. Publication Number: CEC-600-2018-001

[4] *California Auto Outlook, February 2019*. California New Car Dealers Association. Accessed 3/10/19 at: https://www.cncda.org/wp-content/uploads/Cal-Covering-4Q-18.pdf.

[5] https://insideevs.com/monthly-plug-in-sales-scorecard/

Regardless, a dramatic increase is required from the 7.8 percent of today. While EV market penetration will be significantly boosted by decreasing EV costs, with a projected cost parity around 2022[6], market forces alone cannot be relied upon to drive the levels of uptake needed.



Source: EV Alliance analysis, using data from DMV statistics of vehicles by fuel type by city. Assumes total vehicle growth scales with County population growth of .37% over the past year, and 6.6% of vehicles are replaced with new vehicles annually. EV composition of new vehicle sales at a county level taken from Bedir, Abdulkadir, Noel Crisostomo, Jennifer Allen, Eric Wood, and Clément Rames. 2018. ***California Plug-In Electric Vehicle Infrastructure Projections: 2017-2025.*** California Energy Commission. Publication Number: CEC-600-2018-001. 2018 portion of sales from: *California Auto Outlook, February 2019*. California New Car Dealers Association. Retrieved on 3/10/19 from: https://www.cncda.org/wp-content/uploads/Cal-Covering-4Q-18.pdf.

This growth will only be feasible if supported by strong EV-friendly policies, which are discussed in-depth in Chapter 6 of the Ventura County EV Blueprint, a co-deliverable of this project. These Ventura County EV Blueprint recommendations are summarized below:

Recommended Actions

1. **Educate tenants on the "electric experience" to create demand for MUD charging.**
2. **Focus programs on new MUD construction** and geographies with public charging gaps.
3. **Deploy public charging at or near larger clusters of apartments and condos.**
4. **Convene utility, industry, and funding partners to coordinate MUD electric vehicle charging deployment.**
5. **Educate and outreach to engage and inspire property managers** to implement step-by-step guides for MUD charging installation.
6. **Focus investment on electric vehicle infrastructure that will serve MUD residents in Ventura County's Disadvantaged Communities.**

[6] https://evobsession.com/ev-revolution-timeline-evs-cheaper-icevs-2022/

7. **Target MUDs with 17 or more units that were subject to the 2013 California Building Code for electric vehicle charging infrastructure development.** As of January 2, 2014, the California Building Code requires three percent of the total number of parking spaces, but no less than one parking space, to be electric vehicle charging station capable (e.g. have stubouts and sufficient electric panel capacity to accommodate electric vehicle charging) at all MUDs with 17 or more units.[7]

A critical foundation to this level of EV uptake in Oxnard is required for the widespread deployments of EVs statewide – ample public charging infrastructure.

Charging infrastructure in Oxnard

Adequate private and public charging infrastructure is critical to enabling widespread EV adoption. Without adequate public infrastructure, drivers will be forced to constrain charging to residences and workplaces, and EV utilization will be limited by vehicle range. According to a 2017 National Renewable Energy Laboratory (NREL) study, only 26 percent of respondents were aware of charging stations on routes they regularly drove.[8] These 'aware' respondents were much more likely to view EVs positively and consider purchasing them for their next vehicle. In addition to the practical implications of charging access for drivers, awareness of charging access is also correlated with interest and willingness to purchase an EV.

Additionally, residents without easy access to home charging – for instance, residents of MUDs, in which the challenges of installing charging infrastructure can be daunting– will be further prevented from adopting EVs. *(Note: strategies for supporting charging infrastructure in MUDs are discussed extensively in Chapter 3 of the Ventura EV Blueprint, a co-deliverable of this project).*

The City of Oxnard has already identified the importance of supporting electric vehicle charging infrastructure in the 2013 City of Oxnard Energy Action Plan (EAP).[9] The EAP identified 17 Community programs, directed at reducing energy use and GHG emissions from the community. Number C-7 (detailed below) is "Support Electric Vehicle Infrastructure".

[7] The 2013 California Building Code became effective on January 2, 2014. MUDs with 17 or more units that were permitted and constructed after this date should have the required EV charging station capable parking spaces. For more information, see 2013 Chapter 11. Section 4.106.4.2 of the California Building Code.

[8] Singer, Mark. The Barriers to Acceptance of Plug-In Electric Vehicles: 2017 Update. National Renewable Energy Laboratory, available at: https://www.nrel.gov/docs/fy18osti/70371.pdf

[9] City of Oxnard Energy Action Plan, April 2013. Available online at: https://www.oxnard.org/wp-content/uploads/2016/04/OxnardEAP4.2013.pdf

City of Oxnard Energy Action Plan – Community Program C-7

Program C-7	Support Electric Vehicle Infrastructure
Key assumptions and calculation methodology	No direct electricity savings calculated, only GHG emission reductions. Assumed 5 new Electric Vehicle Plug-InStations would be installed annually, resulting in additional 3 electric vehicles per station, each driving 10,000 miles per year. Assume 30% reduction in GHG emissions per vehicle from electricity compared with conventional vehicle fuels. Assume program is implemented by 2015 and in effect for 6 years by end of 2020. Multiply annual new savings by 6 years for total 2020 savings.
Annual electricity savings by 2020 (kWh):	0 kWh
Annual natural gas savings by 2020 (therms):	0 therms
Annual GHG savings by 2020 (MTCO2e):	120 MTCO2e
Annual energy cost savings:	$0
Upfront and first cost to City:	$50,000-249,000
Three-year electricity savings (kWh):	0 kWh
Five-year electricity savings (kWh):	0 kWh
Ten-year electricity savings (kWh):	0 kWh
Supporting information:	Many resources are available to support energy reductions in residential buildings in the City, such as: SCE. http://www.sce.com/residential/residential.htm VCREA. http://www.vcenergy.org
Data Sources:	Department of Energy- Argonne National Laboratory Report. PHEV reduces GHG emissions 30-60% (page 47) http://www.transportation.anl.gov/pdfs/TA/559.pdf Composite emission factor; MT C02 per VMT (EMFAC 2007) http://www.arb.ca.gov/msei/onroad/downloads/docs/user_guide_emfac2007.pdf

Source: City of Oxnard Energy Action Plan, April 2013. Available online at: https://www.oxnard.org/wp-content/uploads/2016/04/OxnardEAP4.2013.pdf, page D-17.

The Community Program suggests adding five new electric vehicle charging stations per year from 2015 through 2020. Current publicly available chargers within the City of Oxnard are summarized below. This charging inventory was derived from both Plugshare data and the Department of Energy's Alternative Fuel Data Center, and verified in-person when possible. In total, the City of Oxnard has 54 Level 2 chargers and 22 DC Fast Chargers.

Current Charging Infrastructure in Oxnard

Station Name	Street Address	Level			Network	Connector Types
		1	2	DCFC		
Courtyard Marriott - Oxnard Ventura	600 E Esplanade Dr		2			J1772
VW Group of America	201 Del Norte Blvd		2		ChargePoint	J1772
Ventura County Behavioral Health	1911 Williams Dr		2		ChargePoint	J1772
County of Ventura Human Services	1400 Vanguard Dr		2		ChargePoint	J1772
Ventura County Probation Agency Juvenile Facilities	4333 E Vineyard Ave		2		ChargePoint	J1772

BMW Facilities	5650 Arcturus		2		ChargePoint	J1772
Town Center	1000 Town Center Dr		4		ChargePoint	J1772
Esplanade Shopping Center	195 W Esplanade Dr		1	3	eVgo	CHADEMO J1772 J1772COMBO
Team Nissan	1801 Auto Center Dr		1	1	eVgo	J1772, CHAdeMO
The Reserve	3851 Harbour Island Ln		10		ChargePoint	J1772
Port Marluna	4001 Tradewinds Dr		8		ChargePoint	J1772
Oxnard Transit Center - Long Term Parking Lot	255 East 5th Street Oxnard, CA 93030		1		ParkMobile	J1772
Oxnard Downtown Parking Garage	328S S B St		1		ParkMobile	J1772
DooPoco Enterprises	640 Maulhardt Ave		1			J1772
St John's Regional Medical Center	1600 N Rose Ave		6		ChargePoint	J1772
Alexander of Oxnard	1501 Ventura Boulevard		1			J1772
DCH Honda of Oxnard	1500 Ventura Blvd		2		ClipperCreek	J1772
Vista Ford of Oxnard	1501 Auto Center Dr		1			J1772
Lazy Dog (The Collection)	598 Town Center Dr		1		Tesla	
Whole Foods (The Collection)	650 Town Center Dr		1		Volta	J1772
Riverpark (The Collection)	2751 Park View Ct		2		Volta	J1772
RiverPark (The Collection)	2751 Park View Ct			18	Tesla	TESLA
Total		**0**	**54**	**22**		

Source: Plugshare and AFDC data, VCREA, EV Alliance, and Community Environmental Council analysis, data confirmed with site hosts whenever possible.

To understand level of charging infrastructure that will be needed to support Oxnard's adoption of EVs, the team leveraged analysis from the Electric Vehicle Infrastructure Projection (EVI-Pro) computer simulation tool, jointly developed by NREL and the California Energy Commission. The EVI-Pro tool is based on simulations of the habits of mainstream drivers, not just the habits of early adopters on whom early charging infrastructure needs assessments were based. From there, the analysis layers on charging needs for different vehicle capacities, charger sharing, travel and charging preferences, as well as variations in vehicle technology and user behavior. The EVI-Pro tool was designed to support Governor Brown's 2012 Executive Order B-16-2012, which decreed that California had to develop the charging infrastructure to support 1.5 million ZEVs on the road by 2025.

The EVI-Pro tool produces two outputs, a "high" estimate and a "low" estimate. The high estimate is based on the total number of vehicle charging events over a 24-hour period, divided by two to account for sharing. This methodology is used for both Level 2 and DC Fast Charger calculations. To derive the low estimate, the EVI-Pro tool analyzes the maximum vehicles needing to charge at the same time in a bounded area during the day. This 'peak charging demand' estimate provides a conservative estimate of need for chargers.

The EVI-Pro calculations were conducted on a county-by-county level. In order to look at the charger requirements for the City of Oxnard, the team scaled the results for Ventura County to the City of Oxnard in proportion to population. We also limited the scope of the Level 2 analysis to publicly available charging stations, including the EVI-Pro categories of both 'destination' and 'public'.

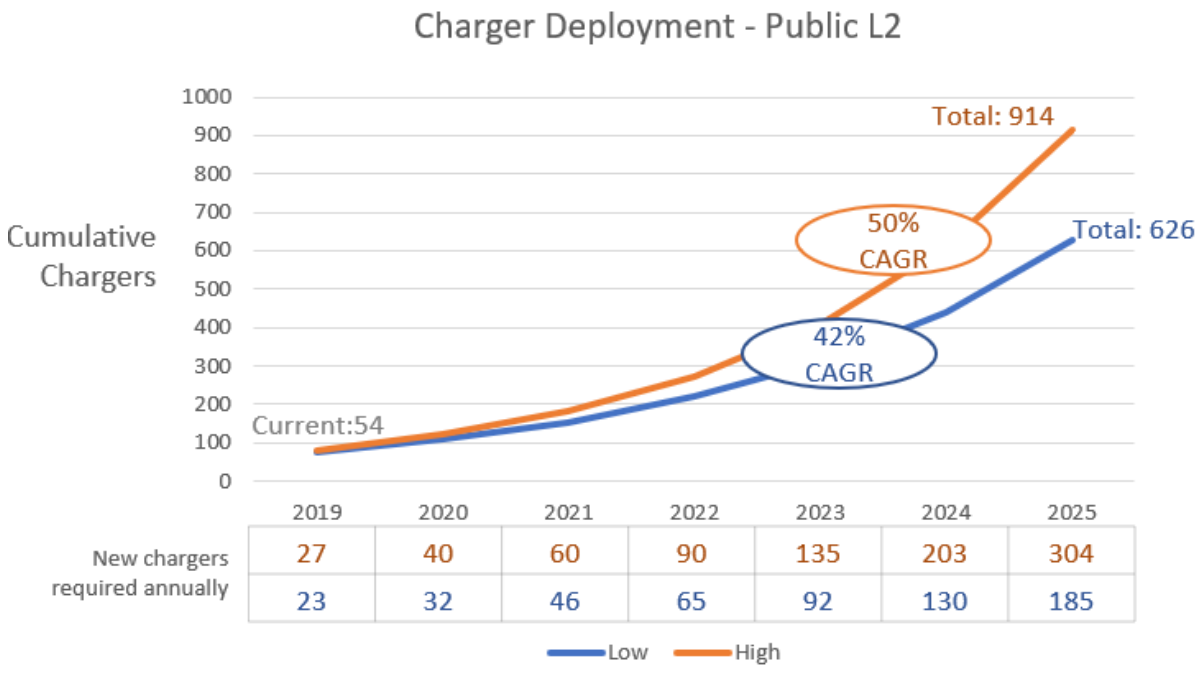
EVI-Pro County Analysis and City Extrapolation

	Scenario	
County of Ventura	**Low**	**High**
Public L2	2,546	3,719
Fast Chargers	105	296

	Scenario	
City of Oxnard	**Low**	**High**
Public L2	626	914
Fast Chargers	26	73

Source: Bedir, Abdulkadir, Noel Crisostomo, Jennifer Allen, Eric Wood, and Clément Rames. 2018. California Plug-In Electric Vehicle Infrastructure Projections: 2017-2025. California Energy Commission. Publication Number: CEC-600-2018-001, EV Alliance analysis.

According to EVI-Pro, the City of Oxnard will need to have between 626 to 914 publicly available Level 2 chargers by 2025 to support the level of vehicle uptake required to meet California's 2025 EV adoption goal. This is a dramatic increase from the 54 publicly available charging ports currently within city limits, and would require between 42 to 50 percent year-over-year annual growth (CAGR) to achieve, demonstrated in the chart below. The annual charger construction to support this level of infrastructure is significant, and can be seen in the "New chargers required annually" section of the chart below.

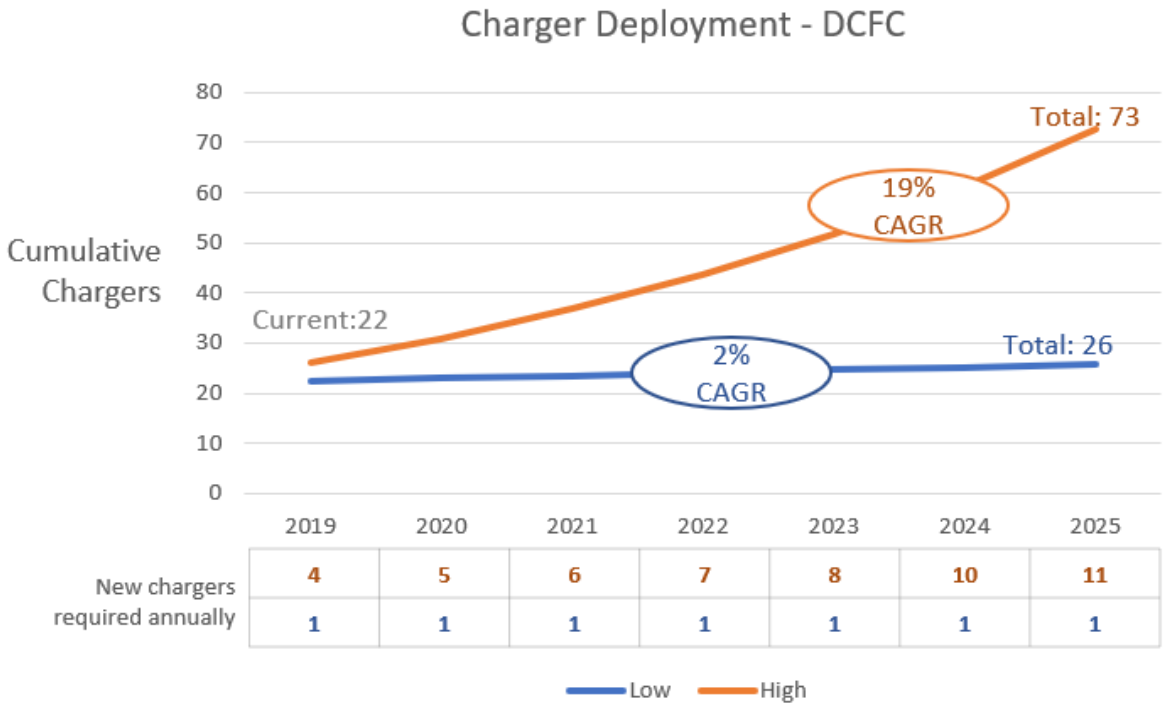


Source: EV Alliance analysis, based on EVI-Pro data, 2019.

A different story exists for DC Fast Chargers. The Riverpark development in the City of Oxnard is home to a Tesla Fast Charging center, which provides 18 DC Fast Chargers for Tesla users. While these are only usable by Tesla owners, they do provide significant DC Fast Charger resources. However, if the City of

Oxnard wants to ensure adequate DC Fast Charger opportunity for drivers of all vehicles, planners will need to further invest in fast charging infrastructure.

When the Tesla chargers are included, the City of Oxnard is currently home to 22 DC Fast Chargers. However, all 24 of the DC Fast Chargers are located along the U.S. 101 in Oxnard and 20 are located at a single location, the Collection. As a result, significant portions of the community lack access to nearby DC Fast Charge charging stations, which could serve renters and other households that lack reliable access to home charging. According to EVI-Pro projections, by 2025 the city will need to have 26 DC Fast Chargers total in the low scenario, and a remarkable 73 DC Fast Charger ports in the high scenario. In order to achieve this growth, the number of DC Fast Chargers within city limits will need to grow by between 2 to 19 percent year-over-year. This equates to Oxnard adding slightly fewer than one DC Fast Charger per year in the low scenario, and up to 11 chargers per year in the high scenario. This significant difference in the high and low scenarios is notable, and likely driven by the EVI-Pro methodology for assuming a maximum of two vehicle charges per day for the high scenario, which the EVI-Pro designers recognize is likely an overly generous estimate for DC Fast Charger utilization patterns.



Source: EV Alliance analysis, based on EVI-Pro data, 2019.

Best practices for pricing EV charging

In order to ensure a successful increase of EV charging infrastructure, the City of Oxnard needs to ensure that a sustainable business model exists for EV charger hosts and providers. Charging pricing has a critical impact on how EV chargers interact with stations, and it is important to ensure best practices are deployed.[10] Unlike refueling at a gas station, EV charging can take a significant amount of time. When one

[10] Winn, Ryan, *Electric Vehicle Charging at Work*. Luskin Center for Innovation: http://innovation.luskin.ucla.edu/sites/default/files/Full%20Report.pdf

vehicle is charging, access for other vehicles, which potentially need a charge more, is constrained. Therefore, in aligning pricing to optimize charging behavior, it makes sense to incorporate some connection between time spent charging and price paid. In line with this, minimizing 'dwell-time', or time in when a vehicle is occupying a charger space without charging, is also an important concern.

Generally, pricing strategies for EV charging fall into four different categories – free charging, a flat fee for a connection, a price based on time spent charging, or a fee based on the energy used. Often, some combination of the three fee-based categories is deployed. The benefits and challenges of each approach are summarized in the table below:

Strategy	Benefits	Challenges
Free charging	Encourages utilization	Causes inefficiencies in utilization, excessive dwell time and 'free-ridership'
Flat fees	Simple to understand, discourages very low efficiency charging (when little charge is needed)	No connection between cost to deliver energy and price paid by driver; provides no incentive for drivers to limit dwell time
Time-based pricing	Discourages charger occupancy in the event of low-efficiency charging, disincentivizes dwell time	Disadvantages slower charging vehicles like plug-in hybrid electrics
Energy per kWh pricing	Simple, clear cost for value delivered, equitable for vehicles with different charging speeds	Critical to get pricing right, as demand is elastic. Pricing too low can incentivize low-efficiency charging. No incentive to minimize dwell time

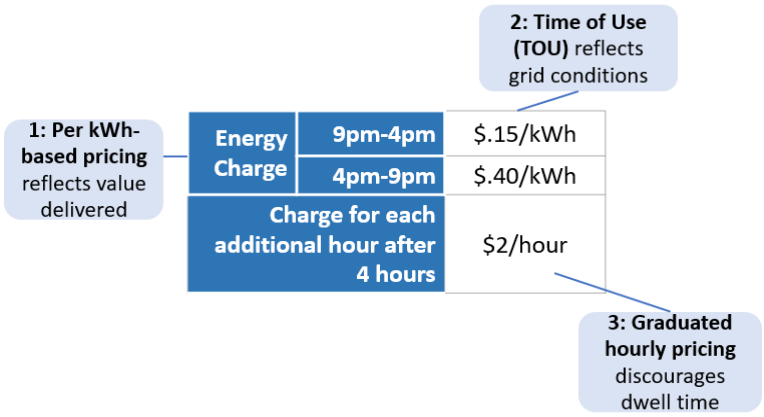
The project team believes that the best charging strategy includes three elements:

1. While some studies have shown that in some conditions, time-based charging encourages the most efficient charger use,[11] the project team believes that **per-kWh pricing** best aligns the incentives of drivers and charging providers by creating the clearest connection between the cost paid by charging providers and the price paid by EV drivers.
2. Incorporating **TOU-based pricing into per-kWh pricing** reflects grid conditions, and often, the cost of electricity provided by a charging provider. TOU rates for EV charging provide an important incentive to drivers to (when possible) charge during hours when the grid is supplied by plentiful, low-cost solar energy, and minimize charging during the 'evening ramp', when expensive fossil fuel 'peaker plants' come online as solar generation subsides.
3. Incorporation of a time-based pricing strategy known as **"graduated hourly" pricing** provides the incentive to minimize dwell time that is otherwise absent from a stand-alone per-kWh rate. With graduated hourly pricing, station managers implement an hourly charge after a set period of time to discourage utilization of a charger without charging. This is appropriate in some instances – for example, a highly trafficked commercial area with high levels of demand and frequent vehicle

[11] Winn, Ryan, *Electric Vehicle Charging at Work*. Luskin Center for Innovation: http://innovation.luskin.ucla.edu/sites/default/files/Full%20Report.pdf

turnover – and less for others like workplaces. The team recommends that station managers consider graduated hourly pricing based on locational characteristics and utilization levels.

Example: Charging rates reflecting best practices



By deploying a charging strategy that includes the a TOU-based per-kWh rate, with graduated hourly pricing, charging managers in the City of Oxnard can optimize their EV charger deployments. Driver pricing will be clearly aligned with energy consumed, as well as the greater impact of the cost of supplying that energy to the grid. Drivers will be incentivized to minimize dwell time, thus maximizing the value and access that publicly-available chargers deliver to a community.

Community fleet transition conclusion

EVs can provide enormous savings through both fuel and maintenance costs, while decreasing the environmental impact of driving. With the roll-out of Clean Power Alliance's green tariffs, residents of Oxnard are in an even better position to harness the environmental benefits that accompany monetary savings of EVs.

While the community of Oxnard has made progress in EV adoption, much more is needed if the city is to meet its portion of California's 2025 EV charging equipment goal and 2030 EV adoption goal. Fortunately, EV-friendly shifts in consumer sentiment, in addition to the commercialization of EVs with longer ranges, lower prices, and a wider range of model types, is naturally increasing EV adoption. The City of Oxnard can continue to support this with EV-friendly policies, continued EV charger investment, especially in Level 2s, with strategic pricing structures, and by providing a strong example with its own fleet.

City fleet transition

In addition to supporting programs to encourage city residents to transition to EVs, the City of Oxnard can be a role model for EV adoption by electrifying its own fleet. With approximately 850 vehicles and equipment, there are several options for increasing the number of EVs within the fleet, though immediate opportunities are limited by available electric vehicle models. This component of the plan first explores actions that the City of Oxnard has taken to address vehicle electrification so far. From there, the plan explores the current fleet composition of Oxnard, including prime opportunities for electrification. This plan then identifies how the City of Oxnard can transition one-eighth of its fleet – in line with California's 2030 goal of 5 million ZEVs on the roads – and identifies barriers that need to be overcome to achieve 100 percent electrification, as well as incremental steps that the city can pursue immediately.

Oxnard fleet electrification efforts so far

In the City of Oxnard 2030 General Plan, the city recognized the importance of transitioning the fleet to zero-emission vehicles when possible. Goal SC-3 of the General Plan focuses on Energy Generation and Increased Efficiency. Sub-goal 3.6 focuses on fleet transition to zero-emission vehicles, and highlights the goal of meeting or exceeding state targets:

2030 Oxnard General Plan – SC-3.6

SC-3.6 Targets for Zero-Emission Vehicles

As part of the City EAP, meet or exceed state targets for zero-emission fuel vehicle miles traveled within the City by supporting the use of zero-emission vehicles (low speed "neighborhood electric vehicles", utility low-range battery electric vehicles, mid-range "city electric vehicles", full function battery electric vehicles, and fuel cell vehicles) within City departments and divisions.

Source: City of Oxnard 2030 General Plan – Goals and Policies, page 2-12. Accessed 3.20.2019 at https://www.oxnard.org/wp-content/uploads/2017/06/Oxnard-2030-General-Plan-Amend-06.2017-SM.pdf

The City of Oxnard fleet currently has 20 electric vehicles – one electric sedan and 19 electric carts. Most efforts to reducing fuel consumption have so far been focused on acquiring conventional hybrid vehicles, of which the city currently has 37 sedans and one SUV. While this is a good start to exploring alternatives to conventional internal combustion engines, recent technology developments have opened up a myriad of cost and GHG saving EV options. Through a thorough evaluation of the potential to electrify the current fleet, this section of this plan seeks to further support Oxnard by identifying immediate opportunities for fleet electrification, as well as opportunities that will emerge in the next two to five years.

Oxnard fleet and electrification potential

The City of Oxnard currently has about 850 vehicles and equipment, including 19 electric carts and one electric sedan. After excluding non-motorized and off-road equipment (e.g. trailers), Oxnard has a total of 665 on-road vehicles and motorized equipment. Approximately 260 of these are light- or medium-duty trucks, the largest category. The following section highlights which vehicles have high potential for replacement with EVs:

- **Sedans:** Sedans are the most mature electric technology, with dozens of products from major manufacturers. Rapid advances in battery technology are leading to vehicles with longer ranges, better features, and lower prices. There is a possibility for cost neutrality or even cost savings over existing gasoline sedans due to lower fueling and maintenance costs.

  Oxnard has done an admirable job procuring conventional hybrid vehicle technologies. Of the 95 non-police sedans in the city fleet, 37 are hybrid vehicles, equating to approximately 39 percent of total sedans. With dramatic increases in technology and range of plug-in EVs, accompanied by price decreases, the City can continue to push innovative technology in the sedan segment. As prices continue to lower and ranges continue to expand for EV sedans, Oxnard can continue to take advantage of fuel and operating savings in this category.

- **SUVs and vans**: Both major manufacturers and smaller companies are currently producing electric SUVs and vans. Depending on the use case and replacement schedule, these could be

acceptable replacements for existing vehicles. By 2020, the variety of electric SUVs in the marketplace should increase significantly, thus broadening the options for fleets looking to electrify SUVs.

- **Light- and Medium-Duty Trucks:** The largest share of Oxnard's fleet is light- and medium-duty trucks. Unfortunately, there are currently no light-duty electric trucks on the market, though many brands, including Ford, Tesla and Rivian have committed to delivering light-duty electric trucks in the early 2020s. In the meantime, there may be some opportunity to replace some of these vehicles with electric vans or specialty trucks, or downsize them to electric carts.

  Manufacturers such as Phoenix and Motiv are producing medium-duty work truck chassis with ranges of up to 100 miles on a single charge. Generous incentives of $80,000-$95,000 from California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) can support the acquisition of these vehicles. By substituting electric medium-duty trucks in place of conventional diesel or gas vehicles, the city can take advantage of significant fueling and maintenance savings over their operating lifecycle.

- **Police:** While there are currently no plug-in electric police pursuit vehicles available without requiring aftermarket adjustments, Ford does manufacture a hybrid electric sedan – the Police Responder Hybrid Sedan. The typical duty cycle of a police pursuit vehicle includes frequent idling. Using a hybrid instead of a conventional internal combustion engine vehicle can create significant savings by enabling the engine to turn-off while idling. Ford does produce a plug-in hybrid sedan for detective or other specialized use.

The police department of Fremont, California recently converted a Tesla Model S to a patrol vehicle. The department is anticipating that the aftermarket conversions will cost approximately $40,000, approximately the additional price of purchasing a 'police package' on a Ford vehicle. The department hopes to save on fuel costs and improve operational time with reduced maintenance.[12]

For City of Oxnard Police Motorcycles, there is an EV option that is used in over 100 North American Police and Law Enforcement fleets.

- **Refuse trucks:** With their frequent stops and starts, and their high mileage at low speeds in residential neighborhoods, electric refuge trucks can take advantage of regenerative breaking and the most efficient speed range of electric motors. Deploying electric technology in refuse trucks has the potential to create one of the best value propositions of any duty-cycle.[13] Additionally, electric refuge trucks are much quieter than conventional vehicles, minimizing impact on neighborhoods.

  Commercial deployments of electric refuse trucks are still in the early stages. Motiv deployed a pilot vehicle in Sacramento in 2017. Volvo plans to deploy vehicles in Hamburg, Germany in mid-2019. Finally, BYD has deployed refuse trucks in Palo Alto, and expects to rapidly scale

[12] https://electrek.co/2019/01/24/tesla-model-s-police-patrol-vehicle-fremont/
[13] From a conversation with John Gerra, Director of Business Development, BYD America on March 15th, 2019.

Case Study: Ojai Ground Maintenance Electrification

Not far from the City of Ventura, the City of Ojai is making tremendous strides in equipment electrification. Taking advantage of the efficiency gains and decreasing prices of battery technology, and with the support of a grant procured through Ventura County Air Pollution Control District, the City of Ojai procured zero-emission grounds maintenance equipment in the fall of 2018.

They're excellent. The tools are light. They seem very durable so far. and it's great.

— Scott Davis, Ojai Public Works Grounds Maintenance Crew

Going forward, the City will use only zero-emissions equipment for all routine maintenance on their 52 acres of municipal property. [13]

deployments of their next generation offering, with deliveries in the end of 2019/beginning of 2020.

- **Other:** The rest of the fleet is made up of trailers, specialty vehicles such as construction equipment, mowers, and fire trucks. Many of these do not have any EV options available, though fleet managers should pay close attention, as models in many of these categories are expected to emerge in the next decade of California's electrification wave.

One option that the City of Oxnard can explore now is electrifying mowers. Rapid declines in battery prices in conjunction with increases in capacity have impacted technology beyond the vehicle world. A recent crop of new electric mowers is hitting markets, and fuel savings lead to price parity in ten years, according to Consumer Reports.[14] While not all commercially-available E-mowers are adequate substitutes for the City of Oxnard's industrial equipment, fleet managers should explore currently available electric options in procurement decisions.

Pathway towards California's 2030 goal

If the City of Oxnard fleet is to achieve its portion of California's 2030 goal of 5 million ZEVs on the road, it will have to transition approximately one-eighth of its fleet to ZEVs. After eliminating equipment that is clearly non-motorized or off-road, like trailers, boats, and ATVs from the vehicle inventory, Oxnard has approximately 665 motorized vehicles left. To transition one-eighth of this fleet to EVs or ZEVs, Oxnard needs to ensure that 83 vehicles have no tailpipe emissions.

As mentioned above, the City of Oxnard currently has 20 electric vehicles, composed of 19 electric carts and one electric sedan. With these vehicles, Oxnard is essentially one quarter of the way to achieving its portion of California's goal. In order to transition one-eighth of the current fleet to EVs, the city only needs to transition 63 additional vehicles by 2030 to achieve 83 EVs (assuming the fleet does not grow). Given the broad

[14] Price parity analysis: Consumer Reports, *Electric Lawn Mowers that Rival Gas Models.* April 2017,: https://www.consumerreports.org/push-mowers/electric-lawn-mowers-that-rival-gas-models/, Available models: https://electrek.co/2018/04/26/electric-lawnmower-guide/,

[13] Available models: https://electrek.co/2018/04/26/electric-lawnmower-guide/, Price parity analysis: Consumer Reports, *Electric Lawn Mowers that Rival Gas Models.* April 2017,: https://www.consumerreports.org/push-mowers/electric-lawn-mowers-that-rival-gas-models/

economic and environmental benefits of EVs, this should be considered the minimum goal, and it should definitely be achievable.

The section below identifies which 63 vehicles are leading candidates for electrification. This is divided into two categories – immediate candidates and candidates for the medium (two to five year) term. The list of immediate candidates focuses on vehicles with the highest mileages, for which EV replacements are already widely commercialized.

Immediate candidates for electrification – sedans, SUVs and vans

As mentioned above, sedans are the most mature electric technology, with dozens of products from major manufacturers. The city fleet has already purchased one electric sedan, the Nissan Leaf, so there is already initial familiarity among city staff with the technology.

In addition to sedans, SUVs and vans also provide opportunities to transition the fleet to either full-electric or plug-in hybrid vehicles. In order to identify which vehicles should be prioritized for electrification, the EV Alliance identified which vehicles have the highest lifetime mileage, and thus will likely be candidates for replacement soon. From there, we eliminated all vehicles that do not currently have a battery electric or plug-in hybrid alternative commercially available. We limited the prioritized list to only vehicles that already had mileages of over 90,000. Some of the extremely high mileage vehicles may have typos, but we weren't able to confirm this with the City.

Near Term Vehicle Recommendations for Electrification

Rank	City Department	Equipment ID	Description	Model Year	Total Mileage	Vehicle Type
1	Public Works	3576	Toyota Prius 1.5L	2002	674,890	Hybrid sedan
2	Recreation and Community Services	17801	Ford Fusion 2.0L	2017	432,851	Hybrid sedan
3	Public Works	17800	Ford Fusion 2.0L	2017	283,026	Hybrid sedan
4	Public Works	16501	Ford CMAX	2016	197,714	Hybrid sedan
5	Public Works	3483	Toyota Prius 1.5L	2001	176,317	Hybrid sedan
6	Police	09900	Toyota Prius Compact	2009	159,187	Hybrid sedan
7	Development Services	3657	Toyota Prius 1.5L	2003	153,851	Hybrid sedan
8	Development Services	17807	Ford Fusion 2.0L	2017	138,707	Hybrid sedan
9	City Treasurer	17806	Ford Fusion 2.0L	2017	135,689	Hybrid sedan
10	Public Works	14400	Ford Fusion 2.0L	2014	130,103	Hybrid sedan
11	Public Works	15806	Honda Accord	2015	129,050	Sedan
12	Fire	07501	Ford Explorer 4.0L	2007	127,908	SUV
13	Development Services	07402	Honda Civic 1.3L	2007	124,287	Hybrid sedan
14	Public Works	3630	Toyota Prius 1.5L	2003	123,493	Hybrid sedan
15	Finance	17805	Ford Fusion 2.0L	2017	121,003	Hybrid sedan
16	Public Works	18408	Toyota Prius1.8L	2018	120,974	Hybrid sedan
17	Police	14801	Ford Fusion 2.0L	2014	119,622	Hybrid sedan
18	Police	12809	Ford Fusion 3.0L	2012	103,662	Sedan
19	Public Works	3196	Ford Taurus 3.0L	1997	102,394	Sedan
20	Public Works	3741	Ford E350 Van	2004	101,115	Van
21	Public Works	17914	Toyota Highlander	2015	95,966	SUV

22	Public Works	18004	Ford Utility SUV 3.7L	2018	93,200	SUV
23	Public Works	05032	Honda Civic 1.3L	2005	92,223	Hybrid sedan
24	Fire	3807	Chevy Uplander	2005	92,016	Van

Many of the vehicles with the highest mileages are from the Public Works department. If Public Works vehicles are parked at the same location, this creates a potential for infrastructure savings, as multiple department vehicles could use the same charger. Additionally, by beginning to introduce 100 percent battery-powered EVs into the department's fleet, employees could become familiar with the operational benefits of EVs, naturally building support for further EV acquisition within the department. Details on the various electric options to replace conventional sedans, SUVs and vans are described below:

Sedans: Unsurprisingly, the majority of immediate replacement candidates in the City of Oxnard fleet are sedans or hybrid sedans. Fortunately, as mentioned above, electric sedans are the most developed sector of the market, with many vehicle types in second or third generation of commercialization. Additionally, the fuel and maintenance savings have been proven in many California municipal fleet deployments.

Battery-Electric Vehicles – Chevy Bolt, Nissan Leaf

• Pure electric vehicles

• 150-238 mile range

• $20,000-$27,000 after incentives

There are over two dozen all-electric and hybrid-plug in sedans currently on the market from major manufacturers. Four EV sedans are most commonly purchased by government fleets, the Chevy Bolt, Nissan Leaf (both pure EVs) and the Honda Clarity and Toyota Prius Prime (both plug-in hybrids). The MSRP of the electric vehicles $20,000-$27,000, after incentives, is similar to the MSRP of the Toyota Prius, $23,475. The EV sedans' 106-133 mpg equivalent is much higher than the Toyota Prius' 52 mpg.

Plug-in Hybrid Vehicles – Honda Clarity, Toyota Prius Prime

- Plug-in hybrids
- 25-48 mile EV range, then 42-54 mpg hybrid mode
- $21,300-$24,400 after incentives

Sedans present a compelling value proposition for transitioning to electric, even over a relatively short timescale. Looking only at fuel savings alone, a Chevrolet Bolt creates enough savings to recoup incremental upfront purchase cost in less than five to eight years, depending on annual mileage. If maintenance savings are included, which this payback period can accelerate by up to one-third.

Years to breakeven based on fuel savings– Sedans

Electric Vehicle

Manufacturer	Chevy
Model	Bolt
Fuel Economy	28 kWh/100 mi
Miles / $	27.5
Upfront cost*	$24.6K

Conventional

Manufacturer	Chevy
Model	Malibu
Fuel Economy	32 mi/gallon
Miles / $	9.6
Upfront cost	$22.0K

Annual miles driven	Years to breakeven
8K	8.4
9K	7.5
10K	6.7
11K	6.1
12K	5.6
13K	5.2
14K	4.8

Source: 2019 EV Alliance analysis, based on data from the Department of Energy's Fueleconomy.gov. *Electric Vehicle upfront cost includes currently available California and National incentives. Price of electricity is $0.13/kWh, assumes charging at SCE's off-peak Commercial & Industrial EV rate, that includes a demand charge holiday. Price of gas based on average price in Ventura County in March of 2019, per https://gasprices.aaa.com/?state=CA.

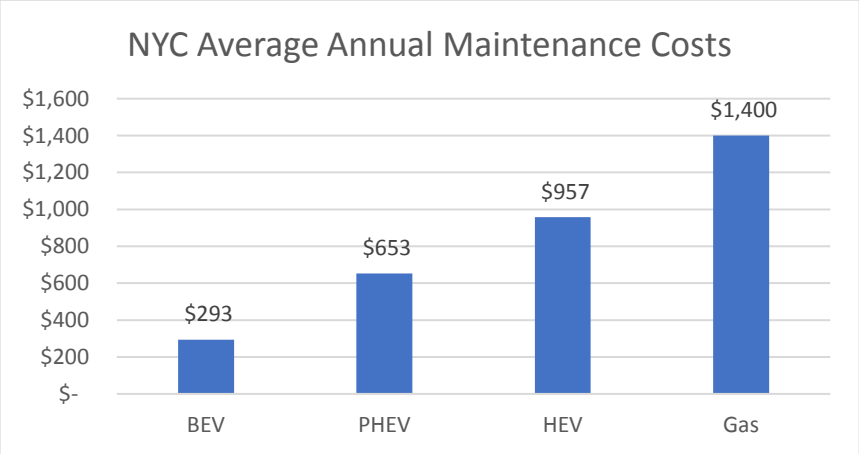
Case Study: Realized maintenance savings for New York City and County of Alameda

Many reports and manufacturers tout the extensive savings on maintenance that EVs provide to fleet managers, but do these emerge in the context of real fleets? New York City and the County of Alameda, both early adopters of EV technology, have made maintenance savings data available.

Vehicle Model	System	Number	2018 Maintenance Cost
Bolt	All electric BEV	93	$204.86
Focus	Gas	11	$1,805.24
Focus Electric	All electric BEV	7	$386.31
Fusion	Gas	62	$1,621.34
Fusion Energi	Hybrid Gas/Electric Plug in	154	$496.73
Fusion hybrid	Hybrid Gas/Electric	205	$1,310.89
Leaf	All electric BEV	149	$344.14
Prius	Hybrid Gas/Electric	1,131	$893.31
Taurus	Gas	38	$922.67
Volt	Hybrid Gas/Electric Plug in	43	$1,210.40

Source: DCAS Client Program, CY2018, accessed at: https://bit.ly/2FFIM5M.

The average annual maintenance costs for NYC's vehicles vary significantly, from a high of $1,621 for the Ford Fusions, to a low of $205 for the Chevy Bolts. When you look at the weighted average by vehicle type, a clear pattern emerges.



The battery electric vehicles in the fleet have by far the lowest annual maintenance costs, followed by the plug-in hybrid vehicles, the hybrid vehicles, and finally, the conventional internal combustion engine vehicles.

The maintenance costs from the County of Alameda have a less dramatic, but still significant, story to tell. For their EV fleet, the County recorded a maintenance cost per mile of $.035, compared to $.079 for their conventional fleet. Phillip Kobernick, the Logistics Manager for the County of Alameda, credits this is largely due to no need for motor oil, their biggest hard cost, as well as time savings. "And labor is way down because [EVs require] about a 45-minute inspection… while the customer waits. ICE PM services are much longer."

Vans: The City of Oxnard has 61 vans, some of which could be replaced with the new Chrysler Pacifica plug-in hybrid van. The Chrysler vans have ample interior space, and can achieve 33 miles on a single charge before switching to hybrid mode.

Chrysler Pacifica

- Plug-in hybrid
- 33 mile EV range, then 32mpg hybrid mode
- $35,000 after incentive

Similar to sedans, the Chrysler Pacifica has a compelling value proposition. While the plug-in hybrid is slightly more expensive than the conventional vehicle, with the right duty cycles, a fleet can rapidly achieve cost parity when looking at savings from fueling alone. If maintenance savings are layered on top of this, the payback period decreases further.

Years to breakeven based on fuel savings – Vans

Electric Vehicle

Manufacturer	Chrysler
Model	Pacifica Plug-in Hybrid
Fuel Economy	33 mi electric 32 mi/gallon hybrid
Miles / $	15.4 electric 9.6 hybrid
Upfront cost*	$31.0+K

Conventional

Manufacturer	Chrysler
Model	Pacifica
Fuel Economy	22 mi/gallon
Miles / $	6.6
Upfront cost	$27.0+K

Annual miles driven	Years to breakeven
8K	6.0
9K	5.6
10K	5.2
11K	4.9
12K	4.7
13K	4.4
14K	4.2

Source: 2019 EV Alliance analysis, based on data from the Department of Energy's Fueleconomy.gov. *Electric Vehicle upfront cost includes currently available California and National incentives. Price of electricity is $0.13/kWh, assumes charging at SCE's off-peak Commercial & Industrial EV rate, that includes a demand charge holiday. Price of gas based on average price in Ventura County in March of 2019, per https://gasprices.aaa.com/?state=CA. Assumes vehicle is fully charged every night and that annual mileage is divided between 220 days per year, or approximately 4 days per week.

SUVs: There are both 100 percent battery electric and plug-in hybrid electric SUVs currently available commercially. Hyundai recently began production of the Kona, an all-electric SUV, and Mitsubishi released the plug-in hybrid Outlander in 2018. Both of these SUVs are relatively affordable, and can be great options for municipal fleets looking to electrify.

Mitsubishi Outlander

- Plug-in hybrid
- 22 miles EV range (74 mpge), then 25 mpg hybrid mode
- $27,500 after incentives

Hyundai Kona

- 258 mile range
- 120 mpge
- <$30,000 after incentives

After examining both the City of Oxnard's fleet vehicles with over 90,000 lifetime miles, as well as the models of plug-in EVs currently available, 24 vehicles have been identified as potential options for immediate electrification. These currently available electric sedans, vans and SUVs present 'quick wins' in which the city can capture both the environmental and the cost-saving benefits of EVs. However, these additional vehicles only achieve approximately one third of the 63 electrified vehicles needed to achieve the one-eighth fleet electrification goal. In order to achieve this goal, the City of Oxnard must look at other EV models approaching commercialization in the next two to five years.

Medium-term vehicles for electrification

When exploring fleet electrification in a two to five-year time horizon, light-duty trucks present a potential opportunity. A number of companies, from start-ups like Rivian to major manufacturers like Ford, plan to produce commercially available electric or plug-in hybrid pick-up trucks by 2020. Given that light-duty and medium-duty trucks compose almost 40 percent of the city's on-road fleet, these vehicles could make an excellent opportunity for electrification.

Medium Term Vehicle Recommendations for Electrification

Rank	City Department	Equipment ID	Description	Model Year	Total Mileage	Vehicle Type
25	Public Works	05037	Ford Ranger Ext Cab 3.0L	2005	706,881	Pickup Truck
26	Police	18904	Nissan Frontier 2.5L	2018	674,285	Pickup Truck
27	Public Works	05036	Ford Ranger Ext Cab 3.0L	2005	667,974	Pickup Truck
28	Public Works	05035	Ford Ranger Ext Cab 3.0L	2005	556,217	Pickup Truck
29	Public Works	3685	Dodge 1500 Standard 4.7L	2003	478,091	Pickup Truck
30	Police	17904	Nissan Frontier 2.5L	2017	349,426	Pickup Truck
31	Police	17905	Nissan Frontier 2.5L	2017	293,801	Pickup Truck
32	Finance	3541	Chevy 2500 Standard 4.8L	2002	283,714	Pickup Truck
33	Public Works	3766	Ford F150 Standard 4.6L	2004	225,612	Pickup Truck
34	Police	05028	Ford Ranger Ext Cab 3.0L	2005	191,056	Pickup Truck
35	Police	3230	Chevy 2500 Suburban 7.4L	1995	180,274	Pickup Truck
36	Police	17907	Nissan Frontier 2.5L	2017	156,973	Pickup Truck
37	Police	17915	Ford F150 Crew 3.5L	2017	155,562	Pickup Truck
38	Police	3731	Ford Ranger Ext Cab 3.0L	2004	151,494	Pickup Truck
39	Police	06042	Ford Ranger Ext Cab 3.0L	2006	148,275	Pickup Truck
40	Public Works	08605	Ford F250 5.4L	2008	146,242	Pickup Truck
41	Public Works	3641	Chevy F150	2003	141,645	Pickup Truck
42	Public Works	3245	Chevy 2500 4X4 5.7L	1998	138,883	Pickup Truck
43	Public Works	06029	Chevy 1500 1/2 Ton	2006	136,056	Pickup Truck
44	Public Works	3545	Dodge 1500 Standard 4.7L	2002	135,058	Pickup Truck
45	Public Works	3475	Ford Ranger Ext Cab 3.0L	2001	132,656	Pickup Truck

46	Police	3326	Chevy S10 Standard 4.3L	1999	132,255	Pickup Truck
47	Development Services	18603	Nissan Frontier 2.5L	2018	129,230	Pickup Truck
48	Public Works	06025	Ford F150 Ext Cab 4.6L	2006	127,544	Pickup Truck
49	Police	05025	Ford Ranger Ext Cab 3.0L	2005	126,915	Pickup Truck
50	Public Works	18401	Ford F150 Super Cab 2.7L	2018	126,492	Pickup Truck
51	Public Works	08622	Ford F250 Std Cab Utility 5.4L	2008	126,130	Pickup Truck
52	Public Works	3309	Chevy 3500 1T Utility	1999	123,593	Pickup Truck
53	Public Works	06039	Ford Ranger Ext Cab 3.0L	2006	120,143	Pickup Truck
54	Police	18905	Nissan Frontier 2.5L	2018	119,614	Pickup Truck
55	Development Services	18604	Nissan Frontier 2.5L	2018	118,999	Pickup Truck
56	Police	3477	Ford Ranger Ext Cab 3.0L	2001	118,625	Pickup Truck
57	Public Works	3376	Chevy 250 Utility Body 5.7L	2000	116,851	Pickup Truck
58	Public Works	3728	Ford F250 Standard5.4L	2004	115,276	Pickup Truck
59	Public Works	3749	Ford F150 Ext Cab 4.6L	2004	114,353	Pickup Truck
60	Public Works	08601	Ford Ranger Standard 2.3L	2008	113,980	Pickup Truck
61	Fire	3632	Ford F150 Standard 4.6L	2003	111,833	Pickup Truck
62	Public Works	3642	Chevy 1500 Standard 4.8L	2003	110,370	Pickup Truck
63	Public Works	08632	Ford F350 Standard 5.4L	2008	110,061	Pickup Truck

Source: EV Alliance analysis 2019.

The list of pickup trucks for potential replacement with EVs above was derived by examining the total mileages of the City of Oxnard's light-duty pickup fleet. The 39 pickup trucks with the highest mileage were selected for prioritization, which, with the 24 vehicles identified for immediate electrification, allows the City of Oxnard to electrify 63 vehicles, leading to a total of one-eighth of the fleet. Notably, 54 light duty trucks had total mileages of over 90,000, indicating that many vehicles in this high-mileage fleet may be good candidates for replacement by E-trucks once trusted vehicle models emerge. Given annual mileages, many of these vehicles will likely be scheduled for replacement within the next one to five years, which is a prime opportunity to take advantage of the new electric trucks on the market.

Prototypes of Ford (left) and Rivian EV Pick-up Trucks

Source: InsideEVs.com, Teslarati.com

Another option to consider is whether the use cases and duty cycles of any of the high-mileage pick-up trucks nearing replacement could be substituted with any other currently available vehicles. Some options for replacement include:

- **Medium-Duty Trucks:** Both Motiv and Phoenix have medium-duty customizable work trucks that are currently commercially available. If the use case of an existing vehicle could be better served

by a truck with a greater payload, these options should be considered. Likewise, Chanje provides electric medium-duty vans, available to lease at essentially price parity for complementary conventional vehicles (~$1,300 - 1,400/month). If a vehicle is primarily used for equipment transportation or equipment or delivery, a Chanje van would be a suitable replacement.

Motiv Work Truck

- All-electric
- Up to 100 mile range

Phoenix Zeus Electric Flatbed

- All-electric
- Up to 100 mile range
- ~$130,000 after incentives

- **Chrysler Pacifica Plug-in Hybrid Vans:** If a truck is primarily used to transport equipment or materials, it may be worth exploring replacement with a Chrysler Pacifica plug-in hybrid van. As discussed in the previous section, the vans have ample interior space and can achieve 33 miles on a single charge before switching to hybrid mode.

- **SUVs:** Depending on the specific vehicle use-case, replacement with an SUV can be a feasible option. As discussed above, both Hyundai's Kona and Mitsubishi's Outlander could make good candidates to replace a truck primarily used to transport people, materials or equipment.

- **Sedans:** If a truck is primarily used for personnel transportation, the department should explore whether that vehicle could be replaced by an electric sedan, like one of the many options discussed above. Not only would this provide significant operating savings over a pickup truck, but the upfront price would also be lower.

With simple, cost-saving procurement decisions over the next five years, the City of Oxnard could position itself to be well aligned with California's 2030 goal of 5 million electric vehicles on the roads. The currently available electric sedans, vans and SUVs present 'quick wins' in which the city can capture both the environmental and the cost-saving benefits of EVs. With the myriad of electric pick-up trucks entering the marketplace in 2020 and beyond, the City of Oxnard should also be able to begin transitioning light-duty trucks, the biggest category of its fleet.

Electrifying 100 percent of City of Oxnard's fleets

In the long run, if California is going to meet its climate goals, the City of Oxnard should explore what barriers need to be overcome to enable the fleet to transition to 100 percent electric. Additionally, the California Air Resources Board recently passed the Innovative Clean Transit Rule, which mandates that state transit agencies move to 100 percent emissions-free transportation options by 2040, and is exploring similar regulation in other industries.[15] Fortunately, the electric vehicle industry is developing rapidly, and affordable, long-range vehicles are at the very least in planning phases in all market segments.

[15] California Air Resources Board, "Zero Emission Airport Shuttle Regulation". Hearing date scheduled for February 21, 2019, more information available at: https://ww2.arb.ca.gov/rulemaking/2019/asb19

Fleet managers should keep abreast of new electric models becoming available through industry tradeshows, ongoing collaboration with local organizations such as Ventura County Regional Energy Alliance and the Community Environmental Council, and through engagement with the regional EV resource, Electric Drive 805. Battery costs will continue to decline, and the total cost of ownership savings over conventional ICE vehicles should continue to improve. Furthermore, as California's grid becomes cleaner, the environmental impacts of vehicle electrification will only become greater.

The challenges of transitioning an entire fleet to electric are real. In addition to strategically procuring electric vehicles based on model availability and fleet needs as discussed above, there are other incremental changes fleets can make to ease the transition. These include:

- **Leasing:** Given the rapid development of EV technology, vehicle leasing can be an enticing option for fleet owners reluctant to commit to vehicle purchase. Many dealers offer lease options for light-duty vehicles. For medium- and heavy-duty vehicles, fleet consulting services like Zeem Solutions offer lease options. Ryder has partnered with a number of EV manufacturers to provide medium- and heavy-duty lease options. Penske is also in the early stages of developing a medium- and heavy-duty lease option.

  Interdepartmental vehicle sharing: The vehicles in the City of Oxnard fleet have a wide range of mileages. In some cases, the duty cycle of a vehicle may exceed even the longer ranges available in current EV sedan models. However, if EVs are only deployed in low-mileage duty cycles, this limits the potential operating savings of fueling with electricity. Interdepartmental sharing policies can ensure that EVs are used as much as possible for range-appropriate trips. This enables maximization of electric vehicle miles traveled (eVMT), which subsequently maximizes operating savings for fleets. While coordination is needed for cohesive vehicle scheduling, the benefits of this can be far reaching, and can increase awareness and pave the way for an incremental shift to EVs.

- **Sharing of charging infrastructure**: Developing charging infrastructure for EVs can significantly add to the costs of EV fleet deployments. By grouping EV chargers together and ensuring charging access is shared across departments, fleet managers can significantly cut down on infrastructure costs.

Policies to support electrification

Transitioning to electric vehicles can be daunting. As studies have shown,[16] one of the biggest barriers to EV adoption is lack of awareness. The tendency to continue to purchase what one knows and is familiar with exists within municipal fleet procurement as well. Several agencies have tried to use internal policies to circumvent these tendencies. Some examples of these are described below:

- **Santa Monica:** The City of Santa Monica has instituted what is known as the "Sustainable Fleet Administrative Instruction". The Instruction has a number of innovative components, including that "The City shall make every effort to obtain non-gasoline and non-diesel equipment that is the most cost-efficient, fuel-efficient, and emit the least pollutants and GHG emissions."[17] In addition,

[16] Singer, Mark. The Barriers to Acceptance of Plug-In Electric Vehicles: 2017 Update. National Renewable Energy Laboratory, available at: https://www.nrel.gov/docs/fy18osti/70371.pdf

[17] Administrative Instruction II-4-22, "Sustainable Fleet". City of Santa Monica, Effective date: December 12, 2015.

the document contains instructions to optimize equipment utilization (and thus reduce the total quantity of equipment) and reduce equipment size.

- **California Department of General Services:** In 2012, Governor Brown mandated that zero-emission vehicles compose 10 percent of state light-duty vehicle purchases by 2015 and 25 percent by 2020. The California Department of General Services (DGS) has developed with innovative guidance and programs to ensure State of California fleet procurement is aligned with these goals. First, DGS will not approve any state fleet purchases unless that state agency follows a rigorous data collection process. DGS then uses this data to evaluate whether the vehicle at hand requires replacement, and what ZEV options are commercially available. While this is not without challenge – DGS must balance emissions goals with special performance vehicles that are exempt from the 10 percent mandate – DGS has compiled a toolkit of methods to 'nudge' purchasing behavior toward ZEVs.[18]

  DGS also instituted a "ZEV and hybrid vehicle first" policy. Not only does this incrementally raise the ZEV purchase percent mandate by 5 percent annually, reaching 50 percent in 2025, but it also "requires departments to purchase light-duty vehicles according to the following priority structure, when available on the statewide contract: (1) pure ZEVs, (2) plug-in hybrid EVs, and (3) hybrids". [19]

The City of Oxnard already has a green procurement policy that supports procurement of recycled content. Perhaps the City of Oxnard could expand this to an EV procurement policy, similar to the City of Santa Monica or the California DGS. [20]

Conclusion

The City of Oxnard has the opportunity to not only stand as a model for other organizations in the community by incorporating a strong fleet electrification program, but can also take advantage of the immediate cost benefits that EVs bring. In the short term, the City of Oxnard is presented with a number of opportunities to transition sedans, SUVs, and vans to EV alternatives. Additionally, a slew of new vehicle models will become commercially available in the early 2020s. Oxnard fleet managers should keep a keen eye on pick-up truck availability, as these compose a large portion of the municipal fleet and present an excellent opportunity to align Oxnard with California's goal of 5 million vehicles on the road by 2030.

If the City of Oxnard is to represent its share of EVs, the number of EVs in the city will need to grow by at least 40 percent each year. Fortunately, as upfront prices decrease, fueling savings grow, and vehicles become available with longer ranges and in more vehicle types, EV uptake is naturally accelerating. Extensive opportunity for electrification exists, both within the community and within the City of Oxnard fleet itself. With proper policies and infrastructure investments, the City of Oxnard can ensure that it is on the forefront of this electric wave.

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[18] "Greening California's State Fleet". Evan Speer, Chief of Office of Fleet and Asset Management, California DGS. Accessed 2/9/2019 at: https://slideplayer.com/slide/13710044/

[19] State of California Green Fleets – Major Initiatives, Accessed 3/13/2019 at https://green.ca.gov/fleet/about/initiatives/.

[20] City of Oxnard, https://www.oxnard.org/green-sustainability-programs-internal-programs-3/

References:

"Ask Ventura City Hall: Who is my new energy provider?" Ventura County Star, January 20, 2019. https://www.vcstar.com/story/news/2019/01/20/ventura-city-hall-clean-power-alliance-renewable-energy-electricity-southern-california-edison/2628151002/

"Greening California's State Fleet". Evan Speer, Chief of Office of Fleet and Asset Management, California DGS. Accessed 2/9/2019 at: https://slideplayer.com/slide/13710044/

Administrative Instruction II-4-22, "Sustainable Fleet". City of Santa Monica, Effective date: December 12, 2015.
Available models: https://electrek.co/2018/04/26/electric-lawnmower-guide/,

Price parity analysis: Consumer Reports, Electric Lawn Mowers that Rival Gas Models. April 2017,: https://www.consumerreports.org/push-mowers/electric-lawn-mowers-that-rival-gas-models/

Bedir, Abdulkadir, Noel Crisostomo, Jennifer Allen, Eric Wood, and Clément Rames. 2018. **California Plug-In Electric Vehicle Infrastructure Projections: 2017-2025.** California Energy Commission. Publication Number: CEC-600-2018-001

California Air Resources Board, "Zero Emission Airport Shuttle Regulation". Hearing date scheduled for February 21, 2019, more information available at: https://ww2.arb.ca.gov/rulemaking/2019/asb19

California Auto Outlook, February 2019. California New Car Dealers Association. Accessed 3/10/19 at: https://www.cncda.org/wp-content/uploads/Cal-Covering-4Q-18.pdf.

City of Oxnard Energy Action Plan, April 2013. Available online at: https://www.oxnard.org/wp-content/uploads/2016/04/OxnardEAP4.2013.pdf

City of Oxnard, https://www.oxnard.org/green-sustainability-programs-internal-programs-3/

Full text of Executive Order B-48-18 available at https://www.gov.ca.gov/2018/01/26/governor-brown-takes-action-to-increase-zero-emission-vehicles-fund-new-climate-investments/.
https://electrek.co/2019/01/24/tesla-model-s-police-patrol-vehicle-fremont/
https://evobsession.com/ev-revolution-timeline-evs-cheaper-icevs-2022/

https://insideevs.com/monthly-plug-in-sales-scorecard/
Price parity analysis: Consumer Reports, Electric Lawn Mowers that Rival Gas Models. April 2017,: https://www.consumerreports.org/push-mowers/electric-lawn-mowers-that-rival-gas-models/,
Available models: https://electrek.co/2018/04/26/electric-lawnmower-guide/,

Singer, Mark. The Barriers to Acceptance of Plug-In Electric Vehicles: 2017 Update. National Renewable Energy Laboratory, available at: https://www.nrel.gov/docs/fy18osti/70371.pdf

State of California Green Fleets – Major Initiatives, Accessed 3/13/2019 at https://green.ca.gov/fleet/about/initiatives/.

The 2013 California Building Code became effective on January 2, 2014. MUDs with 17 or more units that were permitted and constructed after this date should have the required EV charging station capable

parking spaces. For more information, see 2013 Chapter 11. Section 4.106.4.2 of the California Building Code.

Winn, Ryan, Electric Vehicle Charging at Work. Luskin Center for Innovation: http://innovation.luskin.ucla.edu/sites/default/files/Full%20Report.pdf