About this Document
This document was prepared for the Southern California Association of Governments (SCAG) by the UCLA Luskin Center for Innovation. SCAG is coordinating a multi-stakeholder group of government agencies, utilities, and university researchers to prepare multi-faceted and interdisciplinary regional PEV readiness plans. Among other purposes, these plans will help illuminate and guide strategic infrastructure investment, PEV-related economic development, and supportive policy design in Southern California.

The document also serves as an update to the 2013 Southern California Plug-in Electric Vehicle Readiness Atlas. The PEV market has changed considerably since the release of the 2013 report, so policymakers and planners are now encouraged to refer to this version of the PEV Atlas.

Disclaimer
This work was prepared for the Southern California Association of Governments (SCAG) as part of Agreement M-004-16 and sponsored by the California Energy Commission (CEC). The contents of this report reflect the views of the author, who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of SCAG, CEC, the State of California, or their employees. This report does not constitute a standard, specification or regulation. The CEC, the State of California, their employees, contractors, and subcontractors make no warranty, express or implied, and assume no legal liability for the information in this document; nor does any party represent that the use of this information will not infringe upon privately owned rights.

Acknowledgements
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Ventura Council of Governments

Western Riverside Council of Governments
Plug-in electric vehicles (PEVs) may provide a range of important benefits. For drivers, PEVs are a way to save money on fuel, avoid trips to the gasoline station, contribute to energy independence, and improve local air quality. For utilities, PEVs represent a new source of demand for power even as they support efficient use of energy produced during overnight hours. For state and regional air-quality regulators, PEVs help reduce criteria air pollutants and greenhouse gas (GHG) emissions.

To fully realize the benefits of PEVs, planners must coordinate and facilitate the growth of two complementary markets: one for PEVs and another for the electric charging opportunities that these vehicles need to refuel. This Atlas describes how many PEVs are in a given neighborhood and how their spatial concentrations vary over the course of a day as their drivers travel to workplaces and retail destinations. This Atlas also projects PEVs growth over the next 10 years within neighborhoods and municipalities in each of the 15 councils of government (COGs) within the Southern California Association of Governments region.

This Atlas also maps potential charging infrastructure opportunities to support and complement growth in the PEV market. It identifies the locations and sizes of workplaces, multi-unit residences and retail establishments that could potentially host PEV charging. Lastly, the Atlas includes maps of other resources that support PEV charging, such as existing publicly-accessible charging stations and stand-alone parking facilities.

This spatial information enables to planners to know where PEVs are currently and where growth is likely to occur. This will help them prioritize the municipal planning reforms such as those described in the Southern California PEV Readiness Plan. It describes where latent PEV demand is constrained because of the challenges of installing charging opportunities in multiunit residences. It also describes the locations of workplaces and retail establishments that are in neighborhoods with a higher density of PEVs during the day and evening. With this information, planners can take the next steps to provide the targeted technical assistance to these sites as described in the Southern California PEV Readiness Plan.

The methods section of this Atlas provides detailed information on data sources and analyses used to generate each map. This Atlas features the following maps of the neighborhoods and municipalities within each COG in the SCAG region:

1. **PEV registration density as of 2016.** Knowing how many PEVs are registered in a given area will indicate the location of current and near-future demand for residential charging. By extension, this information can help planners and utilities anticipate locations that will carry additional nighttime electrical load.

2. **PEV morning travel to work, providing spatial daytime PEV density at or near workplaces.** Understanding where PEVs are concentrated during morning peak hours (6 to 9 a.m.) can help planners and utilities identify neighborhoods where there will be demand for daytime charging.

3. **Workplaces identified by numbers of employees.** Planners can target the largest employers for workplace charging initiatives, as they presumably host the largest numbers of parking spaces on-site and can potentially serve the highest numbers of employees.

4. **Workplaces overlaid with morning peak PEV density.** Planners and utilities can use these maps to assess the potential utilization of workplace charging by comparing the spatial distribution of employers and weekday morning peak travel destinations for PEVs.

5. **Publicly accessible charging locations, identified by power level and number of stations per location.** Planners can use these maps to compare the location of existing publicly accessible charge stations with the locations of employment centers, retail centers and PEV daytime destinations, also mapped at the COG level in the Atlas. The maps can also be used to identify where there are gaps in meeting demand for charging. For MUDs that do not have parking, publicly accessible sites will become important charging options. The maps identify the number of charging units/cords available at each location along with the level of service (Level 1, Level 2, etc., or “Unknown” where charging is available but the quantity...
of connectors and their level of service could not be immediately
determined). The maps are based on a snapshot of publically
accessible charging stations as of May 23, 2017.

6. **Multi-unit dwellings (MUDs) by number of units and density.**
City planners can use these maps to identify specific buildings
and/or MUD owners that could potentially host charging on-site.
Planners can use the maps to compare spatial distributions of
MUD density with employment and commercial density, publicly
accessible charging stations, and stand-alone parking areas to
assess the potential for these other PEV sites to serve the charging
needs of MUD residents. Mapping the precise location of MUDs
and knowing the density of units on a site will be of particular use
in utility planning. Utilities can use such maps to anticipate where
upgrades may be needed for transformers and distribution stations
to accommodate PEV charging at MUDs.

7. **Retail destinations, from strip development to regional
centers.** Many plug-in electric vehicle (PHEV) drivers find it valuable
to charge when visiting retail destinations in order to maximize
electric miles driven. After locating general categories of retail
charging opportunities on the map, planners can turn to Chapter
8 of the Southern California PEV Readiness Plan for more detailed
descriptions of how long cars are typically parked at specific types of
retail destinations.

8. **Retail destinations overlaid with PEV mid-day travel, providing
spatial retail PEV density at or near retail centers.** Planners and
utilities can use these maps to assess potential for retail charging
by comparing the spatial distribution of retail centers and mid-day
travel destinations (9 a.m. to 3 p.m.) for PEVs.

9. **Stand-alone parking facilities.** Publicly accessible parking facilities
can fill a gap in PEV charging, particularly in older urban cores where
retail stores and even some workplaces and multi-unit dwellings
do not have dedicated parking. Park and ride lots in particular may
substitute for Level 1 workplace charging if workers leave their PEVs
parked all day. Parking lots and structures larger than 2.5 acres that
are not attached to other land uses are mapped at the COG level.

The Atlas provides this suite of spatial tools for PEV readiness planning
for the following COGs:
- Arroyo Verdugo Subregion
- City of Los Angeles
- Coachella Valley Association of Governments
- Gateway Cities Council of Governments
- Imperial County Transportation Commission
- Las Virgenes Malibu Council of Governments
- North Los Angeles County
- Orange County Council of Governments
- San Bernardino Associated Governments
- San Fernando Valley Council of Governments
- San Gabriel Valley Council of Governments
- South Bay Cities Council of Governments
- Ventura County Council of Governments
- Western Riverside Council of Governments
- Westside Cities Council of Governments
METHODS

This section describes the methods, assumptions and data sources used to create the maps and charts presented in this study. They are presented in the order in which they appear.

PEV growth

In this study, we define a PEV as any fully electric vehicle (including low-speed neighborhood electric vehicles and electrified trucks) or a plug-in hybrid electric vehicle (PHEV). See Table A.1 for a summary of the PHEV models counted in this analysis. The scope only includes PEVs registered as new in the Southern California Association of Governments region between December 2010 and September 2016 inclusive. PEV registrations were supplied at the 2010 Census tract level by IHS Automotive (formerly R.L. Polk & Co).

It is important to note that the San Fernando Valley Council of Governments (SFVCOG) is an overlay of portions of the City of Los Angeles, the Arroyo Verdugo Subregion, and North Los Angeles County. There is no unique area within SFVCOG that is not included in another COG.

Once the 2010–2016 PEV counts were obtained, a reasonable growth rate was needed to predict how PEVs would grow through the end of 2025. We experimented with a number of different models of monthly and cumulative growth. Ultimately, a quadratic model of monthly cumulative growth appeared to fit the data best. We estimated the following model for months between December 2010 and September 2016:

Table A.1 PEVs Included in the Analysis

<table>
<thead>
<tr>
<th>Make</th>
<th>Model</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audi</td>
<td>A3</td>
<td>PHEV</td>
</tr>
<tr>
<td>Azure</td>
<td>Transit Connect</td>
<td>BEV</td>
</tr>
<tr>
<td>BMW</td>
<td>330e</td>
<td>PHEV</td>
</tr>
<tr>
<td>BMW</td>
<td>i3</td>
<td>BEV</td>
</tr>
<tr>
<td>BMW</td>
<td>X5</td>
<td>PHEV</td>
</tr>
<tr>
<td>Cadillac</td>
<td>ELR</td>
<td>PHEV</td>
</tr>
<tr>
<td>Chevrolet</td>
<td>Spark</td>
<td>BEV</td>
</tr>
<tr>
<td>Chevrolet</td>
<td>Volt</td>
<td>PHEV</td>
</tr>
<tr>
<td>Fiat</td>
<td>500</td>
<td>BEV</td>
</tr>
<tr>
<td>Fisker</td>
<td>karma</td>
<td>BEV</td>
</tr>
<tr>
<td>Ford</td>
<td>Focus</td>
<td>BEV</td>
</tr>
<tr>
<td>Ford</td>
<td>Fusion</td>
<td>PHEV</td>
</tr>
<tr>
<td>Ford</td>
<td>C-max</td>
<td>PHEV</td>
</tr>
<tr>
<td>GEM</td>
<td>N/A</td>
<td>NEV</td>
</tr>
<tr>
<td>Honda</td>
<td>Accord</td>
<td>PHEV</td>
</tr>
<tr>
<td>Honda</td>
<td>FCX</td>
<td>FCEV</td>
</tr>
<tr>
<td>Honda</td>
<td>Fit</td>
<td>BEV</td>
</tr>
<tr>
<td>Hyundai</td>
<td>Sonata</td>
<td>PHEV</td>
</tr>
</tbody>
</table>
Cumul_m = α + β_{\text{month}_m} + γ_{\text{month}_2m} + ϵ_m

where Cumul_m is the cumulative PEV sales in a given month, month_m is the number of months elapsed since December 2010, month_2m is the number of months elapsed since 2010 squared and ϵ_m is a mean-zero error term. Using the coefficient estimated from this regression, we predicted cumulative PEV sales for all months until the end of 2025. At some point the PEV market will reach saturation, so this quadratic growth model represents PEV registrations in the early stages of technology adoption. We believe that 2025 is early enough in the PEV lifecycle that market saturation will be unlikely.

However, a potential limiting factor on the actual growth of PEVs is the high percentage of Southern California residents who live in multi-unit dwellings (MUDs). Unless steps are taken to facilitate charging in MUDs, PEV ownership may not grow as projected.

**PEV registrations**
The PEV registration maps show the number of PEVs registered between December 2010 and September 2016 in the COGs by Tier 1 travel analysis zone (TAZ). TAZs closely follow 2000 Census tract boundaries and are used by SCAG to estimate travel within and between neighborhoods. There are 4,109 Tier 1 TAZs in the SCAG region. The map colors move from lighter in areas with no or few PEVs registered to darker in areas with more PEVs registered. PEV registration data was supplied at the 2010 Census tract level by IHS Automotive (formerly R.L. Polk & Co), and was harmonized with TAZ boundaries.

**PEV morning peak destinations**
We used the outputs from SCAG’s 2012 Regional Model to determine the arrival locations and densities of PEVs during peak morning hours. Using surveys of household travel behavior, SCAG’s travel demand model estimates the number of trips from home to work, school, and other destinations by time of day. The morning peak period represents weekday trips that occur between 6 and 9 a.m. (i.e., commutes to work). The model does not distinguish commuting patterns by vehicle type, so we assumed that the commuting patterns of PEVs are the same as those of conventional vehicles, and applied the proportion of PEVs registered in the origin TAZ to the commute patterns that characterize that TAZ. The data on PEV registrations comes from automotive data vendor IHS Automotive, which provided the number of PEVs registered as new within each 2010 Census tract from December 2010 through September 2016. It is important to note that these morning peak destination TAZs receive vehicles from outside the COG.

**Workplaces by number of employees**
The maps of employment density were prepared using commercially available Infogroup data from 2015 on employer size (i.e., number of employees) and location. This data is compiled from public documents that disclose employment size, as well as through a website and phone verification process. Each circle on the map represents one workplace. The circles move from small to large and from yellow to red as the number of employees per workplace increases.

**PEV morning peak destinations and workplaces**
This is an overlay of the previous two maps. The maps show both where PEVs driving to work are likely to be during daytime hours and where there are many employers and potentially high demand for workplace charging depending upon how charging is priced.

**Publicly accessible charging stations**
Data on publicly assessable charging stations was obtained from the online database maintained by PlugShare (www.plugshare.com), which contains information posted by users that charge at these locations. “Publicly accessible” refers to stations that are owned by either the government or private businesses but that are available for use by the general public. The precise number of connectors or charging units that are operational at any given time and location are subject to maintenance and upgrade schedules. The distribution of publicly accessible charging stations presented in this report reflect a snapshot of the PlugShare database as of May 23, 2017.

**Multi-unit residential land uses**
This data is obtained from SCAG’s 2012 Existing Land Use Dataset, which
includes information on the concentration of all residential units other than single-family in the SCAG region. The land use data was originally developed by Aerial Information Systems Inc. as a Modified Anderson Land Use Classification for the 2008 SCAG land use dataset. The 2012 dataset is based on this 2008 dataset and is updated using 2008-2012 new construction data and inputs from local jurisdictions in the SCAG region. The designations were determined by using aerial photography to estimate the land use at the parcel level. Each residential parcel in the dataset is assigned a code that best describes the composition of residential unit types. The factors that contribute to a parcel’s residential designation are the height of the buildings, the square footage, and the concentration of multi-unit dwellings per parcel. See Table A.2 for a summary of the multi-unit dwellings designations in the 2012 SCAG Existing Land Use Dataset.

**Commercial (retail) destinations**

This map data is obtained from SCAG’s 2012 Existing Land Use Dataset, which includes information on the concentration of retail centers in the SCAG region. The land use data was originally developed by Aerial Information Systems Inc. as a Modified Anderson Land Use Classification for the 2008 SCAG land use dataset. The 2012 dataset is based on the 2008 dataset and is updated using 2008–2012 new construction data and inputs from local jurisdictions in the SCAG region. The designations were determined by using aerial photography to estimate the land use at the parcel level.

The commercial (retail) destination maps contain retail and small business locations (such as beauty salons and small offices) within each COG in the region. They highlight five types of retail centers that are likely to attract many of the nonwork-related vehicular trips. These five categories are summarized in Table A.3.

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2 Southern California Association of Governments Open Data. 2015. “Land Use Los Angeles.” Accessed October 2017 from: http://gisdata-scag.opendata.arcgis.com/datasets/0c432b1bca21426e83e40a358414fe7c_0


4 Southern California Association of Governments Open Data. 2015. “Land Use Los Angeles.” Accessed October 2017 from: http://gisdata-scag.opendata.arcgis.com/datasets/0c432b1bca21426e83e40a358414fe7c_0

### Table A.2 Multi-Unit Dwellings Designations in the 2012 SCAG Existing Land Use Dataset

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>1120</td>
<td>Multi-Family (General)</td>
<td>Uncategorized</td>
</tr>
<tr>
<td>1121</td>
<td>Mixed Multi-Family Residential</td>
<td>Mix of different density types</td>
</tr>
<tr>
<td>1122</td>
<td>Duplexes, Triplexes, and 2- or 3-Unit Condominiums and Townhouses</td>
<td>3 units or fewer</td>
</tr>
<tr>
<td>1123</td>
<td>Low-Rise Apartments, Condo-miniums, and Townhouses</td>
<td>4+ units; 10 to 18 units per acre; and 1-2 stories</td>
</tr>
<tr>
<td>1124</td>
<td>Medium-Rise Apartments and Condominiums</td>
<td>4+ units ; more than 18 units per acre; and 3-4 stories</td>
</tr>
<tr>
<td>1125</td>
<td>High-Rise Apartments and Condominiums</td>
<td>4+ units; more than 18 units per acre; and 5 stories or greater</td>
</tr>
</tbody>
</table>

### Table A.3 Commercial (Retail) Designations in the 2012 SCAG Existing Land Use Dataset

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Key Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>1220</td>
<td>Commercial (Other)</td>
<td>Retail stores and other/unknown commercial development</td>
</tr>
<tr>
<td>1221</td>
<td>Regional Shopping Center</td>
<td>Department store with surrounding parking</td>
</tr>
<tr>
<td>1222</td>
<td>Retail Centers (Non-Strip With Contiguous Interconnected Off-Street Parking)</td>
<td>Magnet store with in-front parking</td>
</tr>
<tr>
<td>1223</td>
<td>Modern Strip Development</td>
<td>Small businesses with parking on-street and on one side</td>
</tr>
<tr>
<td>1224</td>
<td>Older Strip Development</td>
<td>Small businesses with on-street parking</td>
</tr>
</tbody>
</table>
Land use Code 1220, Commercial (Other), is the general code used for retail stores and commercial development when the specific subland use is not discernable.

Land use Code 1221, Regional Shopping Center, contains large retail centers with at least one major department store and a range of other smaller retail establishments. These shopping centers are generally enclosed malls with parking surrounding the one- to three-story building. This also includes factory outlet malls.

Land use Code 1222, Retail Centers, comprises at least one large magnet store, a large off-street parking lot, and additional detached commercial stores, including small retail stores, gas stations, and restaurants. All structures are generally one story tall. Retail Centers are often located conveniently off major highways or highly trafficked surface streets.

Land use Code 1223, Modern Strip Malls, designates parcels that contain retail stores, restaurants, service shops, and offices, and are often located along major traffic corridors. Parking is available on-street as well as off-street either in front, on the side, or behind the structures. Included in this category are gas stations, auto repair shops, convenience stores, liquor stores, small bank branch offices, clothing stores, restaurants, furniture stores, discount stores, novelty stores, car dealerships or auto centers, drug stores, small corner markets, auctions, and smaller malls which do not contain a large magnet store.

Finally, land use Code 1224, Older Strip Development, contains parcels of land with little or no off-street parking. This category is commonly found in older city and town business corridors. Units are small retail establishments, restaurants, and offices with storefronts without setback, adjacent to the sidewalk. Units are often attached to the neighboring unit creating an uninterrupted streetscape. Units with commercial space on the first floor and residential units on upper floors can be considered Older Strip Development.  

**PEV mid-day destinations and commercial (retail) destinations**

We used the outputs from SCAG’s 2012 Regional Model to determine the arrival locations and densities of PEVs during mid-day hours. Using surveys of household travel behavior, SCAG’s travel demand model estimates the number of trips from home to work, school, and other destinations by time of day. The mid-day period represents weekday trips that occur between 9 a.m. and 3 p.m. (i.e., trips to run errands). The model does not distinguish commuting patterns by vehicle type, so we assumed that the commuting patterns of PEVs are the same as those of conventional vehicles, and applied the proportion of PEVs registered in the origin TAZ to the commute patterns that characterize that TAZ. The data on PEV registrations comes from automotive data vendor IHS Automotive, which provided the number of PEVs registered as new within each 2010 Census tract from December 2010 through September 2016. It is important to note that these mid-day destination TAZs receive vehicles from outside the COG.

We then overlaid mid-day destination information from the travel demand model with the previous map to illustrate the relationship between retail centers and mid-day trips.

**Stand-alone parking facilities**

This map data is obtained from SCAG’s 2012 Existing Land Use Dataset, which includes information on the concentration of retail centers in the SCAG region. The land use data was originally developed by Aerial Information Systems Inc. as a Modified Anderson Land Use Classification for the 2008 SCAG land use dataset. The 2012 dataset is based on the 2008 dataset and is updated using 2008–2012 new construction data and inputs from local jurisdictions in the SCAG region. The designations were determined by using aerial photography to estimate the land use at the parcel level.

The stand-alone parking facilities mapped at the COG level in the

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7 Southern California Association of Governments Open Data. 2015. “Land Use Los Angeles.” Accessed October 2017 from: http://gisdata-scag.opendata.arcgis.com/datasets/0c432b1bca21426e83e40a358414fe7c_0
Southern California PEV Atlas represent parking lots and structures greater than 2.5 acres that are not attached to other land uses. They highlight three types of stand-alone parking classified by SCAG:

Table A.4 PEVs Included in the Analysis

<table>
<thead>
<tr>
<th>Description</th>
<th>Key Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attended Pay Public Parking Facilities</td>
<td>Stand-alone public parking areas and parking structures that have an attendant-cashier present</td>
</tr>
<tr>
<td>Non-Attended Public Parking Facilities</td>
<td>Free or metered public parking areas where no attendant-cashier is present</td>
</tr>
<tr>
<td>Park and Ride Lots</td>
<td>Cal Trans park and ride lots provided for commuter ridesharing, buspooling, vanpooling, and carpooling</td>
</tr>
</tbody>
</table>

The “Attended Pay Public Parking Facilities” classification does not distinguish between privately owned commercial parking facilities available for public use and municipal or other parking facilities owned by the public sector that are available for public use.

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## PEV GROWTH SUMMARY

### PEV Growth by Council of Government (COG)

<table>
<thead>
<tr>
<th>COG</th>
<th>Through 2016</th>
<th>Through 2020</th>
<th>Through 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arroyo Verdugo Subregion</td>
<td>3,431</td>
<td>9,606</td>
<td>21,688</td>
</tr>
<tr>
<td>City of Los Angeles</td>
<td>29,071</td>
<td>80,760</td>
<td>181,541</td>
</tr>
<tr>
<td>Coachella Valley Association of Governments</td>
<td>1,427</td>
<td>3,904</td>
<td>8,713</td>
</tr>
<tr>
<td>Gateway Cities Council of Governments</td>
<td>6,568</td>
<td>17,453</td>
<td>38,251</td>
</tr>
<tr>
<td>Imperial County Transportation Commission</td>
<td>61</td>
<td>163</td>
<td>360</td>
</tr>
<tr>
<td>Las Virgenes Malibu Council of Governments</td>
<td>2,230</td>
<td>5,966</td>
<td>13,131</td>
</tr>
<tr>
<td>North Los Angeles County</td>
<td>15,526</td>
<td>43,178</td>
<td>97,053</td>
</tr>
<tr>
<td>Orange County Council of Governments</td>
<td>30,749</td>
<td>82,732</td>
<td>182,670</td>
</tr>
<tr>
<td>San Bernardino Associated Governments</td>
<td>5,451</td>
<td>14,779</td>
<td>32,763</td>
</tr>
<tr>
<td>San Fernando Valley Council of Governments</td>
<td>17,607</td>
<td>49,442</td>
<td>111,711</td>
</tr>
<tr>
<td>San Gabriel Valley Council of Governments</td>
<td>11,694</td>
<td>32,744</td>
<td>73,884</td>
</tr>
<tr>
<td>South Bay Cities Council of Governments</td>
<td>7,833</td>
<td>19,927</td>
<td>42,610</td>
</tr>
<tr>
<td>Ventura County Council of Governments</td>
<td>5,155</td>
<td>13,664</td>
<td>29,946</td>
</tr>
<tr>
<td>Western Riverside Council of Governments</td>
<td>5,516</td>
<td>14,879</td>
<td>32,892</td>
</tr>
<tr>
<td>Westside Cities Council of Governments</td>
<td>4,668</td>
<td>12,614</td>
<td>27,940</td>
</tr>
<tr>
<td><strong>Total</strong>*</td>
<td><strong>117,685</strong></td>
<td><strong>319,627</strong></td>
<td><strong>709,556</strong></td>
</tr>
</tbody>
</table>

*The rows do not add up to the totals due to overlapping boundaries among some COG regions.*
ARROYO VERDUGO SUBREGION
Cumulative PEV Growth

Cumul. Hybrid and PEV Purchases in Arroyo Verdugo

Cumul. BEV and PHEV Purchases in Arroyo Verdugo

Hybrid Purchases
PEV Purchases

PHEV Purchases
BEV Purchases
ARROYO VERDUGO SUBREGION

Monthly PEV Growth

Monthly Hybrid and PEV Purchases in Arroyo Verdugo

Monthly BEV and PHEV Purchases in Arroyo Verdugo
<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative PEV Registrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>3,431</td>
</tr>
<tr>
<td>2017</td>
<td>4,684</td>
</tr>
<tr>
<td>2018</td>
<td>6,131</td>
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<td>2019</td>
<td>7,772</td>
</tr>
<tr>
<td>2020</td>
<td>9,606</td>
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<tr>
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<td>11,635</td>
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<td>2022</td>
<td>13,857</td>
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<tr>
<td>2023</td>
<td>16,274</td>
</tr>
<tr>
<td>2024</td>
<td>18,884</td>
</tr>
<tr>
<td>2025</td>
<td>21,688</td>
</tr>
</tbody>
</table>
Monthly Hybrid and PEV Purchases in City of Los Angeles

Monthly BEV and PHEV Purchases in City of Los Angeles
CITY OF LOS ANGELES
Projected PEV Growth

Pred. Cumul. PEVs in City of Los Angeles

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative Predicted Sales</th>
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<tbody>
<tr>
<td>2016</td>
<td>29,071</td>
</tr>
<tr>
<td>2017</td>
<td>39,582</td>
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<tr>
<td>2018</td>
<td>51,701</td>
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<tr>
<td>2019</td>
<td>65,427</td>
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<td>80,760</td>
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<td>97,701</td>
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<td>116,250</td>
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<tr>
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<td>136,406</td>
</tr>
<tr>
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<td>158,170</td>
</tr>
<tr>
<td>2025</td>
<td>181,541</td>
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</table>
CITY OF LOS ANGELES
Workplaces by Number of Employees

Number of Employees
- 1 - 100
- 101 - 1,000
- 1,001 - 5,000
- 5,001 - 10,000
- 10,001 +
CITY OF LOS ANGELES
PEV Peak Morning Destinations and Workplaces

Number of Employees
- 1 - 100
- 101 - 1,000
- 1,001 - 5,000
- 5,001 - 10,000
- 10,001 +

PEV AM Peak Destinations
- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +
CITY OF LOS ANGELES
Publicly Accessible Charging Stations
**Cumulative PEV Growth**

**Cumul. Hybrid and PEV Purchases in Coachella Valley**

- **Hybrid Purchases**
- **PEV Purchases**

**Cumul. BEV and PHEV Purchases in Coachella Valley**

- **PHEV Purchases**
- **BEV Purchases**
Projected PEV Growth

Predicted Cumulative PEV Purchases

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative Predicted Sales</th>
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<tbody>
<tr>
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<td>1,427</td>
</tr>
<tr>
<td>2017</td>
<td>1,932</td>
</tr>
<tr>
<td>2018</td>
<td>2,513</td>
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<tr>
<td>2019</td>
<td>3,171</td>
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<td>3,904</td>
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<td>6,561</td>
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<td>2024</td>
<td>7,599</td>
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<td>2025</td>
<td>8,712</td>
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</table>
COACHELLA VALLEY ASSOCIATION OF GOVERNMENTS

PEV Registrations

- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +
COACHELLA VALLEY ASSOCIATION OF GOVERNMENTS

PEV Peak Morning Destinations and Workplaces

<table>
<thead>
<tr>
<th>Number of Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 100</td>
</tr>
<tr>
<td>101 - 1,000</td>
</tr>
<tr>
<td>1,001 - 5,000</td>
</tr>
<tr>
<td>5,001 - 10,000</td>
</tr>
<tr>
<td>10,001 +</td>
</tr>
</tbody>
</table>

PEV AM Peak Destinations

- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +
COACHELLA VALLEY ASSOCIATION OF GOVERNMENTS
Multi-Unit Residential Land Uses
Cumulative PEV Growth

Cumul. Hybrid and PEV Purchases in Gateway Cities

Cumul. BEV and PHEV Purchases in Gateway Cities
Projected PEV Growth

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative Predicted Sales</th>
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<td>2022</td>
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<td>2024</td>
<td>33,452</td>
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<td>2025</td>
<td>38,251</td>
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GATEWAY CITIES COUNCIL OF GOVERNMENTS
PEV Registrations

PEV Registrations
- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +
GATEWAY CITIES COUNCIL OF GOVERNMENTS
PEV Peak Morning Destinations
GATEWAY CITIES COUNCIL OF GOVERNMENTS
PEV Peak Morning Destinations and Workplaces

Number of Employees
- 1 - 100
- 101 - 1,000
- 1,001 - 5,000
- 5,001 - 10,000
- 10,001 +

PEV AM Peak Destinations
- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +
GATEWAY CITIES COUNCIL OF GOVERNMENTS

Stand-alone Parking Facilities

- Red: Attended Pay Public Parking
- Green: Non-Attended Public Parking
- Blue: Park and Ride
Monthly Hybrid and PEV Purchases in Imperial Valley

Monthly BEV and PHEV Purchases in Imperial Valley

- Hybrid Purchases
- PHEV Purchases
- PEV Purchases
- BEV Purchases

Hybrids (smoothed trend)
PHEVs (smoothed trend)
PEVs (smoothed trend)
BEVs (smoothed trend)
IMPERIAL COUNTY TRANSPORTATION COMMISSION
Projected PEV Growth

Pred. Cumul. PEVs in Imperial Valley

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative Predicted Sales</th>
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</thead>
<tbody>
<tr>
<td>2016</td>
<td>61</td>
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<tr>
<td>2017</td>
<td>82</td>
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<tr>
<td>2018</td>
<td>106</td>
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<tr>
<td>2019</td>
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<tr>
<td>2020</td>
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<td>2021</td>
<td>196</td>
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<td>2023</td>
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<td>2024</td>
<td>314</td>
</tr>
<tr>
<td>2025</td>
<td>360</td>
</tr>
</tbody>
</table>
PEV AM Peak Destinations
- 0 (N/A)
- 1 - 15
- 16 - 30 (N/A)
- 31+ (N/A)
IMPERIAL COUNTY TRANSPORTATION COMMISSION

Stand-alone Parking Facilities
LAS VIRGENES MALIBU COUNCIL OF GOVERNMENTS
Cumulative PEV Growth

Cumul. Hybrid and PEV Purchases in Las Virgenes

Cumul. BEV and PHEV Purchases in Las Virgenes

- Hybrid Purchases
- PHEV Purchases
- PEV Purchases
- Hybrids (smoothed trend)
- PHEVs (smoothed trend)
- PEVs (smoothed trend)

Las Virgenes Malibu Council of Governments | 79
Monthly PEV Growth

Monthly Hybrid and PEV Purchases in Las Virgenes

Monthly BEV and PHEV Purchases in Las Virgenes
Projected PEV Growth

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative Predicted Sales</th>
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</thead>
<tbody>
<tr>
<td>2016</td>
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<tr>
<td>2017</td>
<td>2,997</td>
</tr>
<tr>
<td>2018</td>
<td>3,876</td>
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<tr>
<td>2019</td>
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<td>9,932</td>
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<td>2024</td>
<td>11,476</td>
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<tr>
<td>2025</td>
<td>13,131</td>
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LAS VIRGENES MALIBU COUNCIL OF GOVERNMENTS

PEV Peak Morning Destinations

<table>
<thead>
<tr>
<th>PEV AM Peak Destinations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (N/A)</td>
</tr>
<tr>
<td>1 - 15</td>
</tr>
<tr>
<td>16 - 30</td>
</tr>
<tr>
<td>31 +</td>
</tr>
</tbody>
</table>

THOUSAND OAKS

PEV Peak Morning Destinations Map

Pacific Ocean
LAS VIRGENES MALIBU COUNCIL OF GOVERNMENTS

PEV Peak Morning Destinations and Workplaces

Number of Employees
- 1 - 100
- 101 - 1,000
- 1,001 - 5,000
- 5,001 - 10,000
- 10,001 +

PEV AM Peak Destinations
- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +

Thousand Oaks
LAS VIRGENES MALIBU COUNCIL OF GOVERNMENTS
Publicly Accessible Charging Stations
LAS VIRGENES MALIBU COUNCIL OF GOVERNMENTS
PEV Mid-Day Destinations and Commercial (Retail) Locations

Commercial Destinations
- Regional Shopping Center
- Retail Centers
- Modern Strip Development
- Older Strip Development
- Commercial [Other]

PEV Mid-Day Destinations
- 0 (N/A)
- 1 - 15
- 16 - 30 (N/A)
- 31 +
NORTH LOS ANGELES COUNTY
Monthly PEV Growth

Monthly Hybrid and PEV Purchases in North Los Angeles County

Monthly BEV and PHEV Purchases in North Los Angeles County

- Hybrid Purchases
- PHEV Purchases
- BEV Purchases
- Hybrids (smoothed trend)
- PHEVs (smoothed trend)
- BEVs (smoothed trend)
NORTH LOS ANGELES COUNTY
Projected PEV Growth

Pred. Cumul. PEVs in North Los Angeles County

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative Predicted Sales</th>
</tr>
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<tbody>
<tr>
<td>2016</td>
<td>15,526</td>
</tr>
<tr>
<td>2017</td>
<td>21,152</td>
</tr>
<tr>
<td>2018</td>
<td>27,636</td>
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<tr>
<td>2019</td>
<td>34,978</td>
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<td>2020</td>
<td>43,178</td>
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<tr>
<td>2021</td>
<td>52,237</td>
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<tr>
<td>2022</td>
<td>62,154</td>
</tr>
<tr>
<td>2023</td>
<td>72,929</td>
</tr>
<tr>
<td>2024</td>
<td>84,562</td>
</tr>
<tr>
<td>2025</td>
<td>97,053</td>
</tr>
</tbody>
</table>
NORTH LOS ANGELES COUNTY
PEV Registrations

PEV Registrations
- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +
NORTH LOS ANGELES COUNTY
Workplaces by Number of Employees

Number of Employees
- 1 - 100
- 101 - 1,000
- 1,001 - 5,000
- 5,001 - 10,000
- 10,001 +
NORTH LOS ANGELES COUNTY
PEV Peak Morning Destinations and Workplaces

Number of Employees
- 1 - 100
- 101 - 1,000
- 1,001 - 5,000
- 5,001 - 10,000
- 10,001 +

PEV AM Peak Destinations
- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +

[Map showing distribution of PEV peak morning destinations and workplaces with color-coded areas for different employee numbers]
PUBLICLY ACCESSIBLE CHARGING STATIONS

NORTH LOS ANGELES COUNTY

SANTA CLARITA

SANCTUARY

PALMDALE

SANTA CLARITA

SANCTUARY

PALMDALE

PUBLICLY ACCESSIBLE CHARGING STATIONS
NORTH LOS ANGELES COUNTY
Multi-Unit Residential Land Uses

Multi-Unit Residential
- Multi-Unit (General)
- Duplexes/Triplexes
- Low-Rise Apts/Condos/Townhomes
- Mixed Multi-Family
- Medium-Rise Apts/Condos
- High-Rise Apts/Condos
NORTH LOS ANGELES COUNTY
Stand-alone Parking Facilities

Parking
- Attended Pay Public Parking
- Non-Attended Public Parking
- Park and Ride

Map of NORTH LOS ANGELES COUNTY showingstand-alone parking facilities.
ORANGE COUNTY COUNCIL OF GOVERNMENTS
Cumulative PEV Growth

Cumul. Hybrid and PEV Purchases in Orange County

Cumul. BEV and PHEV Purchases in Orange County

- Hybrid Purchases
- PHEV Purchases
- PEV Purchases
- BEV Purchases
**Monthly PEV Growth**

**Monthly BEV and PHEV Purchases in Orange County**

- PHEV Purchases
- BEV Purchases

**Monthly Hybrid and PEV Purchases in Orange County**

- Hybrid Purchases
- PEV Purchases

**Graphs**

- Comparison of BEV, PHEV, and PEV purchases from January 2011 to January 2016.
**Projected PEV Growth**

**Pred. Cumul. PEVs in Orange County**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative Predicted Sales</th>
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<tbody>
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<td>2019</td>
<td>67,406</td>
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<td>82,732</td>
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<td>99,613</td>
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<td>2025</td>
<td>182,670</td>
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</table>
ORANGE COUNTY COUNCIL OF GOVERNMENTS

PEV Registrations

PEV Registrations
- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +

Map showing PEV Registrations across Orange County with different shades indicating registration levels.
SAN BERNARDINO ASSOCIATED GOVERNMENTS

Monthly PEV Growth

Monthly Hybrid and PEV Purchases in SANBAG

Monthly BEV and PHEV Purchases in SANBAG
### Projected PEV Growth

#### Pred. Cumul. PEVs in SANBAG

<table>
<thead>
<tr>
<th>Year</th>
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<tbody>
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<td>28,604</td>
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<tr>
<td>2025</td>
<td>32,763</td>
</tr>
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</table>
SAN BERNARDINO ASSOCIATED GOVERNMENTS
Workplaces by Number of Employees

Number of Employees
- 1 - 100
- 101 - 1,000
- 1,001 - 5,000
- 5,001 - 10,000
- 10,001 +
SAN BERNARDINO ASSOCIATED GOVERNMENTS
Stand-alone Parking Facilities
Cumulative PEV Growth

Cumul. Hybrid and PEV Purchases in San Fernando Valley

Cumul. BEV and PHEV Purchases in San Fernando Valley

- Hybrid Purchases
- Hybrids (smoothed trend)
- PEV Purchases
- PEVs (smoothed trend)
- PHEV Purchases
- PHEVs (smoothed trend)
- BEV Purchases
- BEVs (smoothed trend)
Monthly PEV Growth

Monthly Hybrid and PEV Purchases in San Fernando Valley

Monthly BEV and PHEV Purchases in San Fernando Valley
Projected PEV Growth

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative Predicted Sales</th>
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<tbody>
<tr>
<td>2016</td>
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<td>2024</td>
<td>97,259</td>
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<tr>
<td>2025</td>
<td>111,711</td>
</tr>
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</table>
SAN FERNANDO VALLEY COUNCIL OF GOVERNMENTS

PEV Registrations

PEV Registrations
- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +

[Map showing PEV registrations in the San Fernando Valley]
SAN FERNANDO VALLEY COUNCIL OF GOVERNMENTS
PEV Peak Morning Destinations and Workplaces
SAN FERNANDO VALLEY COUNCIL OF GOVERNMENTS

Stand-alone Parking Facilities

Frame the text as needed for the given context.
Cumulative PEV Growth

Cumul. BEV and PHEV Purchases in San Gabriel Valley

Cumul. Hybrid and PEV Purchases in San Gabriel Valley
### Projected PEV Growth

#### Pred. Cumul. PEVs in San Gabriel Valley

**Year** | **Cumulative Predicted Sales**
---|---
2016 | 11,694
2017 | 15,968
2018 | 20,901
2019 | 26,493
2020 | 32,744
2021 | 39,654
2022 | 47,223
2023 | 55,451
2024 | 64,338
2025 | 73,884
SAN GABRIEL VALLEY COUNCIL OF GOVERNMENTS
PEV Peak Morning Destinations

PEV AM Peak Destinations
0 (N/A)
1 - 15
16 - 30
31 +
SAN GABRIEL VALLEY COUNCIL OF GOVERNMENTS
PEV Peak Morning Destinations and Workplaces

Number of Employees
- 1 - 100
- 101 - 1,000
- 1,001 - 5,000
- 5,001 - 10,000
- 10,001 +

PEV AM Peak Destinations
- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +
SAN GABRIEL VALLEY COUNCIL OF GOVERNMENTS
Publicly Accessible Charging Stations
SAN GABRIEL VALLEY COUNCIL OF GOVERNMENTS

PEV Mid-Day Destinations and Commercial (Retail) Locations

Commercial Destinations
- Regional Shopping Center
- Retail Centers
- Modern Strip Development
- Older Strip Development
- Commercial (Other)

PEV Mid-Day Destinations
- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +
Cumulative PEV Growth

Cumul. Hybrid and PEV Purchases in South Bay Cities

Cumul. BEV and PHEV Purchases in South Bay Cities
Monthly PEV Growth

Monthly Hybrid and PEV Purchases in South Bay Cities

Monthly BEV and PHEV Purchases in South Bay Cities
Projected PEV Growth

### Pred. Cumul. PEVs in South Bay Cities

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative Predicted Sales</th>
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<tbody>
<tr>
<td>2016</td>
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<td>10,352</td>
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<tr>
<td>2018</td>
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<td>16,399</td>
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<td>2020</td>
<td>19,927</td>
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<td>23,791</td>
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<td>2022</td>
<td>27,991</td>
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<td>32,528</td>
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<td>2024</td>
<td>37,401</td>
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<tr>
<td>2025</td>
<td>42,610</td>
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</tbody>
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SOUTH BAY CITIES COUNCIL OF GOVERNMENTS

PEV Peak Morning Destinations

PEV AM Peak Destinations

- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +
SOUTHBAY CITIES COUNCIL OF GOVERNMENTS

Workplaces by Number of Employees

Number of Employees
- 1 - 100
- 101 - 1,000
- 1,001 - 5,000
- 5,001 - 10,000
- 10,001 +
Multi-Unit Residential Land Uses

- Multi-Unit (General)
- Duplexes/Triplexes
- Low-Rise Apt/Condos/Townhomes
- Mixed Multi-Family
- Medium-Rise Apts/Condos
- High-Rise Apts/Condos
Monthly Hybrid and PEV Purchases in VCOG

Monthly BEV and PHEV Purchases in VCOG
### Projected PEV Growth

#### Pred. Cumul. PEVs in VCOG

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative Predicted Sales</th>
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<tbody>
<tr>
<td>2016</td>
<td>5,155</td>
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<tr>
<td>2017</td>
<td>6,906</td>
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<td>2018</td>
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<tr>
<td>2019</td>
<td>11,161</td>
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<td>2020</td>
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<td>2025</td>
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</table>
VENTURA COUNCIL OF GOVERNMENTS
Commercial (Retail) Destinations

Commercial Destinations
- Regional Shopping Center
- Retail Centers
- Modern Strip Development
- Older Strip Development
- Commercial (Other)
VENTURA COUNCIL OF GOVERNMENTS
PEV Mid-Day Destinations and Commercial (Retail) Locations

Commercial Destinations
- Regional Shopping Center
- Retail Centers
- Modern Strip Development
- Older Strip Development
- Commercial (Other)

PEV Mid-Day Destinations
- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +
VENTURA COUNCIL OF GOVERNMENTS
Stand-alone Parking Facilities

Parking
- Attended Pay Public Parking
- Non-Attended Public Parking
- Park and Ride

Map showing various parking facilities in Ventura County.
Cumulative PEV Growth

Cumul. Hybrid and PEV Purchases in Western Riverside

Cumul. BEV and PHEV Purchases in Western Riverside

- Hybrid Purchases
- PEV Purchases
- Hybrids (smoothed trend)
- PEVs (smoothed trend)

- PHEV Purchases
- BEV Purchases
- PHEVs (smoothed trend)
- BEVs (smoothed trend)
Projected PEV Growth

**Pred. Cumul. PEVs in Western Riverside**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative Predicted Sales</th>
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<td>2018</td>
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<tr>
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<td>28,729</td>
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</tbody>
</table>
Publicly Accessible Charging Stations
WESTERN RIVERSIDE COUNCIL OF GOVERNMENTS
Multi-Unit Residential Land Uses

Multi-Unit Residential
- Multi-Unit (General)
- Duplexes/Triplexes
- Low-Rise Apts/Condos/Townhomes
- Mixed Multi-Family
- Medium-Rise Apts/Condos
- High-Rise Apts/Condos

[Map of Western Riverside County showing various land use types with color coding for Multi-Unit Residential.]
WESTERN RIVERSIDE COUNCIL OF GOVERNMENTS
PEV Mid-Day Destinations and Commercial (Retail) Locations

Commercial Destinations
- Regional Shopping Center
- Retail Centers
- Modern Strip Development
- Older Strip Development
- Commercial (Other)

PEV Mid-Day Destinations
- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +

Map of Western Riverside County showing destinations and locations with color-coded categories.
WESTERN RIVERSIDE COUNCIL OF GOVERNMENTS

Stand-alone parking Facilities

[Map showing stand-alone parking facilities in the Western Riverside area]

WESTSIDE CITIES COUNCIL OF GOVERNMENTS
Cumulative PEV Growth

Cumul. Hybrid and PEV Purchases in Westside Cities

Cumul. BEV and PHEV Purchases in Westside Cities

- Hybrid Purchases
- PEV Purchases
- Hybrids (smoothed trend)
- PEVs (smoothed trend)

- PHEV Purchases
- BEV Purchases
- PHEVs (smoothed trend)
- BEVs (smoothed trend)
Westside Cities Council of Governments

Monthly PEV Growth

Monthly Hybrid and PEV Purchases in Westside Cities

Monthly BEV and PHEV Purchases in Westside Cities

- Hybrid Purchases
- Hybrids (smoothed trend)
- PEV Purchases
- PEVs (smoothed trend)
- PHEV Purchases
- PHEVs (smoothed trend)
- BEV Purchases
- BEVs (smoothed trend)
Projected PEV Growth

<table>
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<tr>
<td>2025</td>
<td>27,940</td>
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WESTSIDE CITIES COUNCIL OF GOVERNMENTS
PEV Registrations

PEV Registrations
- 0 (N/A)
- 1 - 15
- 16 - 30
- 31 +

Map showing PEV registrations in Westside Cities Council of Governments area.
Multi-Unit Residential

- Multi-Unit (General)
- Duplexes/Triplexes
- Low-Rise Apt/Condos/Townhomes
- Mixed Multi-Family
- Medium-Rise Apts/Condos
- High-Rise Apts/Condos

Westside Cities Council of Governments
Multi-Unit Residential Land Uses
WESTSIDE CITIES COUNCIL OF GOVERNMENTS
Commercial (Retail) Destinations

Commercial Destinations
- Regional Shopping Center
- Retail Centers
- Modern Strip Development
- Older Strip Development
- Commercial (Other)