



**CALIFORNIA
ENERGY COMMISSION**



California Energy Commission
Clean Transportation Program

FINAL PROJECT REPORT

SAN JOAQUIN VALLEY PLUG-IN ELECTRIC VEHICLE READINESS PLAN

Prepared for: California Energy Commission

Prepared by: San Joaquin Valley Air Pollution Control District



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March 2021 | CEC-600-2021-019

California Energy Commission

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ACKNOWLEDGEMENTS

The San Joaquin Valley Air Pollution Control District (SJVAPCD) thanks the California Center for Sustainable Energy (CCSE) and the CEC for their support of this project. We thank the governmental, utility and business members of the San Joaquin Valley Plug-in Electric Vehicle Coordinating Council for their valuable guidance and assistance to develop the San Joaquin Valley Readiness Plan (Plan).

San Joaquin Valley Plug-in Electric Vehicle Coordinating Council The 28-member Council advisory group is composed of local metropolitan planning organizations, cities, counties, utilities, the San Joaquin Valley Clean Cities Coalition, electric vehicle service providers, local consultants and nonprofit organizations. The Council served as an advisory committee to the SJVAPCD to ensure the Plan was tailored to local conditions and responsive to local needs.

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PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program, formerly known as the Alternative and Renewable Fuel and Vehicle Technology Program. The statute authorizes the CEC to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) reauthorizes the Clean Transportation Program through January 1, 2024, and specifies that the CEC allocate up to \$20 million per year (or up to 20 percent of each fiscal year's funds) in funding for hydrogen station development until at least 100 stations are operational.

The Clean Transportation Program has an annual budget of about \$100 million and provides financial support for projects that:

- Reduce California's use and dependence on petroleum transportation fuels and increase the use of alternative and renewable fuels and advanced vehicle technologies.
- Produce sustainable alternative and renewable low-carbon fuels in California.
- Expand alternative fueling infrastructure and fueling stations.
- Improve the efficiency, performance and market viability of alternative light-, medium-, and heavy-duty vehicle technologies.
- Retrofit medium- and heavy-duty on-road and nonroad vehicle fleets to alternative technologies or fuel use.
- Expand the alternative fueling infrastructure available to existing fleets, public transit, and transportation corridors.
- Establish workforce-training programs and conduct public outreach on the benefits of alternative transportation fuels and vehicle technologies.

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the CEC's annual Clean Transportation Program Investment Plan Update. The CEC issued solicitation PON-10-602 to adopt the Plan. In response to PON-10-602, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards September 26, 2011, and the agreement was executed as ARV-11-008 on March 30, 2012.

ABSTRACT

The purpose of this project was to develop a regionally accepted Plan for the San Joaquin Valley that would help prepare the region for plug-in electric vehicle PEV adoption. The Plan provides a foundation for PEV readiness, including electric vehicle supply equipment planning, and addresses barriers to PEV adoption that are unique to the Valley through best practices and recommendations. The Plan serves as a tool to support local government officials, including planners, code officials and building inspectors when planning for PEV and charging infrastructure deployment, and to assist local policymakers and regional stakeholders in addressing the complexities behind barriers to PEV adoption in the region.

In order to maximize the Plan's effectiveness, an advisory group of regional stakeholders from public agencies, local energy utilities and charging station manufacturers was organized as the San Joaquin Valley Plug-in Electric Vehicle Coordinating Council. The Council used the results of a previous PEV Readiness assessment and prioritized 11 market barriers to the deployment of PEVs and public charging infrastructure specific to the region. The Council provided guidance and real-world input that was used to develop many of the recommendations in the Plan. In addition, the Council participated in coordinated outreach efforts to efficiently and effectively communicate best practices to local jurisdictions and multiple stakeholders involved in PEV readiness throughout the region.

The Plan recognizes that, in addition to the barriers found throughout the state, the Valley endures additional barriers due to its unique geographic and socioeconomic characteristics. Currently, the PEV adoption rate in the Valley only represents approximately two percent of the California PEV market. The Valley's socioeconomic diversity, vast rural regions between major metropolitan areas, and longer-than-average commute distances are some of the main contributing factors to the low adoption rate. While there are clearly early adopters in the region, the large number of disadvantaged communities poses unique challenges to PEV adoption in much of the region and precludes a one-size-fits-all approach. On the road ahead, the economic and environmental benefits of PEVs must be emphasized to the diverse communities in the Valley.

Keywords: California Energy Commission, San Joaquin Valley, Plug-in Electric Vehicles, PEV, EVSE, SJVPEVCC

DeYoung, Todd, Barati, Mehri, Sheikh, Samir. (San Joaquin Valley Air Pollution Control District). 2021. *San Joaquin Valley Plug-in Electric Vehicle Readiness Plan*. California Energy Commission. Publication Number: CEC-600-2021-019.

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EXECUTIVE SUMMARY

This report serves as the final deliverable for the CEC agreement ARV-11-008 awarded to the San Joaquin Valley Air Pollution Control District and its subcontractor, the California Center for Sustainable Energy. The report will summarize all of the deliverables completed under this agreement as well as provide context about on-going activities in the San Joaquin Valley around PEV community readiness and planning.

The purpose of this San Joaquin Valley Plug-in Vehicle Readiness Plan is to help the San Joaquin Valley develop effective PEV readiness strategies to prepare the region for PEVs through recommendations and best practices to help address the barriers to PEV adoption. This Plan builds upon a previous PEV readiness assessment of the San Joaquin Valley and is part of the on-going efforts to prepare communities throughout the state and the country for plug-in electric vehicles.

This Plan also aligns with state policies for deploying PEVs across California. To enable widespread adoption of PEVs, all segments of the population, especially low income and rural communities, must be considered. The Plan results show that a one-size-fits-all approach to encouraging investment in PEVs is not feasible for the San Joaquin Valley due to its unique socioeconomic conditions and rural, expansive geography. PEVs must be perceived as not just economical for a household, but as an opportunity for investment in the community. Although it is recognized that PEVs may ultimately not be a feasible option for many low-income residents in the San Joaquin Valley because of the high upfront cost of the vehicle, there are opportunities to focus on alternative solutions that would allow them to benefit from other lower emission vehicle technology or options that would serve as part of a long-term strategy to transition low-income residents into PEVs.

The Plan also aligns with the San Joaquin Valley Air Pollution Control District air quality goals. With mobile sources as the leading contributor of Nitrogen Oxide emissions in the San Joaquin Valley, the San Joaquin Valley Air Pollution Control District has made long-term commitments through its highly successful incentive programs to further PEV use. The San Joaquin Valley Air Pollution Control District will continue to adjust its current and future incentive programs to the growing PEV market in order to ensure that PEVs are affordable and accessible for all San Joaquin Valley residents and businesses. These incentive programs complement the Plan and help to address the high-cost barrier that challenges many low-income and even middle-income consumers to own PEVs. As the movement to encourage PEV use continues, emphasis will be made on the economic and environmental benefits of the technology to the diverse communities in the San Joaquin Valley.

CHAPTER 1:

Purpose and Approach

Purpose

The purpose of this project is to develop a regionally-accepted, comprehensive Plan¹ for the deployment of electric vehicle supply equipment (EVSE), establishment of best practices for "PEV-ready" building and public works guidelines, and to help to streamline EVSE permitting, installation, and inspection processes, all which provide a foundation for PEV readiness and EVSE planning. The Plan is specifically tailored to the San Joaquin Valley's specific and unique barriers to PEV adoption through best practices and recommendations. The two primary goals that were achieved were:

- Establishing the San Joaquin Valley Regional Plug-in Electric Vehicle Coordinating Council (SJVPEVCC)² which included regional stakeholders from public agencies, local energy utilities and charging station manufacturers to help identify and address the regional barriers and make recommendations for future planning activities.
- Creating a publicly vetted and SJVAPCD Governing Board approved Plan for the Valley.

The establishment of the SJVPEVCC was essential on two levels: (1) to garner region-wide participation of the development of the Plan; and (2) to aggregate the necessary representatives that could convey the true level of PEV readiness in the Valley and in turn, become the resources that could help develop the appropriate recommendations and tools that would best address the barriers in the region. The SJVPEVCC purposely served as an advisory committee to the SJVAPCD to develop a Plan that would be accepted and supported by the entire region. Comprised of eight counties (including San Joaquin, Stanislaus, Merced, Madera,

Fresno, Kings, Tulare, and the Valley portion of Kern), the Valley is equally represented on the SJVAPCD's Governing Board. Approved in May 2014, the adoption of the final Plan by the Board was crucial in maintaining solidarity and uniformity among local policymakers to advance PEVs in the region.

Approach

To develop a purposeful comprehensive regional plan, four primary tasks as identified in the agreement were performed:

1. Establish SJVPEVCC and SJVPEVCC Guidelines and Roles.
2. Prioritize and Develop PEV Readiness Components.
3. Create a Draft Regional Plan for Public Comment.
4. Create a Final, SJVAPCD Governing Board Approved Regional Plan.

¹ [San Joaquin Valley Readiness Plan](https://energycenter.org/sites/default/files/docs/nav/programs/pev-planning/San_Joaquin_Valley_PEV_Readiness_Planning_Guide.pdf) https://energycenter.org/sites/default/files/docs/nav/programs/pev-planning/San_Joaquin_Valley_PEV_Readiness_Planning_Guide.pdf

² [The San Joaquin Valley Regional Plug-in Electric Vehicle Coordinating Council](https://energycenter.org/) <https://energycenter.org/>

SJVPEVCC

To assist in the development of the Plan, the SJVAPCD established the SJVPEVCC to serve as an advisory group to the SJVAPCD to prioritize the market barriers that impede the growth of PEVs in the Valley. The SJVPEVCC consisted of regional stakeholders from local planning organizations, cities, counties, the San Joaquin Valley Clean Cities Coalition, electric vehicle service providers, local consultants, local nonprofit organizations, local energy utilities, and charging station manufacturers. By including a variety of stakeholders that could bring relevance to the meetings, both public and private, the SJVAPCD ensured that the barriers identified and given priority were both pertinent and strategic to near- and long-term PEV deployment goals in the San Joaquin Valley.

Goals were established for and by the SJVPEVCC which included the following:

- Increase education and outreach to municipalities and consumers.
- Conduct outreach to local government to recommend integration of PEV and EVSE policies into regional transportation and land use plans.
- Provide tools and resources to assist counties, cities, and communities in the region to become PEV ready.
- Create and publish recommendations and best practices through on-line information sheets for Valley jurisdictions and consumers.
- Communicate and coordinate regularly with surrounding regions regarding best practices.

The SJVAPCD and CCSE moderated two-hour long meetings for SJVPEVCC members on a monthly basis from February 2013 through August 2013 to garner their feedback on PEV issues and to share best practices from other areas with more advanced PEV readiness strategies. Between meetings, routine communication was made to and between SJVPEVCC members regarding topics discussed, to follow-up on items that were not concluded during regular meeting hours, and to prepare members for upcoming meetings. Meeting minutes were also regularly shared at this time to summarize the discussions with SJVPEVCC members and for members to share with their respective agencies on the progress of the project. Resource tools that were recommended during meetings were developed and/or provided to SJVPEVCC members to review and disseminate to other agencies as appropriate.

The SJVAPCD worked diligently to set out clear and concise goals and objectives for the SJVPEVCC to ensure the creation of the Plan stayed on task and on track. Once the barriers were identified and prioritized, monthly meetings focused on a few specific barriers at a time to allow sufficient, in-depth discussion on the central issues surrounding the barriers. SJVPEVCC members were solicited for their input on the real-world challenges and experiences that prolonged the barrier. Members were also then asked to provide recommendations that could be developed as solutions to eliminate the barrier. To spur suggestions and create constructive discussions, industry leaders and experts, PEV champions, and staff from local cities with PEV strategies in place, were invited to share their successful PEV experiences and share lessons learned. Members were encouraged to take back effective ideas to their respective agencies to initiate new or further existing PEV readiness strategies.

PEV Readiness Components

In its approach to develop a comprehensive plan, the SJVAPCD used the results of a previous PEV readiness assessment that was conducted as part of a Department of Energy grant for PEV readiness planning. The assessment concentrated on the installation of PEV charging infrastructure (or EVSE) and focused on five critical core readiness areas:

1. Updating zoning and parking policies.
2. Streamlining permitting and inspection processes.
3. Updating building codes for EVSE.
4. Training and education programs for municipalities and EVSE installers.
5. Municipal PEV outreach and education programs.

As part of the assessment, local municipalities were surveyed regarding their level of readiness with the preceding areas of EVSE. Although a small number of San Joaquin Valley cities indicated that some level of work was considered, in progress or completed to address EVSE planning, the overall results showed that many cities had shortcomings in addressing these areas. The 2012 Plan: Phase One Regional PEV Assessment can be found in its entirety at [San Joaquin Valley Air Pollution Control District Grant Page](http://www.valleyair.org/grants/pev.htm) www.valleyair.org/grants/pev.htm

Using the results and the recommendations that were derived from the assessment as a foundation for the Plan, the SJVPEVCC identified and prioritized at its first meeting 11 market barriers that were specific to the Valley. Table 1 lists the barriers in order of priority and the justifications as to why the barrier was identified and prioritized.

Table 1: Market Barriers to PEV Adoption in the San Joaquin Valley

Market Barrier	Reasons for Prioritization
Lack of Public Awareness of PEVs and Economic Challenges	Limited public understanding and awareness of the many facets of purchasing and using PEVs, especially with local policymakers who make PEV planning decisions Upfront cost of a PEV is typically higher than a gas-equivalent vehicle and is realistically unaffordable for many Valley consumers as many communities in the region endure some of the highest unemployment rates in the state with median household incomes at thousands of dollars below the state average
Zoning Policies, Parking, Signage	Based on DOE PEV Readiness Assessment results: only 15% of Valley cities/counties surveyed have just started to consider how to adopt EVSE code requirements and 55% have not started the process Consistency across jurisdictions and regional standardization of codes and policies that facilitate the installation and access to publicly available charging infrastructure is necessary
Training for Electrical Contractors	EVSE have specialized requirements and properly trained electrical contractors are needed to ensure installations are completed safely and up to code

	As PEV adoption increases, EVSE installers with the proper expertise, information, tools, and training will be in high demand
Permitting and Inspection	Permits are typically required for the proper and safe installation of EVSE and region-wide standards for permitting and inspection processes do not exist
Utility System Impacts and Rate Design	Local utilities experience issues when managing PEV charging including load impacts with increased electricity demands, rate structures for PEV owners, secondary meter option dedicated to home charging, effect of demand on local-level infrastructure, and renewable energy options High demand charges impact utility costs for EVSE host sites
Workplace Charging	Based on DOE PEV Readiness Assessment results: Lack of workplace charging at most Valley work sites Employers have minimal understanding of benefits and approaches to workplace charging Many Valley commuters are “mega-commuters” making workplace charging a necessity, especially for workers from rural areas
Building Codes for PEV Charging	Lack of standard building codes that accommodate charging infrastructure or dedicated circuits for charging infrastructure in new construction and major renovations
Charging at Multiunit Dwellings (MUDs)	Property owners lack sufficient knowledge regarding EVSE installation at MUDs that would allow them to make economic decisions EVSE installation challenges exists including load capacity issues at existing properties and lack of on-site parking designated for PEV charging
Fleet Electrification	PEVs can be viable as part of a fleet but conversion to PEVs need to make economic sense and not hinder fleet performance Limited available PEV technology for most medium- and heavy-duty fleets
Leveraging Renewable Energy	Reluctance of agencies to install EVSE due to existing concerns that PEV charging could increase emissions related to generating electricity from nonrenewable sources (despite state mandate for utilities to have energy portfolios with increase procurement from renewable sources) Lack of education on the use of renewables combined with PEVs despite high solar adoption rate in the Valley

Regional Charging Station Siting Analysis and Geographic Challenges	Valley is an expansive region stretching across 300 miles with vast rural stretches between major urban areas requiring PEV charging installations to be strategic
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Source: San Joaquin Valley SJVPEVCC Meeting Minutes.

As each barrier was discussed at SJVPEVCC monthly meetings, recommendations for each barrier were made. Where feasible, tools were also developed to address a specific barrier. Ultimately, the Plan toolkit and resources that were developed were a direct result of the recommendations made and vetted by the SJVPEVCC.

PEV Siting Analysis

The development of a regional PEV charging siting analysis was critical to help identify optimal charging locations in the San Joaquin Valley. The Valley currently has very limited public charging stations that can sustain the growth of PEVs and optimize the use of PEVs by current owners. The severe lack of charging infrastructure within the Valley means that, unlike other regions of the state that have robust charging infrastructure networks in place and siting analyses for those regions merely have to address gaps in their network, the entire Valleys' region in itself is a gap. Accordingly, the siting analysis for the Valley had to be developed strategically to address as feasible the region's unique geographic landscape which vastly differs from other regions of the state where PEV adoption flourishes. Unlike other parts of the state, urban areas in the Valley are very spread out along the highways and small, rural communities are separated from other cities by vast farmland, making access to major transportation corridors very limited.

To best address the needs of the Valley, the Siting Analysis focuses on three areas of PEV infrastructure:

1. Fast charging.
2. Public access charging.
3. Workplace charging.

The Siting Analysis provides an overview of each type of charging, how charging locations were selected, the data sources used to conduct the siting analysis, and maps of the optimal locations to place charging stations and infrastructure.

For the fast charging infrastructure portion of the Siting Analysis, the SJVAPCD and SJVPEVCC determined that focus should be placed on the Highway 99 corridor since the Interstate 5 is already well addressed in the California and CEC siting analysis³, as well as the West Coast Green Highway Project, which will deploy charging stations along Interstate 5 from British Columbia, Canada all the way to Baja California, Mexico. In addition, Highway 99 extends through the most densely populated areas of the Valley, connecting the major cities of the Valley to Northern and Southern California. Many Valley cities are located along or near the Highway 99 corridor making it an ideal option to assess placement of PEV charging infrastructure. This approach allowed the SJVAPCD to focus its activities and resources on the areas that would have the greatest impact on Valley residents, address known infrastructure

³ [California Siting Analysis](https://ww2.energy.ca.gov/sitingcases/) https://ww2.energy.ca.gov/sitingcases/

network gaps, and compliment on-going statewide efforts. Although Interstate 5 and Highway 99 are the two major transportation corridors that run parallel and directly through the Valley, it is recognized that numerous other transportation corridors exist in the region. These corridors, such as State Highways 33, 41, 43, 58, 132, 140, 152, 178, 180, and 198, are also frequently traveled by passenger and goods movement vehicles as many provide east-west travel between Interstate 5 and Highway 99 and are accessed by residents of the many rural cities located throughout the Valley to larger metropolitan areas. For these reasons, it is important that these highways are also considered and assessed by local jurisdictions for fast charging host sites. The methodology and guidelines used to evaluate Highway 99 for optimal fast charger sites can also be applied to any of these other highways to assist in identifying potential locations.

The public access charging portion of the Siting Analysis mapped the top four PEV-adopting cities in the Valley and the county seats of each county within the Valley for a total of ten cities. Although there are over 60 cities in the Valley, the basic guidelines for public accessing EVSE infrastructure siting are applicable to any city or town within the Valley. Similarly, the methodology for workplace charging can be applied to any Valley city or county beyond the five cities and three counties specifically mentioned in the Siting Analysis.

Draft PEV Plan

The development of the draft PEV Plan included the input and recommendations of the SJVPEVCC members that were gathered during the course of the SJVPEVCC meetings. To supplement the recommendations made in the Plan, additional items such as informative reports, toolkits, and templates were drafted and included as part of the Plan. These included, but were not limited to, easy-to-read fact sheets about PEVs and charging infrastructure, EVSE installation guidelines, outreach strategies for environmental justice communities, and online cost-savings tools and calculators.

Before taking the draft Plan to the SJVAPCD's Governing Board for approval and adoption, the SJVAPCD convened a public workshop to comment on the Plan. Consistent with previous public workshops, participation in the draft Plan workshop was available from all three SJVAPCD offices in Bakersfield, Fresno, Modesto, or via video-teleconferencing system and was also made available through webcast. This approach allows workshop accessibility and greater participation by the public which is spread out across the San Joaquin Valley's expansive region.

Final PEV Plan

After the draft Plan had been reviewed by the SJVPEVCC and the public, the SJVAPCD wanted to ensure ample discussion of the final Plan by the SJVAPCD Governing Board. To accomplish this, the SJVAPCD opted to discuss the final Plan at the Governing Board Study Session in May 2014. Unlike other Governing Board public meetings, these annual Study Sessions last for two entire days and allow for more in-depth discussion of agenda items between Governing Board members, SJVAPCD staff, and the public. These Study Session meetings also focus on the air quality strategies that the SJVAPCD, with support from its Governing Board, want to prioritize for the upcoming year.

In addition, the SJVAPCD chose to present the Plan as part of a larger comprehensive action plan for promoting the use of clean vehicles within the San Joaquin Valley. With the Valley's challenges meeting federal and state air quality standards, it is important that the SJVAPCD

address all emission sources where feasible, including light-duty passenger vehicles, to improve the air quality in the region. The multi-faceted action plan included recommendations that included the adoption of the Plan, and the following:

- Support the continued implementation of existing SJVAPCD clean passenger vehicle incentive programs.
- Develop and implement PEV charging infrastructure incentive programs.
- Continue to encourage innovative strategies to reduce the impacts of passenger vehicle emissions in low income, disadvantaged Valley communities where electric or advanced vehicle adoption is infeasible or unlikely due to economic or geographic constraints through variable actions.
- Support legislative/policy initiatives that target resources for low-emission and advanced technology vehicles in areas that are disproportionately impacted by air pollution. In addition, support those initiatives that target resources to environmental justice communities and that are designed to fit the unique circumstances faced by those communities.

By including the Plan as part of a package, the SJVAPCD was able to clearly lay out both short-term and long-term goals of PEV adoption and deployment in the Valley and recommend successful strategies for ensuring those goals are reached.

CHAPTER 2:

Activities and Results

During the plan development process, a multitude of activities were conducted that supplemented the final Plan. The Plan was ultimately adopted and approved by the SJVAPCD Governing Board in May 2014.

Activities

SJVPEVCC Meetings

At each SJVPEVCC meeting, the primary regional market barriers were discussed and vetted with members. Activities that were conducted at these meetings help to spur conversation topics, review the market barrier in detail, and consequently generate ideas and recommendations. These activities ranged from informational presentations from invited speakers or SJVPEVCC members to the development of outreach material for local policymakers. Table 2 provides a summary of activities conducted at the SJVPEVCC meetings.

Table 2: SJVPEVCC Meeting Activities

SJVPEVCC Meeting	Activities
February 2013	Review and establish objectives of SJVPEVCC Identify and prioritize PEV market barriers Review 2012 PEV Assessment of the Valley
March 2013	Discuss market barrier PEV Zoning and Parking Rules based, where members provided recommendations for training and education for municipal staff and electrical contractors Discuss market barrier Lack of Public Knowledge of PEV and EVSE, where, among other recommendations, members suggested the creation of a standard presentation to educate local officials and community members about PEVs, and sharing information between agencies regarding their Climate Action Plans and Sustainability Action Plans
April 2013	Discuss market barrier Permitting/Inspection, where members provided input regarding the priority of PEV charging infrastructure, barriers associated with commercial sites, and the need for a commercial permitting template Discuss market barrier PEV Charging – Time-of-use Utility Rates and Grid Impacts, where Southern California Edison presented on its role as a utility and current rate for PEV customers and the City of Lodi Electric Utility presented on the City’s local ordinance to implement a pilot rate schedule for PEV owners

<p>May 2013</p>	<p>Discuss market barrier Workplace Charging, where members recommended the need for an easier application process in which permit fees can be waived in order to spur adoption</p> <p>Discuss market barrier Updating Building Codes, where members offered recommendations for building code updates including providing flexibility for the required number of dedicated spots for PEVs</p>
<p>June 2013</p>	<p>EVSE 101 presentation provided to members to educate them on the basics of EVSE technology, charging rates and protocols, and charging network membership</p> <p>Discuss market barrier EVSE at MUDs where members addressed the definition of a MUD in the Valley and provided the recommendation that property managers be well-informed about EVSE installations, usage, and implementing a pay-per-use method</p> <p>Discuss market barrier EVSE Installation and Inspection Guidelines where members agreed that speaking with EVSE providers is necessary along with contacting the local utility before actual installation of hardware, and there must be consideration of the agriculture industry with respects to EVSE</p>
<p>July 2013</p>	<p>Address plans to attract PEV manufacturing, production, infrastructure, and services of PEV development in the region, where UPS presented on its experiences with sustainability and electric fleets (specifically its current electric fleet operating in the Valley)</p> <p>Address public EVSE installations, where City of Lodi Electric Utility presented on their experiences installing EVSE at public sites, and a template for a request for proposal (RFP) for public agencies was presented to members</p> <p>Discuss outline of an EVSE siting model that will be implemented into final Plan, where members provided comments on optimal approaches and recommended that utilities be involved in the siting process</p>
<p>August 2013</p>	<p>Discuss regional planning for public EVSE, where Dr. Tim Brown of the University of California, Irvine and developer of the siting model presented on the model and its findings</p> <p>Address the promotion of PEVs in fleets, where local manufacturer, Electric Vehicle International, presented on the company's success in manufacturing clean and reliable alternative fuel vehicles for commercial fleets</p> <p>Discuss the role of renewable energy with respect to PEV charging, where members were provided successful examples and members</p>

	recommended the installation of EVSE with renewable energy sources such as solar
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Source: San Joaquin Valley SJVPEVCC Meeting Summaries.

Presentations made during SJVPEVCC meetings were archived on the SJVAPCD and CCSE PEV Readiness websites for members to share with their organizations, interested stakeholders, and the community along with other PEV toolkits and resources. Some of the tools created were used during the course of the plan development process. For example, the public outreach presentation for local officials was used for a presentation at a San Joaquin Valley planners' meeting to educate local planners on PEV and EVSE technology and the importance of their sustainability in the Valley.

The SJVPEVCC meetings were a venue for members to not only provide insight to the region's state of readiness, but it also allowed members to share best practices and lessons learned and take away recommendations that could be effectively incorporated into their own strategies to address PEVs. Many regional members recommended including PEV readiness elements to enhance their local Climate Action Plans and Sustainability Action Plans to secure long-term support for PEVs. By incorporating the Plan and its recommendations into these plans already in development, local public agencies could leverage resources to include PEV readiness planning activities into other general plans.

Draft PEV Plan

A public workshop was held on Thursday, December 5, 2013 to discuss the draft Plan and draft *Charging Roadmap: Siting Optimal Locations for Public Charging Stations in the San Joaquin Valley's Siting Analysis* and provide an opportunity for input from the public. The lack of PEV marketing and outreach targeted to San Joaquin Valley residents and Valley auto dealerships was of primary concern from the public, as well as a request to expand the siting analysis to include additional details for certain regions. Based on these public comments received from the workshop, the siting analysis was expanded to show greater detail of several Valley cities and the Lack of Public Awareness market barrier was further developed to identify that strategies for consumer outreach through auto dealerships is necessary.

Further review of the draft Plan by SJVPEVCC members also identified areas that required additional emphasis for the Plan to be effective. The Valley's unique economic challenges needed to be prominently identified as one of the most critical factors that affect PEV adoption in the region as the price of PEVs simply makes them unaffordable for the many low-income consumers in the Valley. The draft Plan was modified to recognize the economic challenge of PEV ownership in a region with some of the most disadvantaged communities in the state as defined by California Environmental Protection Agency CalEnviroScreen⁴ which calculates and ranks disadvantaged communities throughout California. In addition, many of the PEV readiness elements are affected by the Valley's unique geography, which is vastly different from other areas of the state where PEV adoption is much greater. The Valley is approximately 27,000 square miles with vast rural farmlands between major cities, making it necessary to

⁴ [CalEnviroScreen](https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30) https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30

discuss in the Plan its geographic challenges with respects to EVSE siting and installation. These two additional areas were further developed and included as part of the final Plan.

Siting Analysis

The goal of the *Charging Roadmap: Siting Optimal Locations for Public Charging Stations in the San Joaquin Valley's* Siting Analysis was to identify optimal locations for public electric vehicle charging within the San Joaquin Valley's specific to fast charging along the Valley's transportation corridor, public access and destination charging, and workplace charging. This Siting Analysis contains region-specific planning data to support infrastructure deployment based on previous studies, employer/workplace engagement, transportation studies, and estimates of PEV deployment which could then be used for planning purposes by local employers, businesses, developers, and public and private agencies.

The original intent was to obtain travel analysis zone data with information about vehicle trips per day along with land use information to identify where commercial and workplaces clustered. Mapping vehicle trips per day revealed information about how often destinations are visited, which may indicate specific areas that may experience more charging demand from regional PEV drivers.

Although some county-level Valley government agencies were able to provide land use or trip destination data, obtaining both sets of data proved to be more difficult. To address this inconsistency, Google Places application programming interface (API) was used as a proxy for acquiring vehicle trip and destination data. The API was used to gather information on the location of destinations in ten Valley cities. It was assumed that areas with a higher density of destinations also experience a high volume of visitations and that PEV drivers will benefit from charging at these locations. The analysis does not take into consideration the designated land use, ownership or on-site electrical capacity for public access charging to host chargers at each location. Despite the benefits of Google's API, the dataset of destinations for each city has not been verified by another source and is not exhaustive.

The data for the maps' streets and highways were from the Environmental Systems Research Institute an international supplier of geographic Information API system software. For the direct current charging portion of the Siting Analysis, data was obtained from the National Household Travel Survey, the California Department of Transportation's data on highway exits, an Environmental Systems Research Institute-developed layer for highway exits, and Google Places API with analysis support from the University of California, Davis Plug-in Hybrid Electric Vehicle (PHEV) Research Center. Python computer programming software was used to collect data from the Google Places API. An effort was made to ensure the integrity of the maps, which included data comparison with Google Maps and distributing the maps to local planning organizations for verification.

Plug-in Electric Vehicle Resource Websites

Webpages dedicated to PEV resources and SJVPEVCC activities were created by the SJVAPCD and CCSE to ensure current, regularly updated, factsheets, presentations, templates, and other valuable information were easily assessable and readily available to SJVPEVCC members and the general public as a whole. The PEV Resources Center was launched in May 2012 and housed on the SJVAPCD's website and is a source of information about PEVs and EVSEs. It includes information and links to regional and statewide plans and toolkits to help different audience groups in the San Joaquin Valley learn more about electric vehicles and their

technology, electric vehicle charging, available incentives and rebates, PEV Plan and toolkits, SJVPEVCC-developed presentations, as well as links to several cost-savings calculators and charging maps. This new resource allows local residents, businesses, government officials, policymakers, fleet managers, utilities, dealers, and the media to easily navigate and find a variety of PEV information on the [SJVAPCD website](http://valleyair.org/grants/pev.htm) is at <http://valleyair.org/grants/pev.htm> (Figure 1), and on [CCSE's website](http://energycenter.org) <http://energycenter.org>.

Although these webpages were created as part of the development of the Plan, the SJVAPCD and CCSE have continued to keep the webpages updated with resources, links, and other invaluable information as advancements in PEVs and EVSEs continue to increase.


Figure 1: San Joaquin Valley Plug in Electric Vehicle Resources Center

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HOME LINKS GENERAL FEEDBACK ESPAÑOL / HMOOB SITE MAP CONTACT US

Search: [Advanced Search](#)

BACK **PLUG IN ELECTRIC VEHICLE RESOURCES CENTER**



As part of its commitment to improve the air quality in the San Joaquin Valley, the District strongly supports the advancement and sustainability of clean-air technology. One such technology is the plug-in electric vehicle (PEV) which can be used for commutes throughout the Valley as a clean-air alternative. Today's PEV market provides consumers with a wide-variety of options and understanding the technology is an important factor in your decision to purchase one.

The District has developed this resource center to help you find answers to your PEV questions. In addition, the District encourages you to review its active role to deploy PEVs throughout the Valley and invest in its air quality benefits.

RESOURCES

PLUG-IN ELECTRIC VEHICLES (PEVS)

ELECTRIC VEHICLE CHARGING

WHAT TYPES OF INCENTIVES ARE AVAILABLE TO PURCHASE A PEV?

DISTRICT PEV READINESS PLANS & TOOLKITS

To stay updated with the District's electric vehicle activities, please sign up for the [Electric Vehicle Resources email mailing list](#)

STAFF ACCESS GENERAL FEEDBACK © COPYRIGHT 2006-2012

Source: SJVAPCD

Results

Based on feedback from the SJVPEVCC members, a list of primary market barriers specific to the San Joaquin Valley was created that ultimately shaped the Plan. The Plan addresses and provides recommendations and tools to overcome a wide range of PEV barriers that are specific to the San Joaquin Valley's unique socioeconomic and geographically diverse region. This includes, but is not limited to, recognition of the Valley's many low-income communities and cost barriers that are significant factors that adversely impact the readiness of those communities to adopt PEV technology. The Plan was carefully sculpted in an effort to benefit all Valley residents to help make PEV ownership, and access to the supporting infrastructure, a reality for residents in both urban and rural communities.

During the process of finalizing the draft Plan follow-up discussions with SJVPEVCC members, who represented local public agencies and had discussed the draft Plan with their local public officials, indicated that a fair number of public officials still did not see PEVs and public charging stations (or lack thereof) as a high priority for their jurisdiction. In many cases, these officials did not realize that the base of PEV owners was large enough to justify investing sometimes scant resources towards costly PEV-related activities and infrastructure in lieu of other programs designed to reduce vehicle emissions.

With 47 percent of the San Joaquin Valley's population living in zip codes that rank in the top 10 percent of disadvantaged communities, 75 percent of the population living in zip codes that rank in the top 20 percent of disadvantaged communities, unemployment rates 33 percent higher than the rest of the state⁵, and 25 percent of the population living below the poverty line⁶, local elected officials and public agencies felt incentive programs, such as the SJVAPCD's Tune-In Tune-Up Vehicle Repair Program and Tune-In Tune-Up Vehicle Replacement Pilot Program that were geared specifically towards the low-income and disadvantaged communities, was a better use of resources. These sentiments expressed by local public officials was considered and incorporated in the Plan to recognize that PEVs may ultimately not be an immediate solution for low-income consumers. However, introduction of clean vehicle technology can be gradually made to these consumers which can eventually lead to future acceptance and use of PEV technology once the economic and environmental benefits are realized.

Data Analysis

Data analysis results reveal that the Valley holds a small share of the California PEV market with only approximately 1.5 percent of California PEVs registered in the San Joaquin Valley whereas air districts such as the Bay Area, South Coast and San Diego hold 35 percent, 45 percent and 8.5 percent of the state's market, respectively. Even after accounting for variations in population, the Valley's PEV per capita is significantly less than Bay Area, South Coast and San Diego, as illustrated in Table 3.

2. [U.S. Census, 2014](https://www.census.gov/programs-surveys/decennial-census/decade.2010.html). <https://www.census.gov/programs-surveys/decennial-census/decade.2010.html>

3. [Huffington Post, "California Poverty: Three Metro Areas In Central Valley Rank Among The Poorest In The Nation", September 2012](https://www.huffpost.com) <https://www.huffpost.com>

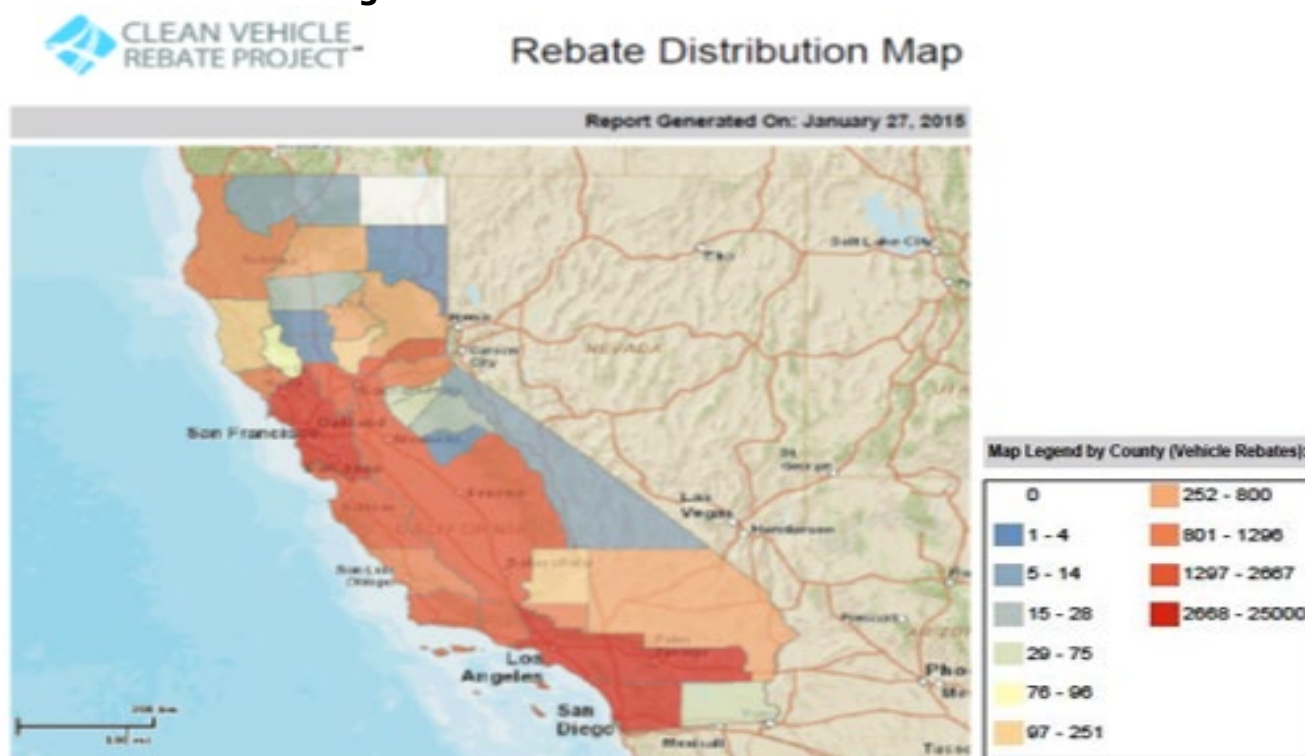
Table 3: Percent of PEV Per Population

Air District	Number of PEVs	Population	% PEVs Per Population
Bay Area	20,138	7,561,755	0.27%
San Diego	4,887	3,263,431	0.15%
San Joaquin Valley	976	4,117,525	0.02%
South Coast	24,012	17,704,110	0.14%

Source: [California Air Resources Board Clean Vehicle Rebate Project, Rebate Statistics](https://cleanvehiclerebate.org/eng/rebate-statistics).
<https://cleanvehiclerebate.org/eng/rebate-statistics>

The Valley did experience a thirteen-fold increase in PEV adoption between December 2011 and December 2013, however the region needs a robust charging network along with greater efforts to expand opportunities for everyone to enter the PEV market. Figure 2 shows the distribution of the California Air Resources Board’s Clean Vehicle Rebate Program (CVRP) rebates issued for California, illustrating the difference in adoption rate of the Valley compared with other regions throughout the state.

Figure 2: Statewide CVRP Rebates Issued



Source: [Center for Sustainable Energy \(2014\), California Air Resources Board Clean Vehicle Rebate Project](https://cleanvehiclerebate.org/eng/rebate-statistics), at
<https://cleanvehiclerebate.org/eng/rebate-statistics>

As part of the plan development process, the SJVPEVCC members expressed the need for specific tools and resources to help overcome the market barriers. As a result of the recommendations provided by SJVPEVCC members, the following resources in Table 4 were developed or modified from existing ones successfully used by agencies in other regions of the state.

Table 4: Resources to Address Market Barriers in the Valley

Market Barrier	Resources
Lack of Public Awareness of PEVs and Economic Challenges	<p>The Basics: A Guide to Plug-in Electric Vehicles and Charging Infrastructure</p> <p>Costs and Benefits of Switching to a Plug-in Electric Vehicle</p> <p>SJVPEVCC Community Presentation</p>
Zoning Policies, Parking, Signage	Sample Zoning Code Provisions
Training for Electrical Contractors	Electric Vehicle Charging Station Installation Guidelines: Fleet, Residential, Nonresidential
Permitting and Inspection	<p>Homeowner’s Guide for Permitting and Inspecting Electric Vehicle Chargers</p> <p>Residential EVSE Installation Guidelines</p> <p>Nonresidential EVSE Installation Guidelines</p>
Utility System Impacts and Rate Design	<p>Local Utilities: Solutions and Programs for PEV Charging</p> <p>San Joaquin Valley Utilities’ Electricity Sources</p>
Workplace Charging	<p>Charging Environments: Workplaces</p> <p>Considerations for Public Agencies that Provide Charging</p>
Building Codes for PEV Charging	Local Government Action Plans: Best Practices for PEV Readiness
Charging at Multiunit Dwellings	Charging Environments: Single-family Residences and Multiunit Dwellings
Fleet Electrification	<p>Fleet EVSE Installation Guidelines</p> <p>Request for Proposal Template for Installation and Operation of Electric Vehicle Charging Stations</p>
Leveraging Renewable Energy	<p>Regional Residential Solar and PEV Adoption</p> <p>San Joaquin Valley Utilities’ Electricity Sources</p>
Regional Charging Station Siting Analysis and Geographic Challenges	<p>Charging Roadmap: Optimal Locations for Public Charging Stations in the San Joaquin Valley</p> <p>Charging Environments: Retail, Commercial, and Public Locations</p> <p>Considerations for Public Agencies that Provide Charging</p>

Source: San Joaquin Valley PEV Plan.

Based on the input of the SJVPEVCC, the SJVAPCD realized that there was a lack of basic, “101” materials and resources that could meet the needs of Valley residents. The resources developed were a direct result of the identification of this lack of fundamental information. Therefore, most of the resources are developed in easy to understand guidelines and fact sheets which promote best practices for local agencies obtained from other Valley public agencies, and easily adaptable templates for use by public agencies and the public.

Siting Analysis

The approach of the siting analysis was to focus on three areas of charging: DC fast charging, public access charging, and workplace charging. For each, optimal locations were specifically identified in the Siting Analysis.

DC Fast Charging

For the analysis of DC fast chargers, the Siting Analysis concentrated on sites along California State Route 99, or Highway 99, since most of the San Joaquin Valley’s populous cities are located along or near the Highway 99 corridor. Optimal locations for hosting fast chargers were those that were within half a mile of a highway exit, easily accessible, well-lit, offer facilities and shelter for drivers while charging and a “destination” point. The location must also have the electrical capacity to support fast chargers and existing parking space availability.

The following cities along the Highway 99 were analyzed for optimal sites to host DC fast charging locations: Lodi, Stockton, Manteca, Modesto, Ceres, Turlock, Merced, Madera, Fresno, Tulare, Delano, and Bakersfield. Most of the cities had areas with high densities of destinations, and those areas have the greatest potential to host fast chargers with adequate electrical capacity.

Public Access Charging

For the analysis of public access charging for Level 2 chargers, ten cities were selected, including the top four PEV-adopting cities in the San Joaquin Valley because local government officials can benefit from understanding what areas in their community are likely to experience the most demand for public charging, and the cities with county seats because they tend to be more populated and doing so is an impartial way to give representation to all counties in the Valley. The ten cities included: Bakersfield, Clovis, Fresno, Hanford, Madera, Merced, Modesto, Stockton, Tracy, and Visalia.

Data was obtained from the National Household Travel Survey to understand where drivers tend to park for a long period of time. Such sites, or destinations, demonstrate to be the best locations to host Level 2 charging stations to generally give a PEV driver enough time to charge and complete the driver’s trip back home. These sites include, but are not limited to, such places as airports, casinos, doctor’s offices, grocery stores, libraries, movie theaters, zoos, and shopping malls.

Each city was mapped to identify optimal locations for public access charging by census block. Census blocks with high densities of destinations such as those mentioned had the greatest potential to host Level 2 public charging access stations. The analyses showed that most of the cities had numerous areas that, based on the destinations, could be optimal locations for publicly accessible chargers.

Workplace Charging

For the analysis of workplace charging, land use data were obtained to understand the total numbers of employees located in a Traffic Analysis Zone, which serves as the geographic basis for travel demand model forecasting systems and is used in transportation models to provide socio-economic data within these zones. Employee data in each Traffic Analysis Zone helped to locate dense workplace zones, which may inform planners and business owners on where to focus workplace charging initiatives, with the presumption that zones with more employees will likely contain higher numbers of PEV drivers. Employee density maps were provided for the cities of Bakersfield, Clovis, Fresno, and Visalia and the counties of Fresno, Kern, and Tulare.

With the San Joaquin Valley being a very expansive region, the Siting Analysis does not necessarily address all the cities or geographic challenges of the region. However, the Siting Analysis does provide a general blueprint and is a tool to help public and private stakeholders to better assess the charging needs in their respective areas throughout the Valley. The maps that were generated as part of the project are intended for informational purposes only and individual stakeholders must decide whether any suggested location is feasible for EVSE installations.

Dissemination of the Plan and Toolkits

The SJVAPCD, CCSE, and SJVPEVCC members have been able to use the resources created to continue PEV outreach activities in numerous ways. Hundreds of copies of the approved Plan and Siting Analysis have been distributed to local public agencies and stakeholders. SJVPEVCC members have used the outreach presentations at local governing board meetings in Fresno and Visalia, as well as other local town hall meetings. In addition, the Siting Analysis has been used by several local Valley agencies, universities, and businesses to receive additional funding to continue the much needed PEV outreach activities and install dozens of publicly available and workplace charging stations throughout the Valley.

CHAPTER 3:

Assessment of Success

The SJVAPCD was successful in its goal to create a regionally accepted comprehensive PEV plan which will provide a foundation for future PEV readiness activities and EVSE planning. The Plan was adopted by the SJVAPCD's Governing Board on May 8, 2014 as part of a comprehensive package for promoting the use of clean passenger vehicles in the Valley.

Environmental Benefits

The San Joaquin Valleys' Air Basin is one of only two areas in the nation designated as "extreme nonattainment" for the federal ozone standard⁷ and the impact of emissions from cars and trucks on the Valley's air quality is significant with more than 80 percent of the NOx emissions in the Valley attributed to mobile sources. The Valley's topography, climate, geography and the presence of two major transportation corridors connecting northern and southern California all contribute to the region's air quality problem. Poor air quality within the region presents the most pressing need for robust deployment of clean technology, which includes PEVs. Even as gasoline vehicles become more efficient and use less fuel per mile, PEVs will still emit considerably fewer smog-forming pollutants. Despite advances in vehicle technology, projections for 2020 show gasoline vehicles will continue emitting more than five times the smog-forming pollutants as all-electric vehicles and nearly twice as much as PHEVs. While much of these avoided emissions come from the fuel cycle – the extraction, transportation, refining and manufacture or generation of a specific fuel – whose reductions would not have large immediate environmental benefits for the Valley, the reduction in emissions attributed to vehicle use would directly impact the Valley's air quality.

To further reduce the volume of greenhouse gas (GHG) emissions created by charging PEVs with electricity generated from nonrenewable sources, the Plan encourages PEV drivers to install and charge with a residential solar photovoltaic system. Advances in residential photovoltaic systems, as well as increased incentives and rebates for these systems, can help PEV owners take advantage of these naturally compatible and complementary technologies.

The adoption of the Plan achieves success in building the foundation for PEVs, and other much needed advanced clean vehicle technology, to sustain in the Valley. Given its poor air quality and many disadvantaged communities, the Valley has a lot to benefit from the implementation of the Plan's recommendations.

Incentive Programs for PEVs

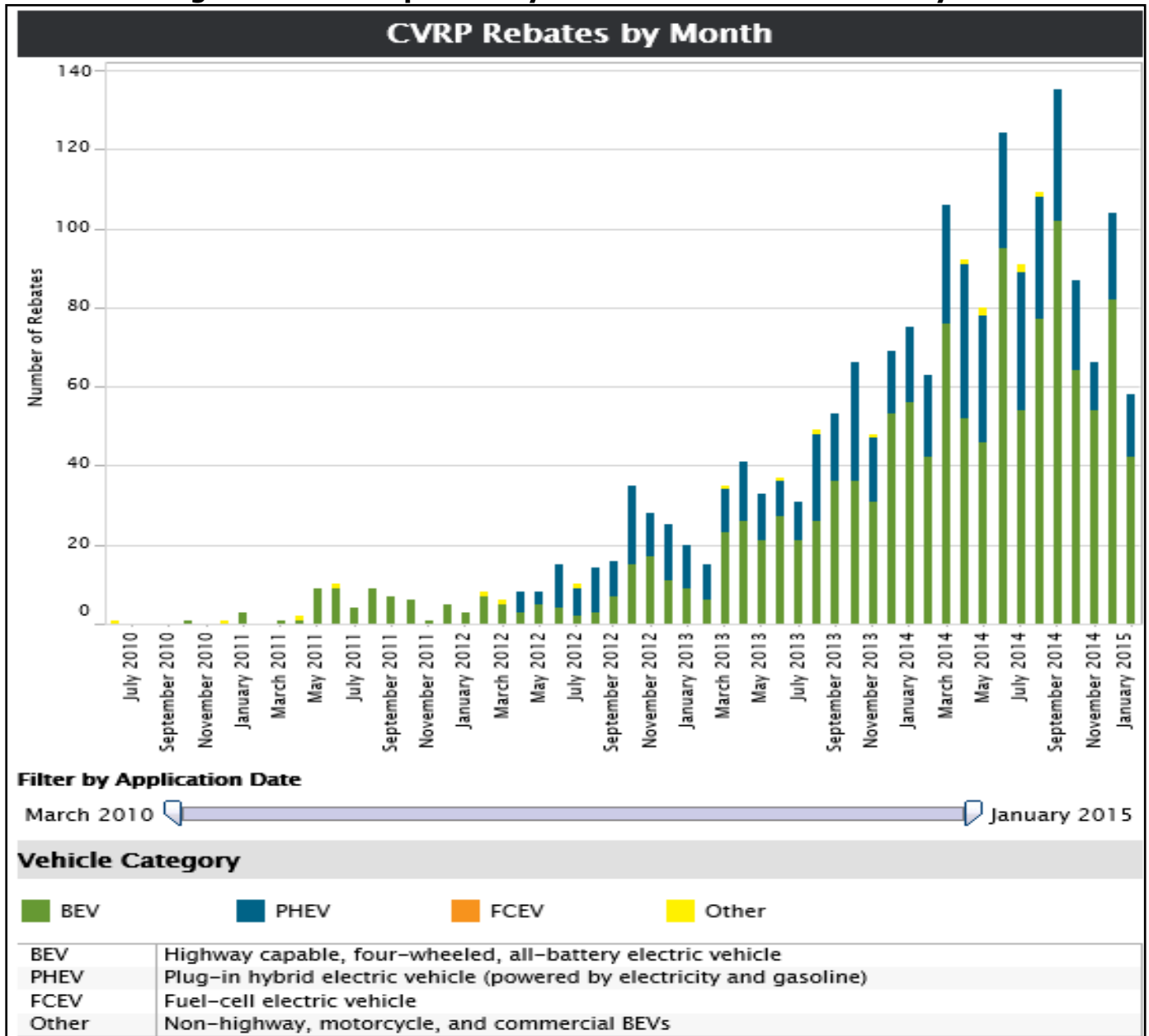
In numerous ways, the Plan successfully complements the many incentive programs that help San Joaquin Valley residents own PEVs. These programs provide a means for low- and middle-income consumers to consider PEVs in a market saturated with fuel-efficient, and oftentimes much cheaper, gasoline vehicles. Regional incentive funding also provides a significant upfront cost-savings for public agencies electing to use cleaner vehicle options to save on fuels costs and contribute to improving the region's air quality. Many of the regional incentives can be combined with state and federal incentives to provide Valley residents the greatest cost-

⁷ [California Air Resources Board "Vision for Clean Air Public Review Draft"](https://www.valleyair.org/Home.htm) <https://www.valleyair.org/Home.htm>

savings in the state. The Plan provides information on these incentive programs and a pathway to overcome some of the significant challenges with PEV ownership.

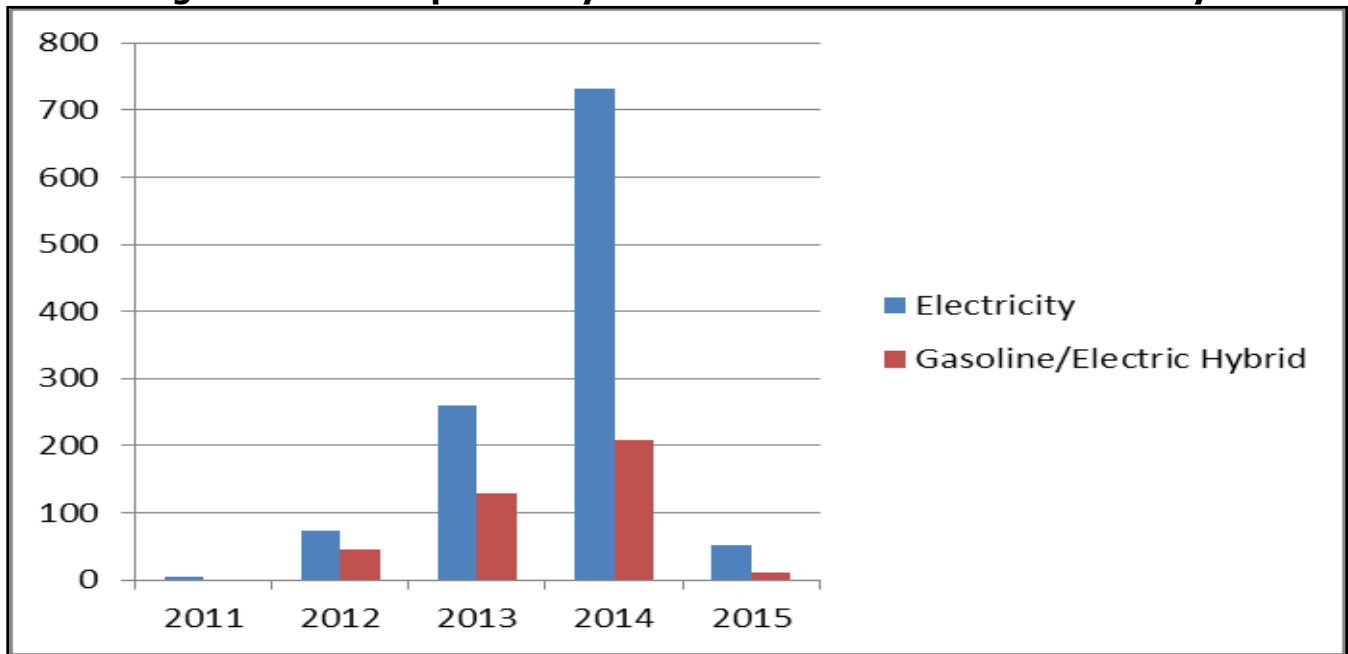
Through incentive rebates provided for PEVs, the Valley experienced a thirteen-fold increase in PEV adoption between December 2011 and December 2013. In addition, the SJVAPCD received more rebate applications from Valley residents in 2014 for its Drive Clean! Rebate Program for PEVs and PHEVs than in both 2013 and 2012 combined. The following figures display the total number of newly purchased or leased PEVs and PHEVs in the Valleys' APCD territory.

Figure 3: San Joaquin Valley CVRP Rebates Issued Monthly



Source: [Center for Sustainable Energy California Air Resources Board Clean Vehicle Rebate](https://cleanvehiclerebate.org/eng/rebate-statistics)
<https://cleanvehiclerebate.org/eng/rebate-statistics>

Figure 4: San Joaquin Valley Drive Clean! Rebates Issued Annually



Source: [Drive Clean Rebate Program data](http://valleyair.org/drivecleaninthesanjoaquin/rebate/) <http://valleyair.org/drivecleaninthesanjoaquin/rebate/>

Valley Case Studies

Despite the many challenges faced by the San Joaquin Valley regarding PEV adoption, a number of local agencies successfully implemented PEV projects. These case studies highlight the success that can be achieved by leveraging resources and making use of the various recommendations found throughout the Plan.

Kings Canyon Unified School District Electric School Bus Project

Kings Canyon Unified School District debuted the nation's first all-electric school bus in March 2014. The bus has a range of 80-100 miles and is expected to save the district \$10,000 in running costs.

Manteca Unified School District Solar/EVSE Project

The Manteca Unified School District has pursued a solar project that allows for electric vehicle charging. In September 2013, the district's \$30 million solar energy project went online after a year of planning. The project included the installation of solar panels at 26 sites and expects to produce 6,720 Megawatt-hour (6.72 million Kilowatt-hour) of energy per year. The district expects to reduce their electricity bill by more than 60 percent by installing these solar panels.

City of Lodi PEV Parking Code Adoption

The City of Lodi introduced an ordinance amending a municipal code to address parking and PEV charging spaces. The ordinance states that parking spaces designated for PEV charging must be used exclusively for charging and parking a vehicle that is connected for charging. It prohibits any obstruction or blocking of PEV-designated stalls or spaces.

City of Stockton Electric Transit Buses Project

The City of Stockton adopted Northern California's first battery electric transit buses in May 2013. By recharging 10 minutes every two hours, the bus can operate throughout the daily operation cycle.

UPS and Electric Vehicle International Joint Electric Vehicle Fleet Deployment Project

UPS, with the help of Electric Vehicle International, an Electric Vehicle manufacturer based in Stockton, CA, was able to deploy the largest fleet in the industry consisting of 100 fully electric vehicles. Half of these electric vehicles will be used to serve the SJVAPCD's jurisdiction. The UPS electric trucks will reduce their consumption of fuel by approximately 126,000 gallons per year, reducing over 1,100 metric tons of Carbon Dioxide emissions. This is equivalent to avoiding the greenhouse gas emissions of 233 passenger vehicles annually or the addition of 918 acres of U.S. forests in one year.⁸

Ikea Trans Power Electric Trucks Project

Ikea uses locally manufactured Trans Power electric trucks at its distribution center in Tejon, California.

Future Opportunities

The Plan provides interested San Joaquin Valley stakeholders the leverage needed to seek additional state, federal, and private funding for PEV-related activities and projects. As incentive funding continues to become available for EVSE and installation, having a plan in place can help Valley stakeholders prepare competitive proposals and implement projects more quickly. In addition, it will be important to seek funding opportunities that implement the recommendations in the Plan to further the success of the project.

⁸ [These were calculated by the Environmental Protection Agency's Greenhouse Gas Equivalencies Calculator.](https://www.epa.gov/energy)
<https://www.epa.gov/energy>

CHAPTER 4:

Observations, Conclusions and Recommendations

Observations

Cost of PEV Ownership

Despite the numerous benefits and reports of widespread owner satisfaction with PEVs, their high initial purchase price compared to conventional internal combustion engine vehicles remains an obstacle to adoption.⁹ This price differential discourages consumers who are reluctant to spend more up front on a new vehicle despite the fact that PEVs have lower total cost of ownership than many ICEs.

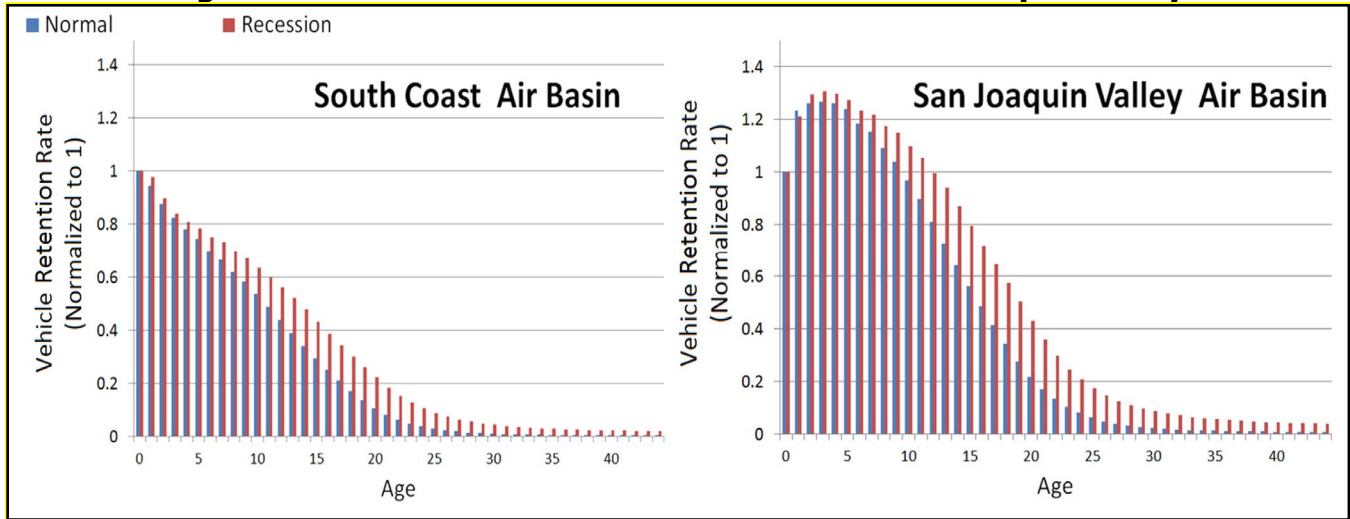
Although incentives, rebates, and tax credits have been instrumental in enticing early adopters to purchase PEVs, as evident by the fact that 91 percent of San Joaquin Valleys' respondents indicated that the state rebate was an important motivation for purchasing a PEV and nearly 68 percent said it was a "very important" or "extremely important" motivation¹⁰, incentives and rebates only address the incremental cost difference between a PEV and a comparable gasoline vehicle.

However, Valley residents keep their vehicles an average of five years longer than South Coast residents and the recent recession caused people to keep their vehicles an additional three years longer (See Figure 5). In addition, there has been a net influx of used vehicles into the Valley from other regions. Since many Valley households spend more than a third of their income on vehicle expenses, finding affordable options that bring the initial purchase price of PEVs closer to older, used vehicles are essential to realize mass PEV deployment.

⁹ [California Center for Sustainable Energy, "California Plug-in Electric Vehicle Driver Survey Results,"](https://cleanvehiclerebate.org/eng/program-reports)
<https://cleanvehiclerebate.org/eng/program-reports>

¹⁰ [2013 California Plug-in Electric Vehicle Driver Survey.](https://energycenter.org/sites/default/files/docs/nav/transportation/cvrp/survey-results/California_Plug-in_Electric_Vehicle_Driver_Survey_Results-May_2013.pdf)
https://energycenter.org/sites/default/files/docs/nav/transportation/cvrp/survey-results/California_Plug-in_Electric_Vehicle_Driver_Survey_Results-May_2013.pdf

Figure 5: Vehicle Retention - South Coast vs San Joaquin Valley

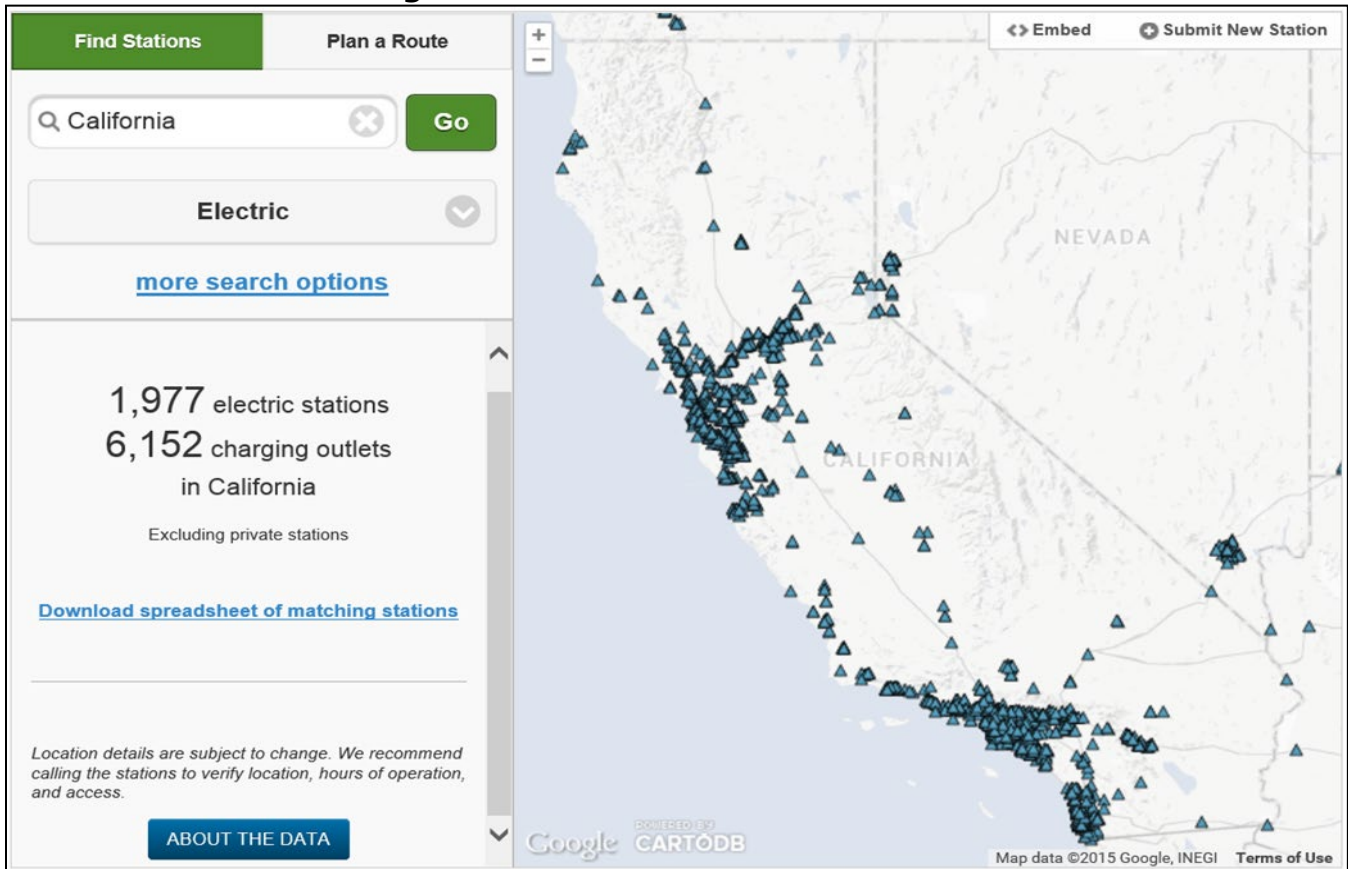


Source: [ARB "Improving Mobile Source Planning Tools. June 2013.](https://ww3.arb.ca.gov/msei/emfac_june_workshop_06_05_2013_final.pdf)
https://ww3.arb.ca.gov/msei/emfac_june_workshop_06_05_2013_final.pdf

Lack of PEV Infrastructure

In addition to PEV costs, there needs to be a way to lower the cost of EVSE installations since even a Level 2 EVSE costing as little as \$500 may require installation that is often double the price of the equipment. Unfortunately, there are not many incentives for the purchase and installation of charging stations to individual residents or business owners. These high costs, in addition to the San Joaquin Valley's large geographical area, lower population density and low PEV adoption rates all contribute to an overall lack of publicly available Level 1, Level 2, and DC Fast Charging EVSE infrastructure in the area, as seen in Figure 6.

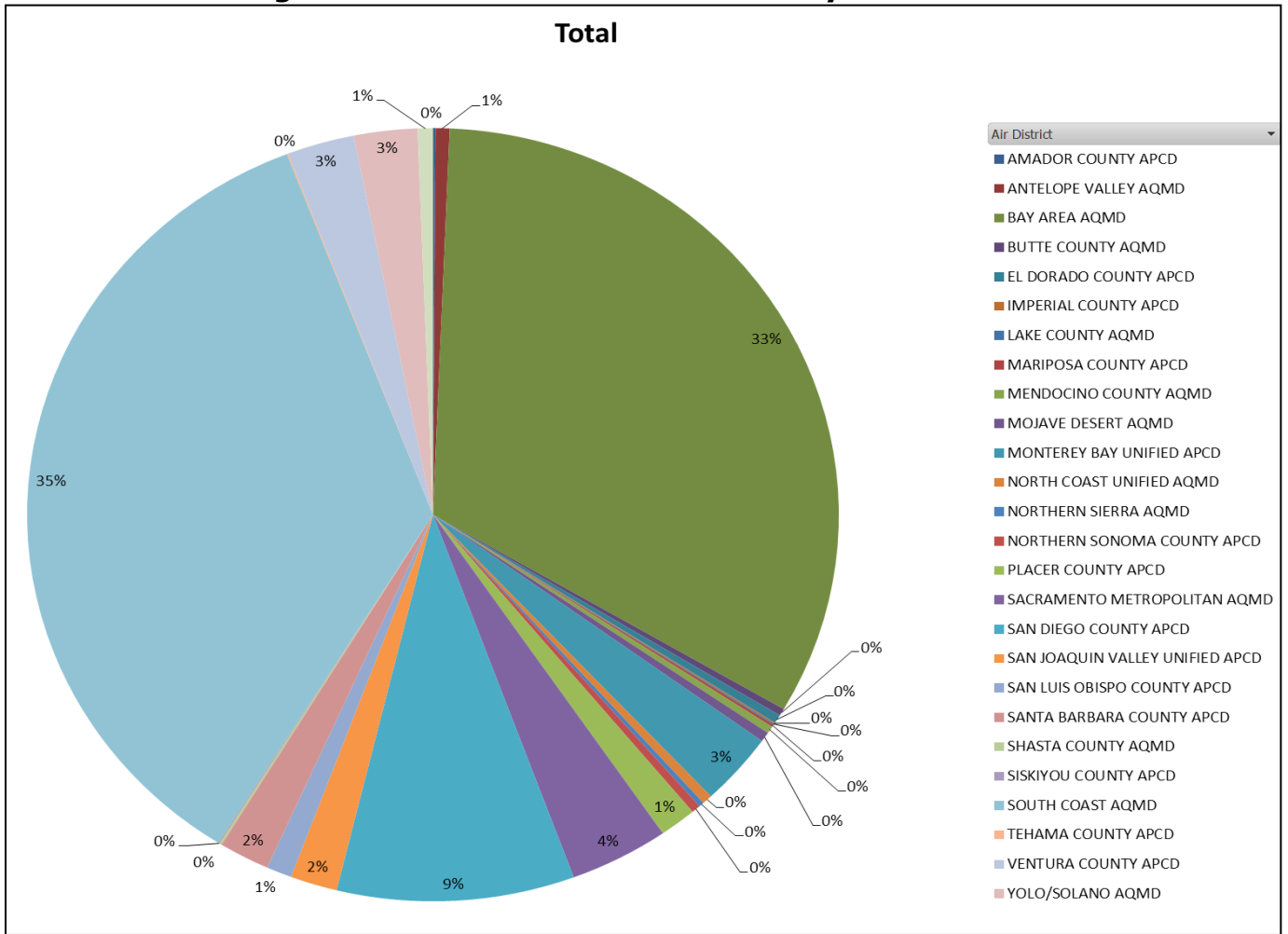
Figure 6: EVSE Locations in California



Source: [United States Department of Energy \(2014\). Electric Vehicle Charging Station Locations.](https://afdc.energy.gov/fuels/electricity_locations.html#/find/nearest?fuel=ELEC)
https://afdc.energy.gov/fuels/electricity_locations.html#/find/nearest?fuel=ELEC

The lack of charging infrastructure makes range anxiety a persistent issue for new consumers considering the technology, and even for early adopters who cannot maximize their PEVs. Therefore, it is imperative that the number of Level 1, Level 2 and DC Fast Charging EVSE infrastructure within the Valley increases to more closely resemble the distribution seen in Bay Area and South Coast which hold 33 percent and 35 percent of the EVSEs respectively, as seen in Figure 7.

Figure 7: Percent of California EVSEs by Air District



Source: [United States Department of Energy \(2014\) Electric Vehicle Charging Station Locations Statistics.](https://afdc.energy.gov/fuels/electricity_locations.html#/find/nearest?fuel=ELEC)
https://afdc.energy.gov/fuels/electricity_locations.html#/find/nearest?fuel=ELEC

According to the U.S. Department of Energy, of the 1,977 publicly available Level 1, Level 2, and DC fast charging EVSEs in California, only 37 are located within the Valley (Table 4), which is only 2 percent of the EVSEs in California.

Table 5: EVSEs in the San Joaquin Valley

SAN JOAQUIN VALLEY UNIFIED APCD	Count of EVSEs
Acampo	1
Atwater	1
Bakersfield	3
Clovis	1
Coalinga	1
Fresno	4
Gustine	1
Lebec	1
Lodi	6
Madera	1
Manteca	1
Merced	1
Modesto	2
Patterson	1
Stockton	3
Tracy	5
Tulare	2
Visalia	2
Grand Total	37

Source: [United States Department of Energy \(2014\) Electric Vehicle Charging Station Locations Statistics](https://afdc.energy.gov/fuels/electricity_locations.html#/find/nearest?fuel=ELEC)
https://afdc.energy.gov/fuels/electricity_locations.html#/find/nearest?fuel=ELEC

There are also barriers regarding the actual installation of charging stations once the initial barriers of cost and location are addressed. It was noted during SJVPEVCC meetings that many local jurisdictions often differ in permit, inspections, zoning and other processes. Consistency across jurisdictions is necessary in order to empower consumers and workplaces to install EVSE. In addition, increased workforce training in EVSE installations will be needed as the PEV population continues to increase in the Valley, as well as region-wide standards for permitting, inspections, zoning, parking, signage, and electrical contractor training.

Conclusions

Although substantial progress has been made to improve the region's air quality, all eight counties in the San Joaquin Valleys' Air Basin still suffer significant ozone and PM levels due to several unique variables, including the Valley's topography, geography, climate and emissions generated by motor vehicles traveling through the Valley on transportation corridors that connect the northern and southern regions of the state. Since more than 80 percent of the Nitrogen Oxide emissions inventory in the Valley is attributed to mobile sources, it is imperative that the SJVAPCD continue to develop and implement a broad, multi-faceted portfolio of innovative strategies and policies to reduce the impact of emissions from both cars and trucks on the Valley's air quality.

Even though progress has been made in number of PEVs and charging infrastructure in the Valley, the Valley still lags behind the rest of the state in market penetration, PEV purchases, and charging infrastructure installation. As evident from the Siting Analysis, on the road ahead the Valley will need to work aggressively to deploy additional charging stations in order to support substantial PEV growth and link the region to the already developed network of chargers in the Bay Area and Southern California regions.

Though the minimal penetration of low-income or rural residents into the PEV market is due partly to the lack of understanding of PEV technology, the current high cost of many PEVs is the most significant reason that therefore must be addressed. Since the Valley is composed of many low-income, disadvantaged communities and the median household income in the Valley is much lower than other regions of the state where the adoption of PEVs is more widespread, advocating legislation that provides funding for these incentive programs, especially legislation that prioritizes funding for low-income disadvantaged communities, is crucial to increase PEV adoption in the Valley.

Although providing incentives to Valley residents is vital to encourage and increase the adoption of PEVs, even with robust incentives programs and significant funding provided to support adoption of PEVs in low-income communities, extensive and targeted marketing, outreach and education will be required. In addition, it is recognized that for many low-income residents in the Valley, PEVs may ultimately not be a feasible option despite the many incentives that are available. For these residents, a focus on alternative solutions that would allow them to benefit from other lower emission vehicle technology or options is recommended.

Ultimately, it was found that due to the unique geographic, economic circumstances and socioeconomic diversity of the Valley, a linear statewide approach simply will not work in the region and strategies that encourage and promote emission reductions from existing vehicles and vehicle replacement with incrementally cleaner, conventional vehicles must be part of a more comprehensive and holistic approach.

Recommendations

In order to meet the San Joaquin Valley's air quality goals moving forward and ensure that emissions from mobile sources are adequately addressed, it is critical for the SJVAPCD to be engaged at every level of the PEV planning process, including policy development, legislative advocacy, funding, innovation and outreach. This Plan is an integral part of the SJVAPCD's comprehensive action plan aimed at increasing the use of clean passenger vehicles in the Valley which includes various strategies that promote the use of electric vehicles and other

advanced vehicle technology throughout the Valley, where feasible, while recognizing that a one-size-fits-all approach will not work in the Valley.

As highlighted in the Plan, the fact that a one-size-fits-all approach to encouraging investment in PEVs and charging infrastructure is not feasible for the Valley and a multi-faceted approach is necessary cannot be overstated. Continued incentivizing of PEV adoption along with extensive and targeted marketing, outreach and education for the low-income communities is crucial in order to deploy PEVs and charging infrastructure in most of the Valley. Development of industries that support the deployment of both PEVs and EVSE is also necessary in order to continue to develop a workforce adequately trained to actively participate in the EVSE industry. Further, local schools and colleges should also anticipate the skills needed for success in the PEV industry and plan accordingly. Cities and counties should continue to leverage resources and share lessons learned regarding zoning, permitting and inspection policies.

Recommendations regarding Plan implementation and future PEV readiness projects to address low-income consumers and disadvantaged communities include, but are not limited to:

1. Require focus on innovative strategies to make PEVs and charging stations affordable.
 - a. Increase and expand existing incentive programs for PEV purchase.
 - b. Provide incentives for purchase of pre-owned PEVs.
 - c. Provide incentives for PEV sharing programs.
 - d. Expand vehicle charging network.
 - e. Develop programs with a tiered approach that will initially provide for affordable alternatives to PEVs to introduce low-income residents to clean-vehicle technology with the end goal of ultimately helping these residents transition into PEVs.
2. Increase adoption of electric and other advanced vehicle technologies where feasible.
 - a. Support existing SJVAPCD incentive programs.
 - b. Implement new electric vehicle charging incentive program.
3. Continue to encourage strategies to reduce vehicle emissions in areas where electric or advanced vehicle technology is infeasible or unlikely.
 - a. Provide options for cleaner/affordable replacement vehicles in low income communities.
 - b. Support existing SJVAPCD programs targeted at vehicle miles traveled reduction.
4. Conduct targeted outreach/public education.
 - a. Shape perception that PEVs can be reliable, primary vehicles for Valley residents.
 - b. Further educate local policymakers on PEV technology and its benefits so policies can be recommended and established to further PEVs.
5. Target resources to assist low income residents.
 - a. Continue financial incentive programs to reduce the upfront cost of PEVs.
 - b. Establish loan programs that make financing a more accessible option.
 - c. Provide education about available incentives.

6. Support legislative/policy initiatives that target resources for low-emission and advanced technology vehicles in areas that are disproportionately impacted by air pollution.
 - a. Air quality needs rather than population should establish priorities for funding.
 - b. Consideration should be made that electric/advanced vehicles may not always be suitable for low income communities.
 - c. Initiatives should provide for tailor-made programs for low income communities with necessary funding.

Since the Valley has unique challenges and conditions that differ greatly from other parts of the state, future PEV planning must focus significant effort on solutions for low income disadvantaged communities in which electric or other advanced vehicle technology may not necessarily be the answer. Even though the socioeconomic barrier is significant, it can be addressed by developing plans, strategies and incentives as mentioned. It is imperative that PEV planning in the Valley recognize and promote the significant benefits of getting residents out of high-emitting or gross-polluting vehicles and into traditional vehicles that are significantly cleaner. This comprehensive regional Plan not only specifically addresses the needs of the Valley, but also recognizes and takes advantage of recent statewide interest and legislative activities geared towards reducing emissions from passenger vehicles in low income, disadvantaged communities and provides model, real-world solutions to address these issues in the Valley. Together, as part of a well-balanced and comprehensive action plan will yield positive results throughout the Valley as its recommendations are implemented.

Glossary

APPLICATION PROGRAMMING INTERFACE (API)—is a computing interface which defines interactions between multiple software intermediaries. It defines the kinds of calls or requests that can be made, how to make them, the data formats that should be used, the conventions to follow, etc. It can also provide extension mechanisms so that users can extend existing functionality in various ways and to varying degrees

CALIFORNIA CENTER FOR SUSTAINABLE ENERGY (CCSE)—is a nonprofit energy program administration and advisory services organization. Our vision is a future with sustainable, equitable and resilient transportation, buildings and communities.

CALIFORNIA ENERGY COMMISSION (CEC)—The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The CEC's five major areas of responsibilities are:

1. Forecasting future statewide energy needs.
2. Licensing power plants sufficient to meet those needs.
3. Promoting energy conservation and efficiency measures.

CLEAN VEHICLE REBATE PROJECT (CVRP)—promotes clean vehicle adoption in California by offering rebates of up to \$7,000 for the purchase or lease of new, eligible zero-emission vehicles, including electric, plug-in hybrid electric and fuel cell vehicles.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE)—Infrastructure designed to supply power to EVs. EVSE can charge a wide variety of EVs, including BEVs and PHEVs.

GREENHOUSE GAS (GHG)—Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (NO_x), halogenated fluorocarbons (HCFCs), ozone (O₃), per fluorinated carbons (PFCs), and hydrofluorocarbons (HFCs).

MULTI-UNIT DWELLINGS (MUD)—is a classification of housing where multiple separate housing units for residential inhabitants are contained within one building or several buildings within one complex

PLUG-IN ELECTRIC VEHICLE (PEV)—A general term for any car that runs at least partially on battery power and is recharged from the electricity grid. There are two different types of PEVs to choose from—pure battery electric and plug-in hybrid vehicles.

PLUG-IN HYBRID ELECTRIC VEHICLE (PHEV)—PHEVs are powered by an internal combustion engine and an electric motor that uses energy stored in a battery. The vehicle can be plugged in to an electric power source to charge the battery. Some can travel nearly 100 miles on electricity alone, and all can operate solely on gasoline (similar to a conventional hybrid). San Joaquin Valley Air Pollution Control District (SJVAPCD)

SAN JOAQUIN VALLEY REGIONAL PLUG-IN ELECTRIC VEHICLE COORDINATING COUNCIL¹¹ (SJVPEVCC)—The 28-member Council advisory group is composed of local metropolitan planning organizations, cities, counties, utilities, the San Joaquin Valley Clean Cities Coalition, electric vehicle service providers, local consultants and nonprofit organizations.

SAN JOAQUIN VALLEY PLUG-IN ELECTRIC VEHICLE READINESS PLAN¹² (PLAN)—serves as a tool to support local government officials, including planners, code officials and building inspectors when planning for plug-in electric vehicle (PEV) and charging infrastructure deployment, and assists local policymakers and regional stakeholders in addressing the complexities behind barriers to PEV adoption in the region.

¹¹ [The San Joaquin Valley Regional Plug-in Electric Vehicle Coordinating Council](https://energycenter.org/) <https://energycenter.org/>

¹² [San Joaquin Valley Readiness Plan](https://energycenter.org/sites/default/files/docs/nav/programs/pev-planning/San_Joaquin_Valley_PEV_Readiness_Planning_Guide.pdf) https://energycenter.org/sites/default/files/docs/nav/programs/pev-planning/San_Joaquin_Valley_PEV_Readiness_Planning_Guide.pdf