CALIFORNIA ENERGY COMMISSION

California Energy Commission

Clean Transportation Program

FINAL PROJECT REPORT

Southern California Plug-in Electric Vehicle Readiness Plan

Sub-Regional Assessment & Deployment Plans

Prepared for: California Energy Commission

Prepared by: Southern California Association of Governments

Gavin Newsom, Governor

March 2021 | CEC-600-2021-018

California Energy Commission

Prepared by: The Southern California Association of Governments, UCLA Luskin Center for Innovation, South Bay Cities Council of Governments, and the Western Riverside Council of Governments.
Marco Anderson
Rogelio Pardo
Primary Authors

Southern California Association of Governments
818 W. 7th Street, 12th Floor
Los Angeles, CA 90017
(213) 236-1800
SCAG (www.scag.ca.gov)

Agreement Number: ARV-11-007

Lindsee Tanimoto
Commission Agreement Manager

Mark Wenzel
Office Manager
ADVANCED VEHICLE INFRASTRUCTURE OFFICE

Hannon Rasool
Deputy Director
FUELS AND TRANSPORTATION DIVISION

Drew Bohan
Executive Director

ACKNOWLEDGEMENTS

We thank the UCLA Luskin Center for Innovation, the South Coast Air Quality Management District, U.S. Department of Energy, and the California Energy Commission for support of this project. In particular, we thank J.R. DeShazo from the UCLA Luskin Center for Innovation, Patricia Kwon of South Coast Air Quality Management District, Wally Siembab of the South Bay Cities Council of Governments and the other governmental and utility members of the SoCal PEV Coordinating Council for their guidance and assistance.

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 California Energy Commission (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 PON-10-602 to assess Regional Plans to Support Plug-In Electric Vehicle Readiness. In response to PON-10-602, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards June 7th, 2011 and the agreement was executed as ARV-11-007 on June 25th, 2012.

ABSTRACT

The Southern California Plug-in Electric Vehicle Readiness Plan was developed in order to identify key issues with the current infrastructure in place for electric vehicles. Recognizing the public benefits that come from electrifying the predominant mode of transportation, the Plan identifies strategies for increasing the number of electric vehicle miles traveled throughout the Southern California Region.

Using electric vehicle registration data and integrating it with the Southern California Association of Governments transportation model, the Plan provides a basis for analyzing electric vehicle owner behavior. An understanding of electric vehicle owner behavior allowed for the study to identify popular destinations and how they relate to the current charging infrastructure (as of Summer 2012), and how the region may improve municipal readiness.

The plan provides an overview of the electric vehicle ecosystem, examining best practices currently implemented in the region, and provides recommendations for how the public and private sectors can play an influential role in expanding the current electric vehicle charging network. Findings suggest that public entities looking to encourage electric vehicle use focus on developing charging opportunities at employment centers, multi-family structures, and fast charging at retail destinations. Furthermore, the report provides policy guidelines to streamline charging station permitting, installation, and inspection. Understanding the municipalities are very limited in staff resources due the recent recession, the report also outlines a "ladder" of engagement that municipalities may utilize to plan for increasing levels of outreach to the public and stakeholder groups.

Keywords: California Energy Commission, Southern California Association of Governments, Plug-in Electric Vehicles, Electric Vehicle Charging, Electric Vehicle Policy

Please use the following citation for this report:
Anderson, Marco, Pardo. (Southern California of Governments). 2021. *Southern California Plug-in Electric Vehicle (PEV) Readiness Plan.* California Energy Commission. Publication Number: CEC-600-2021-018.

TABLE OF CONTENTS

LIST OF FIGURES

Page

EXECUTIVE SUMMARY

Southern California Association of Governments

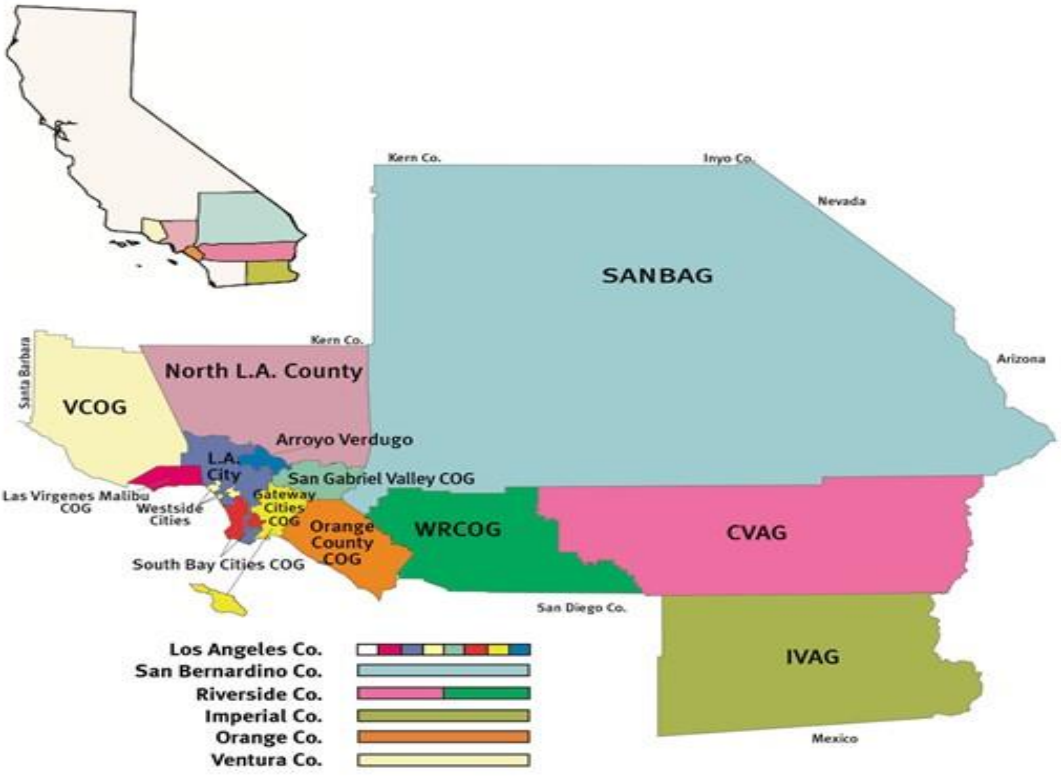
The Southern California Association of Governments is the nation's largest metropolitan planning organization. Under state law, Southern California Association of Governments is a Joint Powers Authority established as an association of local governments and agencies that voluntarily convene as a forum to address regional issues. It is also designated as a Regional Transportation Planning Agency and a Council of Governments.

Southern California Association of Governments undertakes a variety of planning and policy initiatives to encourage a more sustainable Southern California. Southern California Association of Governments and its members have a direct role in the planning of electric-fuel infrastructure and, in partnership the South Coast Air Quality Management District, Southern California Association of Governments led a previous CEC-funded Plug-in Electric Vehicle Readiness Planning effort in the region.

Project Region

The Southern California Association of Governments region, shown in Figure 1, encompasses six counties (Imperial, Los Angeles, Orange, Riverside, San Bernardino and Ventura) and 191 cities in an area covering more than 38,000 square miles with more than 18 million residents.

Figure 1: The Southern California Association of Governments Region



SCAG is made up of 6 Counties which are divided into 14 subregions.

Maps included in this report are produced in whole or in part from THOMAS BROS. MAPS digital database. These maps are reproduced with permission granted by THOMAS BROS. MAPS.

SOUTHERN CALIFORNIA ASSOCIATION of GOVERNMENTS

Source: SCAG

Project Description

This report is intended to provide a summary of materials submitted to the California Energy Commission (CEC). The Southern California Plug-in Electric Vehicle Plan is comprised of a number of elements briefly summarized below and described in greater detail later in the report. The Southern California Association of Governments Plug-in Electric Vehicle Readiness Program was funded by two grants. The first was a US Department of Energy Grant lead by the South Coast Air Quality Management District in partnership with Southern California Association of Governments and Southern California Edison. The second was this CEC grant. Southern California Association of Governments worked with the UCLA Luskin Center for Innovation on both grants, and other partners to coordinate efforts.

The SoCal Plug-in Electric Vehicle Readiness Plan identifies key issues with the current infrastructure in place for Plug-in Electric Vehicle's. The plan recognizes that there are fundamental public benefits to increasing the number of electric vehicle miles traveled in our unique region. Increasing the per capita electric vehicle miles traveled improves performance of regional and localized air quality monitoring, greenhouse gas (GHG) emissions reductions, and energy consumption and management. Southern California Association of Governments partnered with South Coast Air Quality Management District and Southern California Edison to examine Plug-in Electric Vehicle patterns due to their understanding of air quality, electricity supply, and consumer impacts of the development of a Plug-in Electric Vehicle supply ecosystem. Southern California Association of Governments expertise is in analyzing travel patterns, assessing changes to regional vehicle emissions, and analyzing regional built environment factors. Additionally, Southern California Association of Governments has collaborative relationships with our member jurisdictions that include counties, cities, and transportation agencies.

Many of the initial installations were funded with money intended for shovel ready projects. Without the data and research on users, many of the installations went to the easiest locations, not necessarily the most accessible for potential users. However, our efforts have been very valuable in testing the market dynamics, learning about installation costs, and revealing institutional and procedural challenges.

As electric-fuel markets strive to flourish and mature, previous Southern California Association of Governments Plug-in Electric Vehicle readiness efforts are making regional planners increasingly better-equipped to support electric-fuel commercialization. However, several critical problems have emerged in infrastructure markets that have not been adequately addressed.

Goal of the Agreement

The goal of this agreement was to complete two sub-regional plans for Southern California that will serve as models for subsequent research, to accelerate and streamline the deployment of Plug-in Electric Vehicle's in Southern California while promoting economic development within the green technology sector. This goal will be met through extensive collaboration and education, which will be facilitated by the Southern California Plug-in Electric Vehicle Coordinating Council.

Some key objectives of the agreement were:

- Develop a clear understanding of the Market forces that will impact regional Plug-in Electric Vehicle readiness regarding the quantity and cost of a regional charge port infrastructure system. Market forces include vehicle and electric vehicle service equipment types, quantity, charging specifications, launch date and projected quantities.
- Analyze available driver behavioral information and develop appropriate recommendations to be applied in the development of a final infrastructure plan.
- Analyze region-specific travel patterns in various representative sub-regions in the
- Southern California area and prepare model sub-regional plans describing the analysis. Due to the diversity of development patterns in the region, studying several representative areas is important to understand travel patterns.
- Conduct meaningful education and outreach to support the deployment of regional charge port infrastructure, building from the lessons learned from the current Plug-in Electric Vehicle coordinating Council member's education and outreach efforts that have been in place for the last 18 months.
- Develop guidelines for Plug-in Electric Vehicle infrastructure deployment for single and multi-family unit housing stock, workplaces, fleets, commercial and public sites, and fast charging units in strategic locations.
- Create and publish background/briefing and issue reports on all aspects of regional Plug-in Electric Vehicle readiness, which will include but is not limited to public-access charging, DC fast charging deployment, and greenhouse gases reduction opportunities.
- For each Southern California Plug-in Electric Vehicle Coordinating Council Readiness domain area create and publish a timely set of recommendations and best practices through on-line information sheets to help guide on-going region-specific transportation planning efforts through Southern California Association of Governments website.
- Conduct outreach to adjacent regional border entities regarding Plug-in Electric Vehicle readiness to transportation corridors.
- Share regional lessons at state and national workshops and conferences.
- Facilitate and make available additional research including:
    - Cost of Electric Vehicle Supply Equipment installations
    - Time to install Electric Vehicle Supply Equipment
    - Forecast of trends beyond "first wave" adopters
    - Environmental benefits including air quality, petroleum and GHG reductions
    - Smart grid integration including demand response and renewable generation

Project Reports and Resources

Regional Plan

In 2012, the Southern California Air Quality District, and the Southern California Association of Governments in collaboration with the Luskin Center at UCLA, produced the Southern California Plug-in Electric Vehicle Plan. The planning project provides a guide for regional planners to better support the commercialization of electric vehicles. While identifying key barriers to establishing electric vehicles in the region in public policy, finance, and planning,

the goal moving forward is to identify solutions by engaging with stakeholders to disseminate relevant information on the route to fostering EV connectivity throughout the region.

Sub-regional Deployment Plans

Building upon the findings of the Southern California Plug-in Electric Vehicle Plan, complementary studies have proceeded focusing on two Southern California Association of Governments sub regions – The South Bay Cities Council of Governments and Western Riverside Council of Governments. The two sub regions represent different development patterns in terms of associated transportation patterns and distances.

The Sub-regional Deployment Plans offered planning level analysis of each individual jurisdiction's land use mix to determine where local agency planners should focus their attention. In addition, the deployment provided lists of workplaces and multi-family housing structures to assist the COGs in performing targeting outreach. It is important to note that the deployment plans do not purport to have identified definitive targets for charging supply installation. However, these lists do provide a smaller field of potential sites for cities with already limited resources.

South Bay Cities Council of Governments Readiness Plan

The South Bay Cities Council of Governments is represented by a relatively dense area with limited transit opportunities. Profiles were developed for residents of the South Bay to identify potential EV use in the future. Here, Neighborhood Electric Vehicles were also studied, as potential options for local trips. Furthermore, the study looks at workplace charging and multi-family dwelling charging opportunities as keys to developing the charging infrastructure to make electric vehicles a viable option for many.

Western Riverside Council of Governments Readiness Plan

Alternatively, the Western Riverside Council of Governments depicts a relatively spread out, low density region. This study developed profiles for both suburban and rural communities to identify the potential for EV adoption. The sub region study provided an in-depth assessment of municipal staffing readiness for the fostering of EV infrastructure. In addition, best practice opportunities were identified for the regional plan, highlighted by fast turnaround times for permitting, and the availability of good public resources.

Southern California Association of Governments Public Outreach Material

In an effort to spread the findings of the Regional Plug-in Electric Vehicle Readiness Plan, about 20 public presentations have been made to Councils of Governments and potential partners in the development industry. Furthermore, findings have been shared at Santa Monica's AltCar expo, and via an online workshop to share our findings and efforts with other regional stakeholders. Southern California Association of Governments staff gave period presentations to the Southern California Association of Governments Energy and Environment Committee which is comprised of elected officials from Southern California Association of Governments member jurisdictions. Additionally, the CEC grant funded Southern California Association of Governments participation in Sacramento at CEC State-wide stakeholder group workshops.

Southern California Association of Governments developed dedicated Plug-in Electric Vehicle Program webpages. Resources include the full plan and atlas, as well as excerpted chapters targeted for specific audiences including elected officials, planning staff, employers, and building owners and retailers.

Plug-in Electric Vehicle Coordinating Council Meetings

In order to further the efforts sparked by the Plug-in Electric Vehicle Plan, for the past 1.5 years Southern California Association of Governments has taken upon a leadership role to host bi-monthly meetings of the Plug-in Electric Vehicle Coordinating Committee. Seeing Plug-in Electric Vehicle infrastructure as a truly regional issue, Southern California Association of Governments has been instrumental in bringing together key partners and stakeholders to discuss Plug-in Electric Vehicle issues and identify strategies to further the viability of electric vehicles in the region.

Los Angeles Economic Development Corporation Partnership

Southern California Association of Governments realized that though Plug-in Electric Vehicle implementation is a regional issue, it is an issue that will require collaboration across sectors to be successful. The partnership with the Los Angeles Economic Development Corporation has been critical in bringing together public and private entities to work towards bolstering a Plug-in Electric Vehicle network. Furthermore, Southern California Association of Governments and LAEDC partnered to play a key role in mitigating the bankruptcy of Ecotality (an electric vehicle supply provider), as well as disseminating best practices to applicants for a California Energy Commission grant opportunity (PON 13-606).

Conclusion

The Southern California Plug-in Electric Vehicle Plan identifies key issues with the current infrastructure in place for Plug-in Electric Vehicle's. Many of the initial installations were funded with money intended for shovel ready projects. Without the data and research on users, many of the installations went to the easiest locations, not necessarily the most accessible for potential users. Southern California Association of Governments efforts have been valuable in testing the market dynamics, learning about installation costs, and revealing institutional and procedural challenges. This report also incorporates and leverages much of the publicly and privately funded research that has been released over the past two and half years. This plan provides a strong basis of data and research to inform best practices for public and private sector actors as the Plug-in Electric Vehicle supply industry continues to develop.

Based on examination of best practices throughout the region, the plan recommends public sector planning at our cities, counties, and partner agencies focus their limited resources on opportunities as they arise. The research suggests that for cities that wish to be pro-active their efforts will achieve the most impact in the following ways recommended focus areas:

- Increasing the number of workplace charging options through outreach, education, and capacity building.
- Identification and categorization of existing multi-family structures located in opportunity areas.
- Identification and categorization of institutional and economic challenges to retrofitting existing buildings.
- Improve consumer-friendliness of Plug-in Electric Vehicle charging station information, permitting and inspection.
- Continue to educate potential Plug-in Electric Vehicle buyers about eFuel supply through community outreach capacity and support.

- Work closely with retail property owners, Electric Vehicle Supply Equipment installers, utilities, and businesses to seek state and federal funding for publicly available, privately operated charging stations.

CHAPTER 1: Introduction

The Southern California Plug-In Electric Vehicle (PEV) Readiness Plan was prepared in a by the Southern California Association of Governments (SCAG) in partnership with the UCLA Luskin Center for Innovation. The plan provides the first study of its kind into the inner workings of the electric vehicle ecosystem as it currently stands, and identifies key ways to improve the network. The plan is comprised of the following elements:

- SoCal PEV Readiness Plan
- SBCCOG (SBCCOG) Sub-regional Deployment Plan
- Western Riverside Council of Governments (WRCOG) Sub-regional Deployment Plan
- SBCCOG PEV Readiness Assessment
- WRCOG PEV Readiness Outreach
- SoCal PEV Readiness Outreach Material and Resources

These plans and products provide a guide for strategic infrastructure investment, PEV-related market development and suggestions for supportive policies. Moving forward, SCAG is leading a group of varied stakeholders to disseminate data and develop local plans using the regional data collection as a basis.

CHAPTER 2: Project Final Products

Southern California Plug-in Electric Vehicle Readiness Plan

In 2012, the South Coast Air Quality Management District (SCAQMD), the Southern California Association of Governments (SCAG), Southern California Edison (SCE), Western Riverside Clean Cities Coalition (WRCCC), and Clean Cities Coachella Valley (3CV) in collaboration with the Luskin Center at UCLA, produced the Southern California Plug-in Electric Vehicle Plan. This planning project provided a guide for regional planners to better understand and support the commercialization of electric vehicles. Providing an extensive view of the PEV ecosystem, the report provides readers with knowledge on all things regarding the technology, from purchasing, to charging, and projected demand.

The report prepared information for the everyday consumer, explaining the basics of the PEV environment, from vehicle options, to refueling options, as well as an in-depth discussion of varying charging systems. Key components of this report, evaluate the land use opportunities for future charging stations, identifying potential roles for the public and private sectors to collaborate in the development of the charging network. The report also addresses several barriers to establishing electric vehicles and charging infrastructure in the region existing in the public policy, finance, and planning realms.

The report provides a set of tools for planners, policy makers, and private sector partners to overcome the barriers necessary to establish the electric vehicle market. Best practices and policy suggestions are made with regard to zoning, charging pricing, building code amendments, parking requirements, and utility policies, all with the potential to make the implementation of a comprehensive charging network easier within individual jurisdictions. Furthermore, outreach strategies are outlined for interested jurisdictions to educate and engage potential partners in this effort.

As part of the preparation of outreach materials SCAG also created s series of chapter excerpts targeted at individual audiences including introductory chapters for elected officials. Additional downloadable excerpts have been created for local planners, employers, PEV owners, and building owners and retailers. The Regional PEV Readiness Plan was funded for the most part out of the DOE grant, with subsequent products funded by the CEC grant.

Sub-Regional Plug-in Electric Vehicle Deployment Plans

As part of regional plug-in electric vehicle planning efforts, the UCLA Luskin Center for Innovation produced two sub-regional deployment plans to complement the Southern California Plug-in Electric Vehicle Plan. The SBCCOG and the Western Riverside Council of Governments partnered with SCAG and the SCAQMD, and provided in-kind staff support in preparing these sub-regional deployment plans. The SBCCOG region represents a mature or first generation suburban built environment, and serves as an example of a relatively dense, transit limited area. The WRCOG region represents a low density, spread out region. These deployment plans represent the first efforts in the region to gather data in order to understand the current electric vehicle market and infrastructure network. As policy guidance tools, these plans provide local jurisdictions with focus areas for improvements that can assist in bolstering the share of electric vehicles in the region.

Using examples of spatial analysis of PEV charging supply and demand, these plans provide the following key components:

- Inventories of land uses at the sub regional and municipal level to help prioritize PEV planning efforts at three types of locations: multi-unit dwellings, workplaces, and commercial/retail centers;
- An evaluation of the suitability of hundreds of individual parcels to host PEV charging using criteria that represent supply of parking spaces, the relative cost of installing chargers, and parcel-level demand for charging; and
- Maps of PEV registrations and travel patters to daytime within 17 WRCOG and 15 SBCCOG cities.

The lessons of these plans can be implemented by local governments in these sub-regions. However, due to the regional nature of charging infrastructure planning, the data provided can also be utilized for COGs to provide technical assistance to member cities and play a coordinating role in prioritizing electric vehicle charging station placement efforts.

In addition to influencing the development of electric vehicle infrastructure, the spatial analyses components of land use inventories, parcel suitability analyses, and maps, direct focus toward four significant planning activities that impact PEV adoption:

- Zoning Codes – Land use regulations allow cities to incentivize certain types of development. As such, a PEV charging land use classification would provide jurisdictions with appropriate review measures.
- Building Codes – Updates to codes could require new construction projects to include PEV-ready wiring in order to meet future charging demands while reducing retrofitting costs.
- Permits and Inspections – To reduce costs for those seeking to install charging stations, cities should aim to streamline permitting and inspection processes to encourage compliance with stated installation procedures.
- Parking and Signage – Policies regarding parking and signage policies can assist with cost recovery, accessibility to disabled drivers, facilitating turnover at charging stations, and making stations easily identifiable.

With growth projections estimating a growth of 1,000 to over 87,000 EV's in the SBCCOG, and of 574 to over 49,000 EV's in the WRCOG from 2012 to 2022 respectively, significant steps are necessary to ensure the market growth is met with a supportive charging network. Identifying key charging opportunities at workplaces, multi-unit dwellings, and retail destinations in both studies sub-regions, the deployment plans provide a set if blueprints for the developing charging network. As these efforts continue to expand throughout the region, the South Bay, and Western Riverside stand to be examples for similarly developed jurisdictions to model data acquisition and implementation strategies.

SBCCOG Plug-in Electric Vehicle Readiness Assessment

The SBCCOG sub-regional Electric Vehicle Readiness Plan was completed in January of 2014 as a complementary document to the Southern California Plug-in Electric Vehicle Readiness Plan. One of two sub-regional plans, the SBCCOG Readiness Assessment builds on previous findings and provides insight on how the electric vehicle market can impact areas with relatively high density and limited transit opportunities. Due to these characteristics, electric vehicles, specifically neighborhood electric vehicles are seen as a potential component of the local transportation system to complete local trips while reducing greenhouse gas emissions.

This report tackles the question of "readiness," by defining the term to mean that the present electric vehicle ecology is prepared to absorb a rapid influx of electric vehicles in the coming years, with a focus on the fueling system. While this report addresses charging issues widely, there is focus placed on the critical role multiple unit dwellings (MUD's), employers, and local governments have the potential to play in establishing a sustainable network of charging infrastructure for an emerging electric vehicle market.

With single family homes being the dominant location for vehicle charging, the development of infrastructure in MUD's is crucial to expanding the pool of potential consumers. The workplace is the second most dominant charging location, as many spend the most amount of time away from home at their location of employment. A 6-10-hour dwell time for working individuals provides another opportunity for individuals to charge their vehicles. Finally, Cities are the other key component of this study, due to the potential for impacting policy issues and zoning amendments in order to streamline the processes needed to install more charging stations in the region.

Some key findings of this study were:

- Rudimentary data collection to illustrate current conditions.
- Currently, employers, municipal governments and MUD owners are not actively preparing for an influx in plug-in electric vehicles.
- Electric vehicles are just above 1 percent of the sub-region's current passenger vehicle fleet.
- At about 1,000 EV's in the area in 2012, forecast numbers expect a minimum of 88,000 PEV's in the South Bay by 2022.

Western Riverside Council of Governments PEV Readiness Presentations

The WRCOG, a sub-region of the Southern California Association of Governments has worked toward gathering data to accompany the Southern California Plug-in Electric Vehicle Readiness Plan. The second of two sub-regions working on electric vehicle issues, the WRCOG has gathered data and performed a significant number of outreach presentations. Western Riverside provides an interesting setting for studying plug-in electric vehicle issues as a relatively spread out, low density region.

These efforts have developed profiles for both suburban and rural communities in the Riverside area to identify the potential for EV adoption. The sub-region has provided an in-depth assessment of municipal staffing readiness for the fostering of EV infrastructure. In addition, best practice opportunities have been identified in the Southern California PEV

Readiness Plan as highly applicable to the sub-region, highlighted by fast turnaround times for permitting, and the availability of good public resources.

Furthermore, with electric vehicles in Western Riverside expected to increase from 398 in 2012, to numbers between 46,000 and 60,500 in 2022, the WRCOG has begun significant outreach efforts with stakeholders to prepare for this increasing market. Key components of these efforts are informational presentations, as well as a Plug-in Electric Vehicle Readiness Survey that serves as a tool for engaging potential stakeholders and partners, as well as gathering data regarding the areas level of readiness for an electric vehicle market.

SCAG Public Outreach Material

Throughout this effort, SCAG has collected a diverse set of outreach material derived from the development of the Southern California Plug-in Electric Vehicles Readiness Plan provided by partner stakeholders. These materials have been adopted and used in developed products, and many of the figures and images have been integrated into SCAG presentations to provide visual aids to cities and other stakeholders. Currently, SCAG is undergoing a wide outreach effort to present to local Councils of Governments, stakeholders, and real estate developers, which has been met with interest and enthusiasm.

Included in the material submitted to the CEC are outreach materials used to present to the Energy and Environment Committee at SCAG's Regional Council gathering. The project briefings provided an opportunity to engage elected officials who serve as representatives to the SCAG regional council and gather feedback during the project's development. Furthermore, material was developed specifically for the South Bay Cities, as the sub-region was selected for additional research. This provided a basis to test how local leaders reacted to the project and adapt as SCAG geared up to further disseminate the information.

Southern California Edison has been an engaged partner during the development of the plan beyond in their involvement in the Plug-in Electric Vehicle Coordinating Committee. SCE deliverables comprise $60,000 dollar in match funding that has resulted in significant data gathering efforts. The Non-Residential Customer Education and Outreach Needs Assessment provided exploration of PEV education and outreach to non-residential customers in key industries in order to identify barriers to EV charging at workplaces, multi-family developments, consumer destinations, and fleet services. In addition, SCE performed a Nissan Leaf Early Buyer Study to identify trends in driving behavior, charging behavior, charging hours, and overall satisfaction with the market leading Leaf.

Progress reports provided by researchers at UCLA's Luskin Center were a key factor during the development of the plan, to ensure that the project was on task, and allow for discussion and refinement amongst stakeholders and So Cal Plug-in Electric Vehicle Coordinating (PEVCC) members. A total of 9 such reports were provided between June of 2012, and March of 2013 as the plan was completed. The reports are a great source of preliminary data used in the PEV readiness plan, as well as other information that has been useful during outreach. The key topics covered by these reports are as follows:

- Data Collection and Model Development
- PEV Market Study
- Pricing Policies
- PEV Readiness Plan Overview
- Workplace Charging: Strategic Planning Metrics
- PEV Planning Tools
- Electric Vehicle Supply Equipment (EVSE) Siting Support Methods
- EVSE Siting Support and PEV Growth Analysis
- EVSE Siting Support and PEV Growth Analysis
- Sub-regional and Municipal PEV Planning: Methods and Metrics

As evidenced by the topics covered, these reports provide insight into the thought processes and methodologies used in the development of the Southern California Plug-in Electric Vehicles Readiness Plan.

Several stakeholders provided important sets of material for use during our project and beyond, which aided in the data collection processes. A few key examples are:

- Los Angeles County PEVCC Briefing– Provided data unique to LA County about the importance of working towards developing EV infrastructure, benefits, and the county's potential role.
- EPRI Installation Cost Study – Gives an in-depth review of factors that attribute to installation costs while developing baseline data from past EVSE installations in order to estimate near-term and long-term costs to install EVSE based on location attributes.
- Center for Sustainable Energy California, PEV Vehicle Owner Survey – The CCSE insight into a survey about PEV owner demographics, usage, and charging issues.
- SCAG Goods Movement – The Goods Movement Department at SCAG developed a
- presentation analyzing the potential for zero emission freight corridors that adds to the findings of the PEV Readiness Plan.

Moving forward, the outreach materials gathered from stakeholders, and prepared during this planning effort by SCAG represent the beginnings of PEV data collection in the region. This information provides an archive for future planning efforts, and the key for effective outreach to ensure that all potential adopters of PEV's are reached.

Southern California Plug-in Electric Vehicle Coordinating Council

In order to further the efforts sparked by the PEV Plan, for the past 1.5 years SCAG has taken upon a leadership role to host bi-monthly meetings of the Southern California Plug-in Electric Vehicle Coordinating Committee. Seeing PEV infrastructure as a truly regional issue, SCAG has been instrumental in bringing together key partners and stakeholders to discuss PEV issues and identify strategies to further the viability of electric vehicles in the region.

CHAPTER 3: Project Assessment and Advances

Assessment of PEV Readiness in Southern California

Based on examination of best practices throughout the region, the plan recommends public sector planning at our cities, counties, and partner agencies focus their limited resources on opportunities as they arise. The research suggests that for cities that wish to be pro-active their efforts will achieve the most impact in the following ways:

- Increasing the number of workplace charging options through outreach, education, and capacity building.
- Identification and categorization of existing multi-family structures located in opportunity areas.
- Identification and categorization of institutional and economic challenges to retrofitting existing buildings.
- Improve consumer-friendliness of PEV charging station information, permitting and inspection.
- Continue to educate potential PEV buyers about eFuel supply through community outreach capacity and support.
- Work closely with retail property owners, EVSP installers, utilities, and businesses to seek state and federal funding for publicly available, privately operated charging stations.

The collaborative work being spearheaded by SCAG and our regional partners building on this plan is focused on improving information of the PEV ecosystem and coordinating public and private efforts. In partnership with SCE, and the Los Angeles Economic Development Corporation (LAEDC), SCAG is meeting regularly with property developers, brokers, and businesses to identify potential early adopter sites.

Based on research and outreach with partner agencies and PEV industry entities, the plan suggests that agencies actively working on increasing proliferation of eFuel in Southern California focus their efforts with local public agencies and communities on the following:

- Monitoring and assisting in applying for state and federal funding sources and incentives.
- Educational awareness of utility incentives and PEV ecosystem support.
- Work with Councils of Government, and pro-active jurisdictions to assist in identifying promising case study locations.
- Assist in disseminating decision making guides, and fact sheets produced by PEV stakeholders, researchers and private sector entities.
- Maintain links to resources on installation costs, business cases, and institutional challenges.

Funding through the CEC has been essential in furthering these efforts in order to increase the use of alternative fuels and converting gasoline vehicle miles traveled (VMT) to electronic

vehicle miles traveled (eVMT) in Southern California. The following are identified as preliminary needs for additional research:

- Public policies inadequately incentivize potential charging-facility site hosts.
- The financial viability of charging stations is complex, complicating comparison of incentive alternatives.
- Previous PEV readiness planning created a wealth of knowledge that needs to be disseminated to and digested by key stakeholders.
- As deployments age and turbulent EVSP markets raise questions, maintenance and other ongoing requirements for electric-fuel (e-fuel) infrastructure are of increasing concern.
- E-fuel planners lack up-to-date, region-specific knowledge about PEV and infrastructure market penetration upon which to base efforts.
- Many resources exist to train potential e-fuel stakeholders, but knowledge of their extent, scope, and targeted audiences is limited and fragmented.
- Charge station siting disrupts on-site parking systems at workplaces and MUDs, hindering adoption.
- EVSP contracting practices have discouraged site-host participation.
- Stations are being planned and placed without adequate knowledge of expected utilization.

To overcome these and related barriers, ongoing efforts are needed to develop the knowledge and materials necessary to inform key stakeholders and potential consumers and catalyze electric-fuel market growth.

Innovation in Project Methodology

In order to better understand the interface between land use planning and PEV transportation behavior, the Luskin Center proposed an innovative approach to deriving likely PEV driver destinations. Instead of using electric vehicle registration data to estimate driver behavior in relation to the current infrastructure or relying on costly and difficult to administer surveys the Luskin Center modeled PEV destinations by using the Southern California Regional Transportation Model. This modeling produced maps showing likely morning peak, and midday destinations related to the origin points of known PEV registrations. These maps were then correlated with employment, and retail destinations, respectively.

Additionally, the report materials proposed innovative methodologies for examining the impact on eFuel of different pricing strategies of electric vehicle stations. The research showed that there is some cause for concern in the trends observed so far in the region. Some pricing structures penalize Plug-in Hybrid Electric Vehicles when compared to vehicles running purely on a battery. Though the intent is likely to encourage PEV use, and reduction of gasoline consumption, it is important to ensure that PHEV's are looked at as a part of the solution. Given the layout of the region, many individuals require the additional range of a PHEV when compared to a standard PEV, and its use should be encouraged as well. The report proposed various strategies for addressing these inequalities, and for correctly pricing vehicle charging time on a kilowatt/per hour basis. These findings have been published in other academic, and trade publications.

CHAPTER 4: Findings and Recommendations

The plan represents an extensive effort to gather baseline electric vehicle data in the region to get an idea of what the current infrastructure network looks like, how the market will grow in the future, and what must be done to ensure the charging network can accommodate the growing demand.

With a conservative growth estimate of PEV's in the Southern California region seeing numbers rise from 9,300 in 2012 to 889,000 in 2022, it is essential to identify methods to improve the charging network in order to support the demand. This growth rate was established by extrapolating data from Toyota Prius sale rates, under the assumption that Prius owners are likely to lead the way in adoption of new technology. The steep increase in PEV's in the region will require significant efforts to provide the necessary charging infrastructure.

One of the initial concerns this effort was designed to address was whether there were significant regulatory barriers that would impede installation of charging stations or EVSE. Fortunately, the findings suggest that there are no significant municipal regulatory barriers for a potential PEV purchaser who wishes to install EVSE in their single-family residence. This is not to say that the process cannot be improved, and the plan has recommendations for improving the consumer friendliness of the permitting and installation process.

Given that current charging mostly takes place at single family homes, the PEV Readiness Plan directs local agency staff to focus on three alternative locations where charging opportunities should be encouraged:

1. Workplace Charging
2. Multi-Family Dwelling (or Multi-Unit Dwellings – MUD)
3. DC Fast Charging at Retail Destinations

Workplaces are a prime candidate for charging opportunities as most people spend most of their day outside of home, at their place of employment. Additionally, correctly priced workplace charging effectively double the commute range of Battery Electric Vehicles (BEV) and ensures that Plug-in Hybrid Vehicles (PHEV) spend more time powered by their batteries then by gasoline. In other words, they achieve more electric Vehicle Miles Traveled (eVMT). Based on interviews, outreach, and anecdotal evidence most employers are not actively pursuing workplace charging. Pro-active and environmentally conscious employers are taking a wait and see approach, and only investigating workplace charging opportunities when approached by employees who are PEV owners.

In order for the market to grow significantly, charging at multi-unit dwellings must also be addressed, as it would provide many with the infrastructure to consider an electric vehicle. The plan and the associated atlases identify locations throughout the region where residents in multi-family housing likely match their neighbors in single family homes in socio-economic characteristics. They represent potential PEV buyers who might be hindered by lack of easy access to charging solutions. Unfortunately, the analysis also indicated that they barriers to multi-family charging installation are institutional, and economic. Therefore, they need to be addressed on a case-by-case basis.

Lastly, retail locations may be another location where PEV drivers can plug-in to "top off," their battery for the hour or so that they spend at the destination. Based on interviews, outreach, and anecdotal evidence individual jurisdictions have limited resources to pursue these opportunities. However state and federal agencies are still funding installation and the plan recommends that jurisdiction level staff work with interested retailers, developers, property managers, and private sector partners to assist in addressing parking, and permitting issues.

Initially, "fast charging," at locations such as retail destinations was seen as a method that would help PEV users replicate the gasoline vehicle experience with electric vehicle technology, but studies have shown that that may not be necessary. Electric Vehicle drivers change their driving styles in order to accommodate nighttime charging. This adaptation to new vehicle technology is reflected in the way in which PEV drivers do not worry about range as much as non-PEV drivers.

Land Use and policy recommendations to expand charging opportunities in these areas are addressed below.

Apart from the policy recommendations and overall findings provided in the Plan, the Southern California Electric Vehicle Atlas outlines specific data for all of SCAG's subregions. Sub-region data provided includes:

- PEV Growth
- PEV Registrations
- PEV Morning Peak Destinations
- Workplaces by number of employees
- Multi-Unit Residential
- Commercial/Retail Locations
- PEV Mid-Day Destinations and Commercial Locations
- Stand-alone Parking Facilities

This information is provided to effectively guide and inform local jurisdictions as they prepare to facilitate the development of an electric vehicle network.

Moving forward, the Plan encourages the continued development of outreach strategies. SCAG will continue to facilitate the PEV Coordinating Council in order to engage stakeholders across sectors to collaborate in the development of the charging network. Furthermore, information dissemination efforts will continue in order to bring awareness to sub-regions in Southern California, and key jurisdictions interested in pursuing such projects.

Land Use Policy Recommendations

Currently, the majority of EV charging occurs at single-family residences. However, for the EV market to reach its potential, it is necessary for charging opportunities to become diversified. Large potential for charging opportunities was identified at multi-unit dwellings, workplaces, retail, and public sector locations. Land use policy recommendations to facilitate charging at these locations are as follows:

- Reform building codes to require a certain amount of PEV-ready spaces in new MUD and non-residential construction

- Require PEV upgrades when a building is sold
- Allow PEV charging stations to count towards minimum parking requirements.

In addition, a streamlined process for obtaining the necessary permits to establish a charging site further adds in facilitating the growth of the charging network. The report provides a set of tools for planners and policy makers, including a review of zoning policies and building codes that affect how land could be used in the region to further establish the EV market.

Local Agency Outreach Recommendations

As noted, local agencies are stretched very thin in the current economic climate. Based on outreach and interviews local agencies including city and county planning and building inspection staff report limited interest in actively pursuing EVSE installation opportunities. The Plan recommends a "ladder" of public engagement activities that proactive cities can pursue to increase PEV friendliness. In order to ensure an effective roll out of PEV friendly projects, the following process is outlined for deployment:

- Informational support to begin with dissemination of information to potential partners and key stakeholders, PEV resource information at planning counters, and familiarity with the needs of EVSE installers.
- Prioritizing zoning, building, permitting, parking reforms according to dominant land uses. Using provided spatial analysis, and land use inventories, planning activities can be used to implement necessary planning reforms that may foster PEV charging opportunities. The plan recognizes that zoning code updates are involved, and unlikely
- to be initiated just based on PEV Plan recommendations. These recommendations are meant to inform additions to zoning code changes when they occur.
- Targeted outreach and workshops for workplaces, MUD's, and single-family homeowners to engage stakeholders that hold the key to bolstering the charging network.

Demonstration projects that provide regional examples of effective charging station incorporation in various land uses. Specifically, the plan recommends that local agency staff work with residential building owners, and retail establishments to partner on installations, in order to address the outstanding institutional issues facing these projects.

Further Study

Several critical problems have emerged in infrastructure markets that have not been adequately addressed by previous research and planning. As the largest market for PEVs in the country it is vital that SCAG remain at the forefront of planning for these issues. Some of the remaining barriers raised by the report are:

- Public policies inadequately incentivize potential charging-facility site hosts.
- The financial viability of charging stations is complex, complicating comparison of incentive alternatives.
- Previous PEV readiness planning created a wealth of knowledge that needs to be disseminated to and digested by key stakeholders.
- As deployments age and turbulent EVSP markets raise questions, maintenance and other ongoing requirements for e-fuel infrastructure are of increasing concern.

- E-fuel planners lack up-to-date, region-specific knowledge about PEV and infrastructure market penetration upon which to base efforts.
- Many resources exist to train potential e-fuel stakeholders, but knowledge of their extent, scope, and targeted audiences is limited and fragmented.
- Charge station siting disrupts on-site parking systems at workplaces and MUDs, hindering adoption.
- EVSP contracting practices have discouraged site-host participation.
- Stations are being planned and placed without adequate knowledge of expected utilization.

These identified barriers should guide further study in order to identify solutions to further develop a comprehensive network to support electric vehicles in the Southern California Region.

GLOSSARY

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.
4. Developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels.
5. Planning for and directing state response to energy emergencies.

Funding for the CEC's activities comes from the Energy Resources Program Account, Federal Petroleum Violation Escrow Account, and other sources.

CLEAN CITIES COACHELLA VALLEY (3CV)–A part of the e U.S. Department of Energy Clean Cities Program. C3VR takes leadership roles in coordinating efforts between government and industry to recognize the value of partnership in achieving air quality, energy security, economic development, and transportation goals.[1]

ELECTRIC FUEL (E-FUEL)–Electricity used to power 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 (NOx), halogenated fluorocarbons (HCFCs), ozone (O3), perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs).

LOS ANGELES ECONOMIC DEVELOPMENT CORPORATION (LAEDC)– Los Angeles County Economic Development Corporation (LAEDC) was founded in 1981 as a nonprofit, public-benefit organization to harness the power of private sector in collaboration with L.A. County, to guide economic development and create more widely shared prosperity. LAEDC collaborates with all stakeholders in the region including education, business, and government.[2]

MULTI-UNIT DWELLING (MUD)– A classification of housing where multiple housing units are contained within one building or multiple buildings within a complex or community.[3]

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

[1] 3CVR can be found at https://www.c3vr.org/
[2] LAEDC can be found at https://laedc.org/
[3] MUD can be found at https://www.lawinsider.com/dictionary/multi-unit-dwelling

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).

SOUTH BAY CITIES COUNCIL OF GOVERNMENTS (SBCCOG)–A joint powers authority of 16 cities and the County of Los Angeles that share the goal of maximizing the quality of life and productivity of the South Bay region.[4]

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)—The air pollution control agency for all of Orange County and the urban portions of Los Angeles, Riverside, and San Bernardino counties. This area of 10,740 square miles is home to over 17 million people—about half the population of the whole state of California. It is the second most populated urban area in the United States and one of the smoggiest. Its mission is to clean the air and protect the health of all residents in the South Coast Air District through practical and innovative strategies.

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS (SCAG)–A Joint Powers Authority under California state law, established as an association of local governments and agencies that voluntarily convene as a forum to address regional issues.[5]

SOUTHERN CALIFORNIA EDISON (SCE)—One of the nation's largest electric utilities, which delivers power to 15 million people in 50,000 square miles across central, coastal, and Southern California, excluding the City of Los Angeles and some other cities.

WESTERN RIVERSIDE COUNTY COUNCIL OF GOVERNMENTS (WRCOG)–A joint powers authority of 18 cities, the Riverside County Board of Supervisors, the Eastern and Western Municipal Water Districts, and the Morongo Band of Mission Indians that focus on collective regional issues.[6]

UNITED STATES DEPARTMENT OF ENERGY (U.S. DOE)—The federal department established by the Department of Energy Organization Act to consolidate the major federal energy functions into one cabinet-level department that would formulate a comprehensive, balanced national energy policy. DOE's main headquarters are in Washington, D.C.

[4] SBCCOG can be found at https://www.southbaycities.org/about-us
[5] SCAG can be found at http://www.scag.ca.gov/about/Pages/Home.aspx
[6] WRCOG can be found at https://ca-wrcog.civicplus.com/152/About-WRCOG