CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

California Energy Commission

Clean Transportation Program

FINAL PROJECT REPORT

San Diego Regional Plan to Support Plug-in Electric Vehicle Readiness

The San Diego Regional Electric Vehicle Infrastructure Working Group and Plug-in Electric Vehicle Readiness Plan

Prepared for: California Energy Commission

Prepared by: San Diego Association of Governments

SANDAG

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PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation 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-11-004 on March 9th, 2012.

ABSTRACT

The San Diego region has been a national leader in plug-in electric vehicle adoption. This document serves as the Final Report by the San Diego Association of Governments pursuant to its Agreement ARV-11-004 with the California Energy Commission under solicitation PON-09-602 for regional Plug-in Electric Vehicle readiness. The project developed a San Diego regional Plug-in Electric Vehicle strategic plan for electric vehicle supply equipment and established best practices to address readiness barriers across local jurisdictions.

The project comprised four primary tasks: establish the San Diego Regional Electric Vehicle Infrastructure Working Group, create best practice materials to address barriers to deployment of Plug-in Electric Vehicle chargers, develop the San Diego Regional Plug-in Electric Vehicle Readiness Plan, and distribute these materials. Project methods were to utilize the California Center for Sustainable Energy to assist in working group meetings, Regional Electric Vehicle Infrastructure materials, and outreach; and to leverage existing Plug-in Electric Vehicle efforts to bring real-time information and issues to the Regional Electric Vehicle Infrastructure.

Major findings included regional Plug-in Electric Vehicle adoption exceeding 4,000 vehicles and almost 500 publicly accessible electric vehicle supply equipment by January 2014, compared with less than 40 electric vehicle supply equipment operating in late 2011. Results include the Plug-in Electric Vehicle Readiness Plan being referenced in local Climate Action Plans and the San Diego Association of Governments Energy Roadmap Program for local governments. Best practice materials such as an electric vehicle supply equipment request for proposal template, a guide for siting electric vehicle supply equipment at transit or park-and-ride stations, and a technical policy on parking accessibility for electric vehicle supply equipment have been utilized by several agencies.

Project conclusions are that the Regional Electric Vehicle Infrastructure played a critical role in Plug-in Electric Vehicle market growth within San Diego County. A broad array of regional stakeholders contributed to the readiness plan and without a coordinating council, greater barriers would continue to stifle market development. Project recommendations are for continued collaboration amongst public agencies, greater public and stakeholder outreach, and continued state resources and assistance.

Keywords: California Energy Commission, San Diego Association of Governments, California Center for Sustainable Energy, electric vehicle, plug-in electric vehicle, zero-emission vehicle, planning, policy, guidebook, readiness plan, barriers, permitting, parking, accessibility, multiunit

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EXECUTIVE SUMMARY

The San Diego region is at the forefront of plug-in electric vehicle deployment with the highest per capita Plug-in Electric Vehicle purchases and car charging equipment installations in the nation. The region's early Plug-in Electric Vehicle experiences have identified barriers to widespread Plug-in Electric Vehicle adoption, which are best addressed by strategic and coordinated consensus.

The San Diego Regional Plug-in Electric Vehicle Readiness Plan was developed to support the growing market of Plug-in Electric Vehicles in the San Diego region by enabling municipalities and others to address and resolve challenges to deploying charging infrastructure, referred to as electric vehicle supply equipment. Currently, the San Diego region has more than 4,000 Plug-in Electric Vehicles on the road and 500 publicly available charging stations.

The goal of this project was to develop a regionally relevant Plug-in Electric Vehicle readiness plan for electric vehicle charging stations that would be used by local governments, regional agencies, the utility, universities, and business interests to further Plug-in Electric Vehicle adoption in the San Diego region. The San Diego Association of Governments led the project as a means to implement its 2050 Regional Transportation Plan and Sustainable Communities Strategy and address the impact transportation fuels have on the San Diego region. On-road transportation represents 46 percent of this region's greenhouse gas (GHG) emissions and as such, the San Diego Association of Governments 2050 RTP/SCS and Regional Energy Strategy both call for San Diego Association of Governments to undertake coordinated planning for electric vehicle charging and alternative fueling infrastructure in the region.

The project scope comprised four primary tasks:

1. Establish the San Diego Regional Electric Vehicle Infrastructure Working Group (the San Diego region's Plug-in Electric Vehicle Coordinating Council)
2. Create best practice materials to address barriers to deployment of electric vehicle chargers
3. Develop the San Diego Regional Plug-in Electric Vehicle Readiness Plan
4. Distribute the guidance materials and San Diego Regional Plug-in Electric Vehicle Readiness Plan

The San Diego Association of Governments Board of Directors adopted the San Diego Regional Plug-in Electric Vehicle Readiness Plan on January 24, 2014. The San Diego Regional Plug-in Electric Vehicle Readiness Plan, including best practice materials and fact sheets, is available for download at SANDAG. (www.sandag.org/energy.) The adopted plan has been distributed to Regional Electric Vehicle Infrastructure members and stakeholders including all local jurisdictions in the San Diego region, and has been made available to the public at no cost. The Regional Electric Vehicle Infrastructure members include representatives from local jurisdictions, regional public agencies, California Center for Sustainable Energy, San Diego Gas & Electric, local universities and community colleges, IBEW Local 569, the National Electrical Contractors Association and the business community.

Chapter 1 of this final project report (report) describes the purpose of the San Diego Regional Electric Vehicle Infrastructure project and the approach this region used to achieve the purpose. To accomplish the overall Plug-in Electric Vehicle planning project, San Diego Association of Governments partnered with the California Center for Sustainable Energy, the

sustainable energy non-profit that serves as the program manager for the California Air Resources Board Clean Vehicle Rebate Program and the San Diego Regional Clean Cities Coalition. The California Center for Sustainable Energy assisted with Regional Electric Vehicle Infrastructure working group meetings, development of best practice materials and fact sheets, preparation of the San Diego Regional Plug-in Electric Vehicle Readiness Plan and outreach.

Chapter 2 of this report encompasses the various activities that were performed by the Regional Electric Vehicle Infrastructure, as well as regional results related to local Plug-in Electric Vehicle adoption. Fourteen (14) Regional Electric Vehicle Infrastructure working group meetings were held over a twenty-month period. Meetings were originally held every other month and moved to monthly in 2013 based on keen member interest in contributing to the interim materials and final plan. The meetings were well attended and as materials were completed, Regional Electric Vehicle Infrastructure members would bring them back to their jurisdictions and organizations to disseminate. In addition to Regional Electric Vehicle Infrastructure working group meetings, the materials and activities from this project were shared at more than twenty-five (25) regional events.

Region-specific fact sheets, templates and/or educational resources were developed over the project period. These materials complement the readiness plan and serve as standalone resources available to members of the community, municipal staff and other stakeholders. Importantly, these fact sheets highlight recommended solutions to reducing several of the following barriers identified for the San Diego region.

- Permitting/Inspection
- Building Codes
- Zoning and Parking Rules
- Training and Education for Municipal Staff and Electrical Contractors
- Lack of Public Knowledge of Plug-in Electric Vehicle and electric vehicle supply equipment
- electric vehicle supply equipment at Multi-Unit Dwellings
- Regional Planning for Public electric vehicle supply equipment Siting
- On-Peak Charging
- Public Agency electric vehicle supply equipment Installations
- Commercial and Workplace Charging
- Plug-in Electric Vehicles in Government Fleets

Chapter 3 of this report identifies the project goal and objectives and the degree to which each was achieved during the agreement period. The chapter also includes an overview of three (3) science and technology projects that were underway and discussed at Regional Electric Vehicle Infrastructure working group meetings. Tables 10 and 11 list project goals and objectives, identify their level of success as a percentage, and provide an explanation for their ranking or measurement.

Chapter 4 includes observations, conclusions and recommendations for going forward. The San Diego Regional Electric Vehicle Infrastructure working group played a critical role in Plug-in Electric Vehicle market growth within San Diego County. Over the course of this eighteen-month agreement, San Diego Association of Governments and its partners (the California

Center for Sustainable Energy, San Diego Regional Clean Cities Coalition, and others) coordinated a broad array of regional stakeholder input into the development of a regional Plug-in Electric Vehicle readiness plan. Based on the Regional Electric Vehicle Infrastructure meetings and development of a regional Plug-in Electric Vehicle readiness plan, San Diego Association of Governments and the California Center for Sustainable Energy can offer several observations under three (3) main categories: stakeholder participation, program collaboration coordination and leveraging of programs and resources, and early market development.

The major findings in Chapter 4 include regional Plug-in Electric Vehicle adoption exceeding 4,000 vehicles and almost 500 publicly accessible electric vehicle supply equipment by January 2014, compared with less than 40 electric vehicle supply equipment operating in late 2011. Results include the San Diego Regional Plug-in Electric Vehicle Readiness Plan being referenced in local Climate Action Plans and in the San Diego Association of Governments Energy Roadmap Program for local governments. Best practice materials such as a request for proposal template for electric vehicle supply equipment, a guide for siting electric vehicle supply equipment at transit and park-and-ride stations, and a technical policy on parking accessibility for electric vehicle supply equipment have been utilized by several local agencies including San Diego Association of Governments.

Project conclusions are that the Regional Electric Vehicle Infrastructure played a critical role in Plug-in Electric Vehicle market growth within San Diego County. A broad array of regional stakeholders contributed to the readiness plan and without a coordinating council, greater barriers would continue to stifle market development. Project recommendations are for continued collaboration amongst public agencies, greater public and stakeholder outreach, and additional state resources.

CHAPTER 1: Project Purpose and Approach

1.1 Purpose of the Regional Electric Vehicle Readiness Project

The San Diego Association of Governments (SANDAG) is concerned with the impact transportation fuels have on the San Diego region. On-road transportation represents 46 percent of this region's greenhouse gas (GHG) emissions according to the Energy and Policy Initiatives Center's "San Diego County Greenhouse Gas Inventory (Sept. 2008)". As such, the SANDAG Regional Energy Strategy and 2050 Regional Transportation Plan and Sustainable Communities Strategy both direct SANDAG to undertake coordinated planning for electric vehicle charging and alternative fueling infrastructure in the region.

The purpose of the San Diego region's plug-in electric vehicle (PEV) readiness project has been to establish a PEV stakeholder group and develop a customized PEV readiness plan to meet the needs of the San Diego region. In February 2012, SANDAG established the San Diego Regional Electric Vehicle Infrastructure Working Group (REVI) through SANDAG Board Resolution 2012-18.

Without the resources provided by this California Energy Commission (Energy Commission) award, the San Diego region would not have been able to produce a regional PEV readiness plan, nor maintain a PEV working group to address:

- Barriers (real and perceived) to acceptance of PEVs in the San Diego region
- Planning for "Life after the EV Project," and the second wave of PEVs introduced by several car original equipment manufacturers (OEM)
- Timing of electric vehicle supply equipment (EVSE) deployments and future PEV market penetration
- Integration of early learnings about PEV driver charging behavior and regional charging patterns; and
- Dissemination of many San Diego-specific PEV activities including:
    - Regional EV Project findings
    - The first all-electric vehicle car-share project in the world
    - Our method of planning for publicly accessible Level 2 and DC fast chargers using land use characteristics and trip generation data
    - San Diego Gas & Electric (SDG&E) electric vehicle time of [electricity] use study;
    - SDG&E-government-car OEM collaborations; and
    - Solutions to roadblocks when siting chargers at multi-unit dwellings.

1.1.1 Mission of the San Diego REVI

At its inaugural meeting in March 2012, the working group members agreed to the following mission:

"To facilitate and develop a San Diego regional PEV readiness plan that identifies, reduces and resolves barriers in order to promote the widespread deployment of private and public EVSE, thereby showcasing the San Diego region as a national leader in PEV readiness."

1.1.2 Charter of the San Diego REVI

The Charter states that all efforts in this project were to be undertaken in a manner that maximized the benefits of PEVs while further enhancing our quality of life, protecting our environment, promoting sustainability, and offering more mobility options for people and goods. The adopted Charter and other REVI materials are available at SANDAG. (www.sandag.org/energy.)

The working group's purpose has been to function as a coordinating body for:

- The sharing of information on PEV readiness planning;
- The dissemination of best practices and EVSE deployment materials to stakeholders from the San Diego region, other regions and the state; and
- The development of policy approaches that reduce or remove barriers to region wide PEV readiness.

1.2 Approach to Achieve Project Purpose

SANDAG was the program administrator responsible for overall program content, performance and deliverables to the Energy Commission. SANDAG contracted with the California Center for Sustainable Energy (CCSE) to provide working group support, dissemination of activities and materials, and development of readiness plan components. SANDAG and CCSE collaborated on the management of REVI working group meetings and led the topical discussions.

Our operational approach to ensure success was built upon:

- Strong communication via multiple avenues [websites, council/committee meetings, emails, presentations, agenda materials, guidance documents and the San Diego Regional Plug-in Electric Vehicle Readiness Plan (PEV Readiness Plan)].
- Open meetings at accessible venues (publicly noticed in line with the Brown Act—a state law that ensures actions and deliberations of public bodies of local agencies are taken openly and with public access and input)
- Consensus-building across diverse regional stakeholders (local governments, regional public agencies, Caltrans, academic institutions, local utility, electrical contractors, car OEMs and EVSE suppliers)

SANDAG has extensive experience in utilizing stakeholder groups in order to develop policies and projects. As such, we held extra REVI meetings and brought all materials through the working group early in their development. This approach led to robust discussions and wide engagement on PEV readiness issues from both the REVI and interested members of the public.

The San Diego REVI activities were designed to leverage existing PEV efforts to bring real-time information and issues to the working group for deliberation. The approach to developing the readiness plan was to focus REVI meetings on specific barriers, hearing the issues from project developers, EVSE suppliers, government officials and/or others for each topic. From those discussions combined with interviews and research, the project team prepared fact sheets and guidance materials for immediate use by REVI members and others across the San Diego region.

For each barrier, the REVI determined what type of materials (e.g., best practice template, fact sheet and guidance document) would be most helpful for immediate use.

CHAPTER 2: Activities Performed, Data Collection and Results

2.1 Activities Performed

2.1.1. REVI Meetings

Fourteen REVI meetings were held over a twenty-month period. Meetings were originally held every other month and moved to monthly in 2013 based on keen member interest in contributing to the interim materials and final plan. The meetings were well attended and as materials were completed, REVI members would bring them back to their jurisdictions and organizations to share (e.g., RFP template for EVSEs and guidance on EVSE accessibility).

REVI meetings were held at either CCSE or the SDG&E Energy Innovation Center (EIC), both centrally located in San Diego County. CCSE and SANDAG would collaborate to create agenda topics, prepare materials and subsequently publish the meeting agendas one week prior to each meeting; giving working group members a full week to read and contemplate materials prior to each REVI meeting. By providing materials well in advance and holding meetings as frequently as needed, REVI meetings had very robust discussions across a wide range of PEV readiness topics. Table 1 below lists all of the REVI meetings and the main discussion topics. After each meeting, a meeting summary was prepared and included within the next meeting's agenda packet published on REVI at www.energycenter.org/pluginready.

Table 1: San Diego REVI Meetings

Meeting	Date	Main Discussion Topics
1.	3/15/12	REVI kickoff meeting REVI project tasks REVI member responsibilities
2.	5/17/12	REVI formation documents PEV charging at multi-unit dwellings
3.	7/19/12	Working draft REVI document Commercial installation issues
4.	9/20/12	Lack of public knowledge of PEV and EVSE
5.	11/08/12	EVSE contracting issues
6.	1/17/13	Permitting and inspection Public agency EVSE installations
7.	2/21/13	Prioritization of REVI barriers
8.	3/21/13	Permitting and inspection Regional planning for public EVSE siting Public agency EVSE installations Commercial and workplace charging
9.	4/18/13	Zoning and parking rules EVSE at multi-unit dwellings
10.	5/16/13	Building Codes Zoning and Parking Rules EVSE at multi-unit dwellings
11.	7/18/13	Lack of public knowledge of PEV and EVSE Training and education for municipal staff and electrical contractors
12.	8/15/13	Permitting/inspection for commercial installations EVSE at multi-unit dwellings
13.	9/19/13	Permitting/inspection for residential and commercial installations
14.	11/14/13	Finalization of the PEV Readiness Plan

Source: CCSE and SANDAG.

2.1.2 Identification and Prioritization of San Diego Regional Barriers

SANDAG leveraged work already underway by the California Plug-in Electric Vehicle Collaborative, SDG&E and CCSE to develop a list of regional barriers to PEV readiness. CCSE's Phase One Regional Assessment established a baseline of information for how local

governments were addressing permitting, zoning and other related EVSE issues. In addition, the REVI identified roadblocks to EVSE installation and PEV deployment with important stakeholder groups, such as new car dealerships and homeowner associations. Table 2 is a list of the 11 barriers the San Diego REVI addressed. These barriers shaped the discussions for each San Diego REVI meeting.

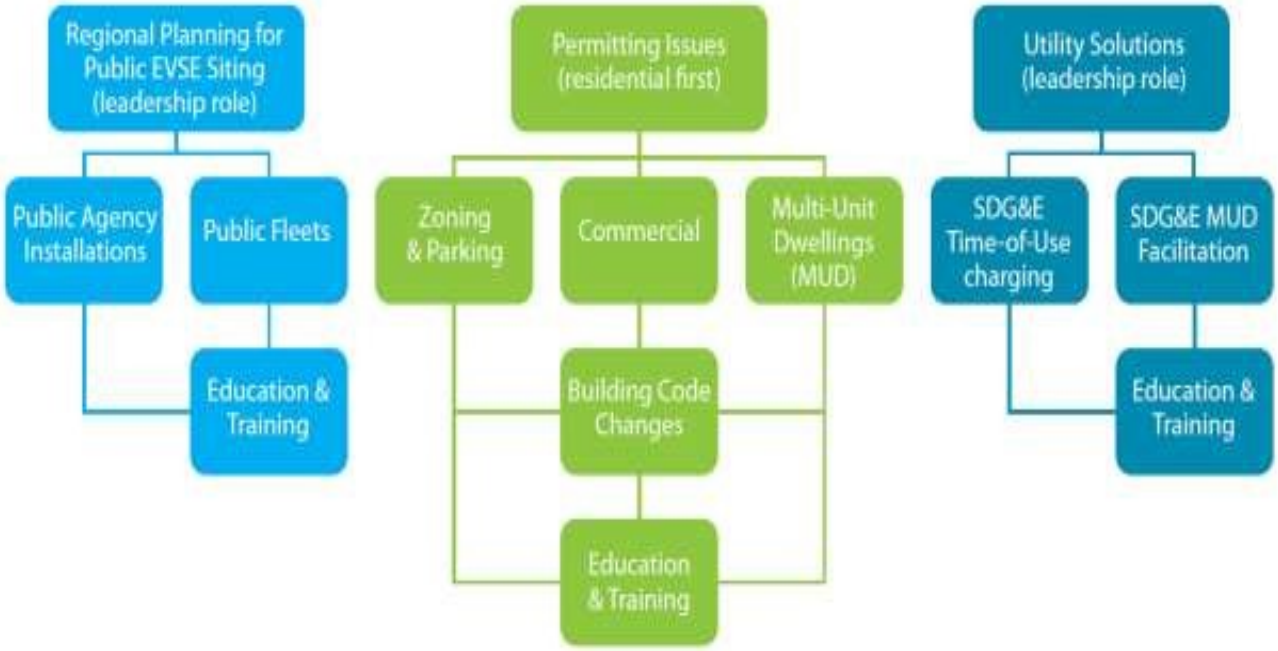
Table 2: PEV Readiness Barriers

No.	Barrier	Description
1.	Permitting/Inspection	Lack of streamlined permitting and inspection processes and inconsistent (high) costs across jurisdictions.
2.	Building Codes	Lack of standard building codes that accommodate charging infrastructure or dedicate circuits for charging infrastructure in new construction and major renovations.
3.	Zoning and Parking Rules	Lack of standard regional ordinances that facilitate the installation and access to publicly available charging infrastructure.
4.	Training and Education for Municipal Staff and Electrical Contractors	Lack of knowledge about PEVs and EVSE
5.	Lack of Public Knowledge of PEV and EVSE	Municipal outreach to Local Residents and Businesses
6.	EVSE at Multi-Unit Dwellings	Consumer lack of knowledge regarding EVSE installation in these buildings. Need to educate and work with HOAs to identify and find solutions to unique building challenges.
7.	Regional Planning for Public EVSE Siting	Regional land use and transportation plans served as a basis to identify optimal public EVSE sites. In rollout of EV Project, experience was different from planning. Alternate approaches have been taken to increase public EVSE hosts and sites.
8.	On Peak Charging – TOU Utility Rates	Need to discourage charging when electricity supplies are in high demand and cost more. Support of time of use (TOU) pricing. High demand charges that impact EVSE host utility bills. Expensive metering options to access TOU rates.
9.	Public Agency EVSE Installations	Contracting issues have stalled many public agencies from taking part in The EV Project. Need to identify common project barriers and find solutions.
10.	Commercial and Workplace Charging	Lack of understanding regarding benefits and approaches to understanding workplace charging.
11.	PEVs in Government Fleets	Procurement justification needed for local public fleets. Need to describe PEV benefits, including role in reducing municipal GHGs for Climate Action Plans.

Source: SANDAG and CCSE.

The PEV barriers were later grouped and prioritized into domain areas as a way to focus the REVI meetings and the development of interim outreach materials. Figure 1 illustrates how the barriers were grouped and addressed by the REVI. It also served as the structure for the PEV Readiness Plan.

Figure 1: San Diego Regional PEV Readiness Barriers



Source: SANDAG and CCSE.

2.1.3 Creation of Barrier Fact Sheets, Best Practices and other Templates

Region-specific fact sheets, templates and educational tools were developed and identified over the project period. These materials complement the readiness plan and serve as stand-alone resources available to members of the community, municipal staff and other stakeholders. Importantly, these fact sheets highlight recommended solutions to reducing several of the following barriers identified for the San Diego region.

- Permitting/Inspection
- Building Codes
- Zoning and Parking Rules
- Training and Education for Municipal Staff and Electrical Contractors
- Lack of Public Knowledge of PEV and EVSE
- EVSE at Multi-Unit Dwellings
- Regional Planning for Public EVSE Siting
- On-Peak Charging
- Public Agency EVSE Installations
- Commercial and Workplace Charging
- PEVs in Government Fleets

The region-specific fact sheets and resources developed and identified by the REVI over the project period are listed by barrier in Table 3.

Table 3: REVI Tools and Resources

Barrier	REVI Tools and Resources
Permitting/Inspection	Fact Sheet: *Electric Vehicle Charging Station Installation Guidelines: Residential and Commercial Locations*
Building Codes	Resources: *Building Codes Summary*
Zoning and Parking Rules	Resources: *San Diego REVI Comments on Plug-in Electric Vehicles: Universal Charging Access Guidelines and Best Practices*
Training and Education for Municipal Staff and Electrical Contractors	Fact Sheet: *Resources for Public Agencies in San Diego*; *Resources for Electrical Contractors in San Diego* Resources: *San Diego Plug-in Vehicle Community Seminar: The Electric Vehicle Infrastructure Training Program (EVTIP) Summary;* *Towing Alternative Fuel Vehicles Presentation Summary*
Lack of Public Knowledge of PEV and EVSE	Fact Sheet: *Plug-in Electric Vehicles & Charging: Getting Started* Resources: *San Diego Regional Clean Cities Coalition Dealership Outreach Pamphlet; CCSE Guide to Plug-in and Get Ready*
EVSE at Multi-Unit Dwellings	Fact Sheet: *Charging at Condos, Apartments and Community Living Areas*
Regional Planning for Public EVSE Siting	Fact Sheet: *Regional Planning for Public EVSE Charging in San Diego*
On Peak Charging – TOU Utility Rates	Information: *San Diego Gas & Electric provided information for the development of the TOU Section of the PEV Readiness Plan*
Public Agency EVSE Installations	Resources: *Request for Proposals Template: Installation and Operation of Electric Vehicle Charging Stations; Electric Vehicle Charging for Regional Park-and-Ride Lots and Transit Stations*
Commercial and Workplace Charging	Fact Sheet: *Workplace Charging for Businesses in San Diego* Resources: *San Diego Regional Nonresidential Charging Infrastructure Study*
PEVs in Government Fleets	Fact Sheet: *Resources for Fleet Managers in San Diego*

Source: SANDAG and CCSE.

2.1.4 Development of the San Diego Regional PEV Readiness Plan

The final PEV Readiness Plan was made possible through the input of REVI members on content drafted by CCSE and SANDAG. The Governor's Office of Planning and Research (OPR) Zero-Emissions Vehicles in California: Community Readiness Guidebook (ZEV Community Guidebook), California PEV Collaborative (CA PEV Collaborative) reports and CCSE's Phase One Regional Assessment also were used in preparing the draft regional plan.

A draft PEV Readiness Plan was first presented to the REVI on September 19, 2013. Members discussed the draft, provided comments and had the option to submit document revisions. Following the REVI's review, the revised draft was shared with a wider audience through a public workshop held October 9, 2013. The workshop kicked off a 30-day comment period whereby stakeholders and the general public could access and download the draft PEV Readiness Plan from CCSE's *Plug-In & Get Ready* website.

Subsequently, the final draft PEV Readiness Plan was prepared for review by SANDAG committees, working groups and Board of Directors.

- The SANDAG Regional Energy Working Group: Sept. 26 and Oct. 24, 2013
- Regional Planning Committee: October 4, 2013
- Regional Planning Technical Working Group: January 9, 2014
- SANDAG Board of Directors: January 24, 2014

The Final PEV Readiness Plan addresses barriers and provides recommendations to overcome them. In addition, all of the fact sheets and best practices developed throughout the course of the REVI meetings are included as appendices.

2.1.5 Coordination and Contributions to Statewide PEV Efforts

San Diego REVI activities have been closely coordinated with larger California efforts to both bring local expertise to state initiatives and to learn from the state and other regions. Some examples include our (CCSE, SDG&E and SANDAG) participation on the ZEV Community Readiness Guidebook Working Group; SDG&E's active participation in the CA PEV Collaborative, in particular its leadership on the multi-unit dwelling working group; and coordination on activities related to National Plug-in Day (September 2013), which was held in San Diego. In addition, the REVI provided comments to OPR during the public review period (June 2013) on its draft Accessibility Guidelines.

2.1.6 San Diego Regional Electric Vehicle Events

SANDAG and CCSE coordinated REVI efforts with the San Diego Regional Clean Cities Coalition, REVI member organizations, and other relevant clean transportation programs. This coordination included attending and participating in events that were relevant to REVI goals and barriers. Table 4 identifies the most relevant events sponsored by the San Diego Regional Clean Cities Coalition. Table 5 identifies the most relevant events sponsored by SDG&E. Table 6 identifies the most relevant events sponsored by CCSE. Table 7 identifies the most relevant events sponsored by SANDAG, and Table 8 identifies the most relevant events sponsored by other REVI participants.

Table 4: San Diego Regional Clean Cities Coalition PEV Events

Event Name	Organizer	Date Held
Odyssey Day San Diego National AFV Day Odyssey	Clean Cities Coalition at CCSE	Oct. 23, 2012
Overview of the ECOtality Project Clean Cities TV YouTube Channel	Clean Cities Coalition at YouTube	Dec. 2012
Options and Opportunities for Alternative Fuels and Vehicles	Clean Cities Coalition at CCSE	Feb. 12, 2013
Electric Vehicle Infrastructure Training Program (EVITP)	Mira Costa College	Nov. 4 – Dec. 18, 2013

Source: San Diego Regional Clean Cities Coalition.

Table 5: San Diego Gas & Electric PEV Events

Event Name	Organizer	Date Held
PEV Charging at Multi-Unit Dwellings Continuing to be held on quarterly basis.	SDG&E at Energy Innovation Center	Apr. 24, 2012 Jul. 31, 2012 Nov. 1, 2012 Feb. 26, 2013 May 14, 2013 Sep. 17, 2013
SDG&E Energy Showcase: 7th Annual Energy Showcase Clean Transportation display and seminar	SDG&E	May 11, 2012
Introduction to Electric Bicycles.	SDG&E	Jul. 12, 2012
PEV Dealer Workshop Is your Dealership Plug-in Ready?	SDG&E	Nov. 12, 2013
San Diego Gas & Electric Fleet Forum For medium and heavy-duty trucks	SDG&E	Nov. 29, 2012
Plug-in Vehicle Charging at the Workplace	SDG&E	Mar. 21, 2013
Plug-In 2013 Conference and Exhibition	EPRI SDG&E	Sep. 30 – Oct. 3, 2013

Source: SDG&E and San Diego Regional Clean Cities Coalition.

Table 6: California Center for Sustainable Energy PEV Events

Event Name	Organizer	Date Held
California Community Plug-in Electric Vehicle Readiness Workshop	CCSE	Jun. 14, 2012
National Plug-in Day San Diego	CCSE	Sep. 23, 2012
PEV Infrastructure Training for Electrical Contractors and Municipal Staff	CCSE	Jan. 29, 2013

Source: CCSE and San Diego Regional Clean Cities Coalition.

Table 7: SANDAG Events

Event Name	Organizer	Date Held
San Diego Forward: The Regional Plan workshop on environment, energy, climate change and public health	SANDAG at Caltrans HQ	May 17, 2013
EV and Alternative Fuel Vehicle First Responder Training for SANDAG Freeway Service Patrol (FSP)	SANDAG at Caltrans District 11 Operations Ctr	Jun. 8, 2013
San Diego Forward: The Regional Plan Community Workshops (sought input on all topics- land use, transportation, housing, environment, health, energy, climate change, borders)	SANDAG in South County North County Inland North County Coastal East County	Jun. 6, 2013 Jun. 13, 2013 Jun. 20, 2013 Jun. 27, 2013
San Diego Regional PEV Readiness Plan Public Workshop	SANDAG and CCSE	Oct. 9, 2013

Source: SANDAG.

Table 8: Additional REVI Member PEV Events

Event Name	Organizer	Date Held
The EV Project Free Workshop & Product Demonstration for commercial and public hosts	ECOtality and SDG&E at The Grand Del Mar	Mar. 14, 2012
The EV Project San Diego Forum for commercial and public hosts	ECOtality	Oct. 15, 2012
car2go One Year Anniversary Event with City Resolution for "car2go Day"	car2go City of San Diego	Nov. 29, 2012
Inauguration of car2go new BEV fleet in Chula Vista	car2go City of Chula Vista	Jul. 12, 2013
NRG eVgo event at Fashion Valley mall	NRG eVgo	Sep. 30, 2013
MultiCharge San Diego Demonstration Project	ChargePoint at EIC	Oct. 21, 2013
Free EV Chargers for Multifamily Buildings Workshop	ChargePoint	Nov. 12, 2013

Source: San Diego Regional Clean Cities Coalition, SANDAG and ECOtality.

2.2 Data Collection during the Project Period

The REVI had a standing meeting agenda item for PEV-related developments since their previous meeting. For this item, the REVI would learn of new PEV programs, local events, preliminary research findings from the EV Project, CCSE and others. The most relevant PEV related developments for data collection are described briefly in this section.

2.2.1 The EV Project and ECOtality

2.2.1.1 Statistics on Vehicles and Chargers by Metropolitan Area and Total Project

ECOtality presented initial EV Project findings and progress reports to the REVI at each meeting. Several regional barriers to EVSE deployment were realized and addressed through the EV Project. In addition, ECOtality provided the following data to the REVI.

- Growth of Project Participation
- Number of Publicly Accessible AC Level 2 and DCFC
- Percent Charging Events per Day at Home for the Leaf and the Volt
- Percent Charging Events per Day Away from Home for the Leaf and the Volt
- DCFC Charging Events
- Quarterly and Cumulative Total Miles Driven by Region
- Average Distance Driven and Distance per Day by Project Vehicle
- Average Distance Traveled between Charging Events for Leaf and Volt
- Number of Residential and Public AC Level 2 EVSE Charge Events
- Number of Publicly Accessible EVSE Charge Events for Level 2 and DC Fast Charge with/without Car Sharing
- Weekday Charging Availability and Charging Demand in San Diego

- Charging Availability and Charging Demand for Residential Level 2, Private Non-Residential Level 2, Publicly Accessible AC Level 2, and DCFC – All Regions

Figure 2 highlights vehicle and driving statistics gleaned from all of the EV Project designated metro-areas. The San Diego region has the second highest miles driven among all of the metro areas, with the largest number of smart electric drives enrolled to date.

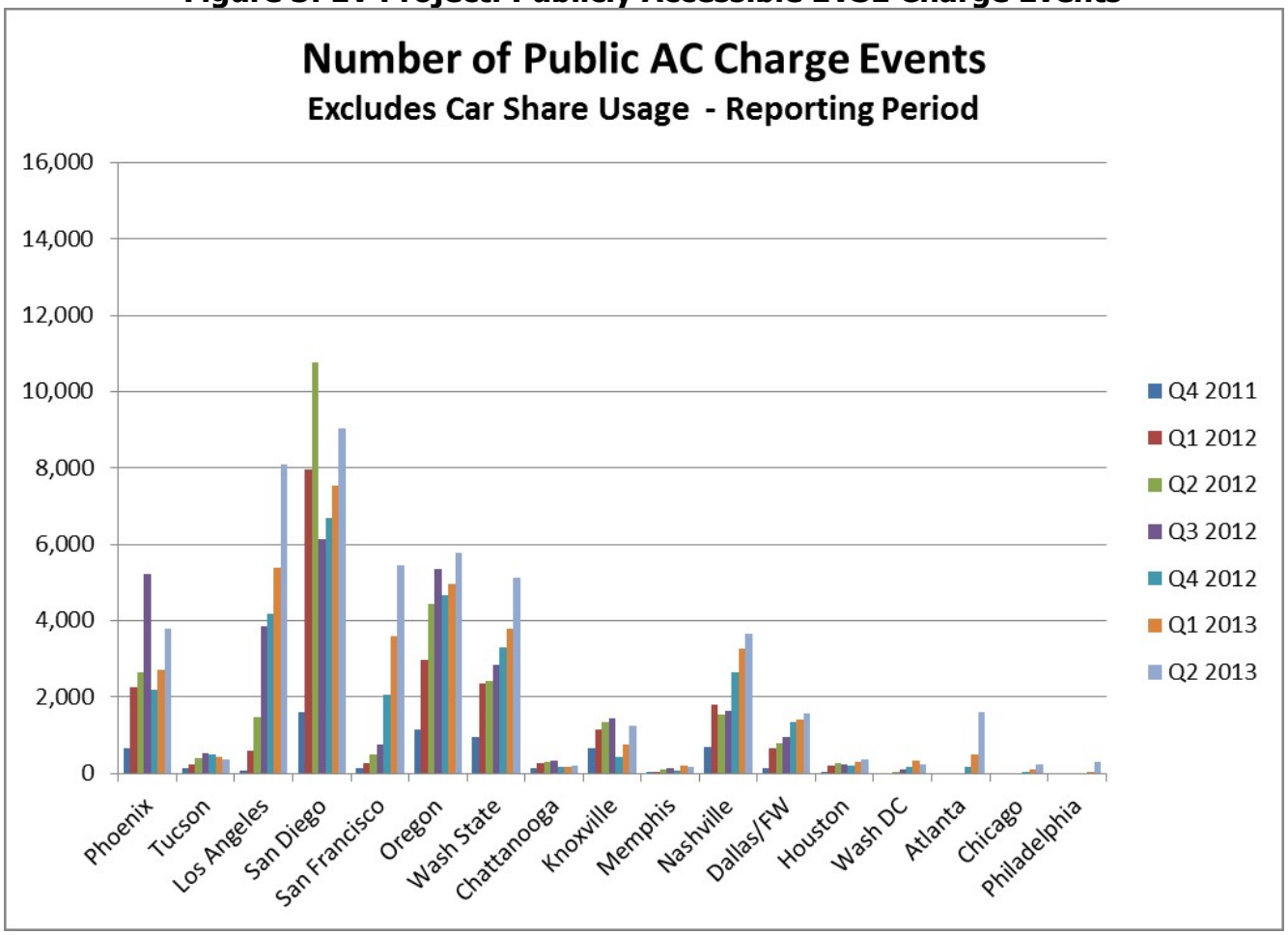
Figure 2: The EV Project: Metro-Area Statistics

Vehicles Region[1]	EV Project Nissan Leafs Enrolled to Date[2]	EV Project Chevrolet Volts Enrolled to Date[2]	EV Project Smart Electric Drives Enrolled to Date[2]	Distance Driven (mi)
Phoenix, AZ Metropolitan Area	274	143	—	5,279,867
Tucson, AZ Metropolitan Area	80	8	—	1,078,906
Los Angeles, CA Metropolitan Area	424	338	—	8,250,790
San Diego, CA Metropolitan Area	677	275	333	15,203,231
San Francisco, CA Metropolitan Area	1,708	—	—	21,460,580
Washington, D.C. Metropolitan Area	42	290	—	3,632,640
Oregon	541	133	30	8,044,791
Chattanooga, TN Metropolitan Area	59	14	—	928,765
Knoxville, TN Metropolitan Area	96	33	—	1,797,520
Memphis, TN Metropolitan Area	54	31	—	793,452
Nashville, TN Metropolitan Area	645	54	—	7,409,754
Dallas/Ft. Worth, TX Metropolitan Area	21	186	—	2,676,950
Houston, TX Metropolitan Area	5	86	—	1,447,789
Washington State	898	164	—	12,156,789
Chicago, IL Metropolitan Area	26	129	—	1,020,726
Atlanta, GA Metropolitan Area	153	75	—	1,379,229
Philadelphia, PA Metropolitan Area	26	53	—	544,508
Total	5,729	2,012	363	93,106,288

Source: EV Project EVSE and Vehicle Usage Report 2nd Quarter 2013

Figure 3 highlights the San Diego region as a leader among all of the EV Project metro-areas in public EVSE charge events.

Figure 3: EV Project: Publicly Accessible EVSE Charge Events



Source: EV Project EVSE and Vehicle Usage Report 2nd Quarter 2013

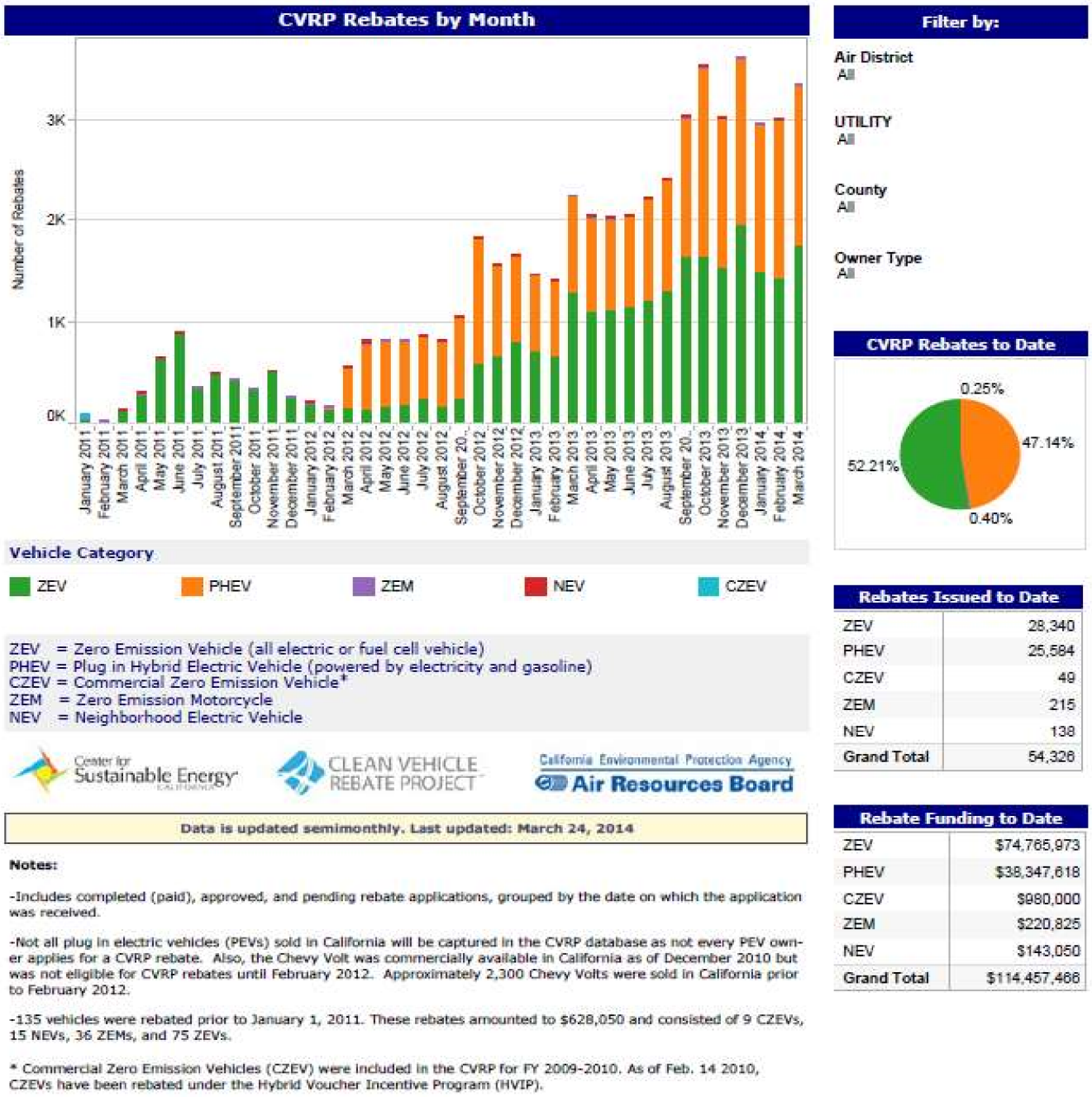
2.2.2 SDG&E EV Time of Use Study

Customers who have an electric vehicle can sign up with SDG&E for an Electric Vehicle Time-of-Use (EV-TOU) rate and receive lower electricity rates for charging their vehicle during off-peak hours; between midnight at 5 a.m. EV-TOU rates are offered to encourage customers to limit daytime electricity use, when demand for electricity is highest. Initial results have been shared with the REVI quarterly as part of the EV Project reporting. The final results have an anticipated report date of early 2014.

2.2.3 CARB Clean Vehicle Rebate Program Data

CCSE is the statewide program manager for the Clean Vehicle Rebate Program (CVRP) and regularly provided updates on regional and statewide CVRP applications to the REVI. These figures captured all rebates received by electric vehicle owners in the state, not just EV Project participants. Figure 4 illustrates CVRP rebates in San Diego County. This CVRP data was used in the development of the San Diego Regional PEV Readiness Plan.

Figure 4: San Diego County CVRP Data



Source: California Center for Sustainable Energy.

2.2.4 CCSE Phase One Assessment of PEVs in San Diego (US DOE Project)

2.2.4.1 Baseline of knowledge and jurisdictional concerns

As part of a US Department of Energy grant, CCSE performed a phase one assessment of PEVs in the San Diego region to identify local government policies and practices associated with PEVs. CCSE also analyzed survey data from EVSE hosts in the San Diego region to evaluate the costs of hosting Level 2 EVSE, user fees, PEV owners' willingness to pay for those fees, and nonrevenue benefits. CCSE presented key findings to the REVI in February 2013. REVI members discussed how this information could be used to address barriers related to commercial and workplace charging in the region. The Phase One Assessment is online at:

- PEV Collaborative available at www.pevcollaborative.org/sites/all/themes/pev/files/docs/SD_PEV_Readiness_Plan_Main.pdf
- PEV Colloaborative available at www.pevcollaborative.org/sites/all/themes/pev/files/docs/SD%20PEV%20Readiness%20Plan _Appendix.pdf

2.2.5 UC Davis Plug-In Hybrid & Electric Vehicle Research Center

The University of California (UC) Davis Plug-In Hybrid & Electric Vehicle Research Center (Center) has been a resource to the REVI for research on various barriers to greater PEV adoption. As part of the EV Project, the Center has undertaken the San Diego PEV Market and Infrastructure Usage Project (2010-2013), which will be evaluated upon its release, in conjunction with continued PEV planning in the region. The Center also has completed reports on a two-year plug-in hybrid electric vehicle (PHEV) consumer experiment; a BMW MINI E report and papers on batteries, consumers and grid impacts. SDG&E, an active REVI member and leader in regional PEV efforts, made the REVI aware of the work being done at the Center.

2.3 Results

2.3.1 Adopted Barriers Collateral and Distribution Region Wide

The REVI created and published best practices and fact sheets on all aspects of regional PEV readiness. The REVI was presented with preliminary fact sheets that addressed several barriers to PEV adoption. Their comments were assimilated and the entire San Diego region – specific fact sheets were accepted by the REVI. In total, eight fact sheets were developed and available on the San Diego Resources web page of the San Diego REVI website. The fact sheets are:

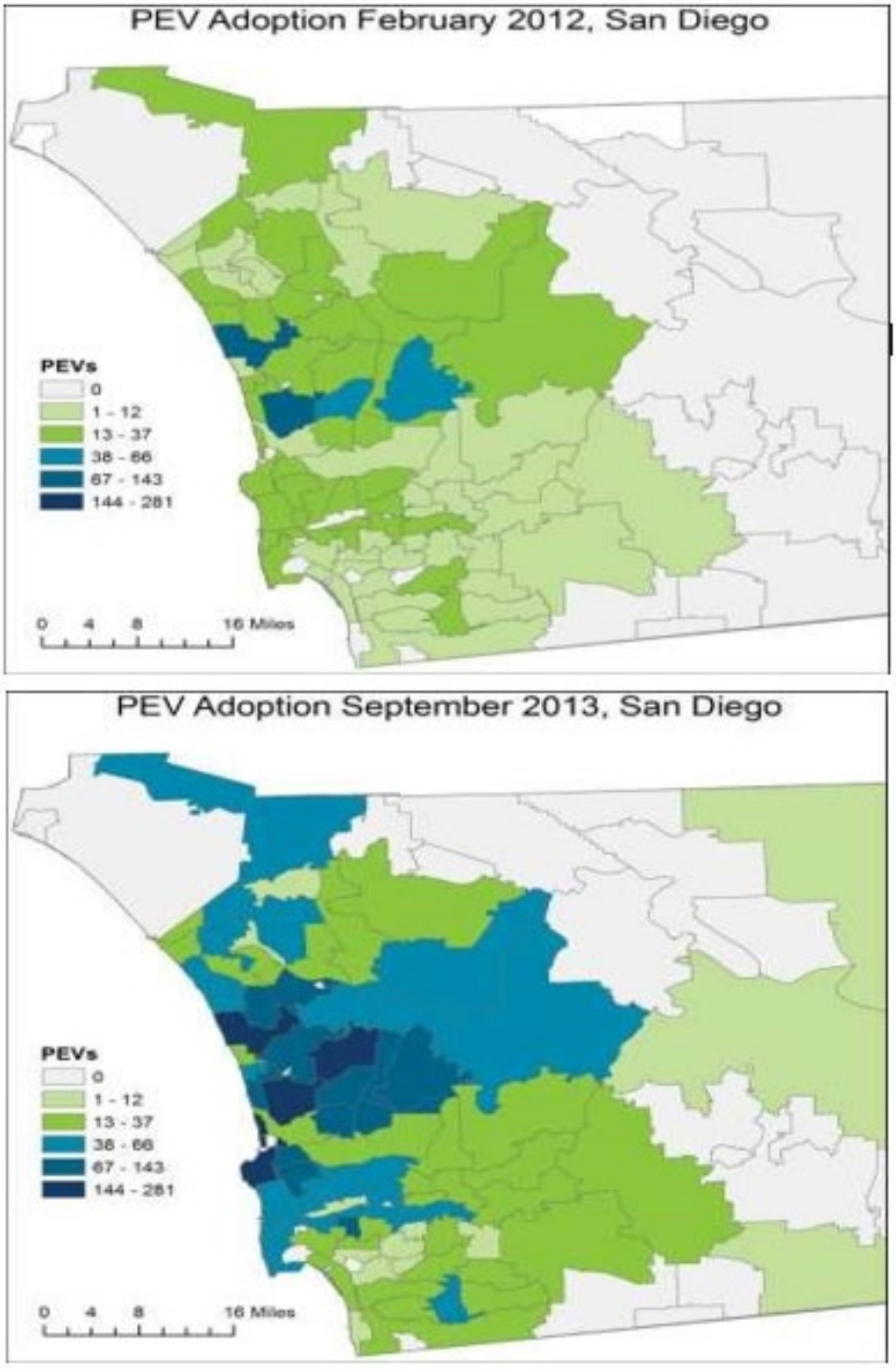
- Plug-in Electric Vehicles & Charging: Getting Started
- Resources for Public Agencies in San Diego
- Regional Planning for Public Charging in San Diego
- Resource for Fleet Managers in San Diego
- Charging at Condos, Apartments and Community Living Areas
- Workplace Charging for Businesses in San Diego
- Resources for Electrical Contractors in San Diego
- Electric Vehicle Charging Station Installation Guidelines: Residential and Commercial Locations

2.3.2 Growth in Regional PEV Purchases and Public EVSE Deployed

2.3.2.1 Distribution of PEV Owners in the San Diego Region

The following maps, shown in Figure 5, illustrate the growth of the PEV market in the San Diego region between February 2012 and September 2013.

Figure 5: PEV Adoption February 2012 and September 2013, San Diego



Source: CCSE, 2013

2.3.2.2 Number of PEVs Available in the San Diego Region

The growth of the PEV market in the San Diego region, like that of the overall PEV market, has been enabled by the availability of additional vehicle models offered by manufacturers. Table 9 shows the number of commercially available vehicles from 2010 to September 2013. Before 2011, there was only one PEV on the market, the Tesla Roadster. As of January 2014, there are more than 16 PEV models available in the San Diego region.

Table 9. Commercially Available Vehicle Models

Year available for Purchase/Lease	2010	2011	2012	2013
No. of Models	1	3	9	16
Battery Electric Vehicles			Plug-In Hybrid Vehicles	
BMW Active E	Honda Fit EV		Chevrolet Volt	
Chevrolet Spark	Scion IQ EV		Ford C-MAX Energi	
Toyota RAV4 EV	Tesla Model S		Ford Fusion Energi	
Fiat 500e	Mitsubishi i-MiEV		Honda Accord Plug-in	
Ford Focus Electric	Nissan LEAF		Toyota Prius Plug-in	
Ford/Azure Dynamics Transit Connect Electric	Smart fortwo electric drive			

Source: CCSE

2.3.2.3 Locations of public charging stations in the San Diego region

As of October 2013, 455 public Level 2 charging sites, four public DC Fast Chargers and two Level 1 charging sites serve the San Diego region. In the last three months, four more DC fast chargers have been sited along transportation corridors in the region, as illustrated in Figure 6 from NRG's eVgo.

Figure 6. San Diego Regional eVgo Freedom Stations with DC Fast and Level 2 chargers

Source: NRG eVgo, January 2014

CHAPTER 3: Advancements in Science and Success of the Project

3.1 Advancements in Science

Another function of REVI was to serve as a forum to inform and disseminate information to the region about various PEV projects and programs. The REVI learned about the following three local projects, which have the potential to further science in the field of battery capabilities and secondary use.

3.1.1 Secondary Use Applications of PEV Lithium-Ion Batteries

University of California San Diego (UCSD), CCSE, National Renewable Energy Laboratory (NREL), Power Analytics, AeroVironment, and OSI Soft have partnered on this project. The purpose is to identify alternative uses of electric car batteries at the end of their useful life in automobiles.

Although the batteries used in PEVs usually only have a vehicle lifetime of 8-10 years, they still have significant capacity left for alternative uses. Finding secondary uses for these batteries reduces their up-front cost and can provide benefits to consumers and utilities, such as demand charge management, renewable energy integration and regulation energy management. UCSD used its Battery Test Facility to track battery performance over time under second-use application cycling. When the research is complete, it will be shared with the REVI.

3.1.2 Increased Charging Speed for PEV Lithium-Ion Batteries

The Jacobs School of Engineering at UCSD received a grant from the Department of Energy (DOE) to develop estimation algorithms to enable batteries to charge faster and run more powerful electric motors. By enabling the batteries to run more efficiently, manufacturers can be more precise in sizing the batteries for vehicles, thus saving weight and cost. In addition, these advanced algorithms enable faster battery charging and better condition monitoring.

Instead of measuring voltage and current, UCSD is estimating a battery's state of charge at the electrochemical level. They are developing algorithms to estimate where the ions are in the battery, which is much more precise than voltage monitoring. Part of their research will be testing the algorithms on PEV batteries and then comparing their performance to the existing estimation and control algorithms. The end-in-mind is to formulate a strategy to charge and discharge batteries at their maximum potential and do it safely. When the research is complete, it will be shared with REVI.

3.1.3 Plug-in Electric Vehicle Battery Pack Standardization Study

Electricore with support from CCSE, SDG&E, BMW and Ricardo, are working together to provide the electric vehicle industry with information on the advantages of battery standardization to second-life use and repurposing. The project goal is to determine the benefits of establishing standardized EV battery packs to facilitate secondary use and recommend a strategy to implement standardization based on the study.

Interests focus on repurposing the batteries for energy storage systems, potential uses range from residential to industry. The study collaborators are working to identify the barriers and costs involved in implementing and manufacturing standard EV battery packs so that when they hit the second-use market, they will be more adaptable and capable of being combined

with modules from other manufacturers. When the research is complete, it will be shared with the REVI.

3.2 Measuring Success of the Project

The goal of the San Diego Regional PEV Readiness Plan and the REVI was to create a regionally accepted comprehensive PEV Readiness Plan which leverages initial PEV Readiness/EVSE planning and addresses emerging barriers and complexities through clear and easy-to-read best practices and recommendations across all domain areas.

3.2.1 Achievement of the REVI's Project Goal

Table 10 provides a description of program achievements as compared to the original goal.

Table 10: SANDAG Agreement Goal from ARV-11-004 Contract

1.	**GOAL**: The goal of this Agreement is to create a regionally accepted comprehensive PEV Readiness Plan which leverages initial PEV Readiness/EVSE planning and addresses emerging barriers and complexities through clear and easy-to-read best practices and recommendations across all domain areas.	**100%**
	EXPLANATION: The San Diego Regional PEV Readiness Plan was completed leveraging past efforts, regional stakeholders and by presenting PEV barriers and solutions in a comprehensive user-friendly manner.	

Source: SANDAG-CEC Agreement and SANDAG staff.

3.2.2 Achievement of the REVI's Project Objectives

Table 11 describes the original program objectives as compared to the program achievements.

Table 11: SANDAG Agreement Objectives from Contract ARV-11-04

1.	**OBJECTIVE:** Conduct bi-monthly public meetings to broaden participation in regional PEV planning efforts.	**100%**
	EXPLANATION: Fourteen REVI working group meetings were held during the contract period. Initially meetings were bimonthly and then became monthly.	
2.	**OBJECTIVE:** Ensure the REVI addresses all facets of PEV Readiness including EVSE deployment in residential, commercial, multi-unit dwelling, workplace and siting of DC Fast Charging stations; commercial fleet outreach and consumer education of available incentives.	**100%**
	EXPLANATION: REVI addressed each of the readiness barriers identified above as well as others. Fact sheets were created on barriers and the PEV Readiness Plan addressed them.	

3.	**OBJECTIVE:** Form an electronic distribution list to members and interested stakeholders.	**100%**
	EXPLANATION: An electronic distribution list was created and maintained by SANDAG using iContacts. The list was accessible online by SANDAG and CCSE. The e-list will continue to be used to communicate with regional PEV stakeholders.	
4.	**OBJECTIVE:** Develop and publish comprehensive agenda packets prior to each REVI meeting.	**100%**
	EXPLANATION: Agenda materials were prepared and made available one week prior to each REVI meeting online and through electronic mail out.	
5.	**OBJECTIVE:** Create and publish background/briefing and issue reports on all aspects of regional PEV readiness, which will include but is not limited to public-access charging, DC Fast Charging deployment, GHG reduction opportunities, and leverage SANDAG's Sustainable Communities Strategy (SCS).	**100%**
	EXPLANATION: The REVI agendas included reports on PEV readiness issues. Subsequent fact sheets and materials were developed and incorporated into the PEV Readiness Plan. The SANDAG SCS included PEV readiness actions that support corridor charging at transit and park and ride stations. A REVI-developed RFP template has been used by agencies to support this action.	
6.	**OBJECTIVE:** For each REVI Readiness domain area create a timely set of recommendations and best practices through online information sheets to help guide on-going region-specific transportation planning efforts through the SANDAG website.	**100%**
	EXPLANATION: Over the course of the REVI meetings, CCSE's "Plug-In & Get Ready" website became the online choice for most stakeholder access to REVI and other PEV readiness materials. REVI materials and the PEV Readiness Plan also are at SANDAG found at www.sandag.org/energy.	
7.	**OBJECTIVE:** Link REVI goals into the development of SANDAG's next Regional Comprehensive Plan.	**100%**
	EXPLANATION: The REVI goals and overall REVI PEV Readiness Plan will be used as the foundation for the next SANDAG RCP. SANDAG has already incorporated some PEV readiness goals in the SCS adopted in October 2011. The next RCP will be a combined Regional Transportation Plan (RTP), SCS, and RCP entitled San Diego Forward: The Regional Plan. REVI activities and materials are already being used to help SANDAG implement clean transportation actions in the SCS.	
8.	**OBJECTIVE:** Conduct outreach to adjacent regional border entities (i.e. Riverside, Imperial and Orange Counties and sovereign Tribal Nations) regarding PEV readiness to transportation corridors.	**100%**

	EXPLANATION: PEV readiness and energy programs have been of mutual interest among tribal nations, the military, the international border and other counties. Multiple public workshops were held in 2013 as part of the San Diego Forward: The Regional Plan outreach, stakeholders and interested parties from a variety of different agencies and demographics were in attendance and shared PEV infrastructure challenges; including cross-international border charging. SANDAG and the Southern California Tribal Chairmen's Association (SCTCA) held a forum in November 2013 for the local tribal nations which energy, including PEV readiness, was one of 4 priority areas. We had an energy discussion, including PEV readiness at the SANDAG Military Working Group in January 2014. Furthermore, neighboring Riverside County residents and other stakeholders attended a number of REVI meetings.	
9.	**OBJECTIVE:** Share regional lessons at state and national level.	**100%**
	EXPLANATION: The REVI PEV Readiness Plan and materials have been shared with the San Diego Regional Clean Cities Coalition (SDRCCC) and through that mechanism to CCCs outside the region. The REVI has shared all materials with Department of Energy staff that manage CCC and/or PEV programs. Local lessons have been shared with the ZEV Community Readiness Working Group as that guide was being developed.	
10.	**OBJECTIVE:** Facilitate and make available additional research including: a) cost of EVSE installations, b) time to install EVSEs, c) forecast of trends beyond initial "first wave" adopters, d) environmental benefits including air quality, petroleum & GHGs, e) smart grid integration including DR & renewable generation.	**100%**
	EXPLANATION: REVI meetings served as a forum to share research and projects of interest or relevance members (or the public) were aware of. This included EV Project updates on all of the above; SDG&E updates on the TOU study and multi-unit dwelling (MUD) case studies; CCSE and UCSD battery research efforts; eVgo and ChargePoint efforts for MUDs; car2go tracking of above environmental and fuel savings; APCD's HVIP dollars and CVRP. As SANDAG receives more R, D &D news, we can share that via our REVI e-list.	
11.	**OBJECTIVE:** Publish final PEV Readiness Plan for approval by SANDAG Board of Directors.	**100%**
	EXPLANATION: The San Diego Regional PEV Readiness Plan is published and available electronically via CCSE and SANDAG websites. The SANDAG Board of Directors accepted the PEV Readiness Plan on January 24, 2014. The accepted PEV Readiness Plan was electronically distributed to REVI stakeholders.	

Source: SANDAG-CEC Agreement and SANDAG staff.

CHAPTER 4: Observations, Conclusions and Recommendations

4.1 Observations

The REVI played a critical role in the plug-in electric vehicle market growth within San Diego County. Over the course of this eighteen-month contract SANDAG, with its partners (California Center for Sustainable Energy, San Diego Regional Clean Cities Coalition, and others), coordinated a broad array of regional stakeholders, whose contributions were invaluable to the development of a regional PEV readiness plan. Without the SANDAG outreach network, established relationships, and respected reputation, the PEV Readiness Plan would not have had the impact on local governments it did; offering fewer resources and opportunities to engage local planners, building officials and industry stakeholders.

Based on the San Diego REVI working group meetings and the development of a regional PEV Readiness Plan, SANDAG and CCSE can offer several observations. Observations and lessons learned fall into three main categories:

- Stakeholder participation
- Program collaboration coordination and leveraging of programs and resources
- Early market development

4.1.1 Stakeholder Participation

REVI meetings were held from March 2012 to November 2013. During 2012, meetings were held on a bi-monthly basis and were changed to monthly starting in January 2013. This was due to requests for additional meetings by REVI members to further discuss barriers and solutions. To maintain active participation, it was imperative to:

- Provide as many research and agenda materials one week prior to the meeting dates to give stakeholders time to review them
- Facilitate barrier-specific conference calls amongst stakeholders and provide summaries of next actions
- Consider the REVI audience, so as to keep the PEV readiness discussions about relevant issues and to obtain appropriate feedback.

4.1.2 Program Collaboration

4.1.2.1 Amongst REVI Participants

Based on the diverse makeup of the REVI, member collaboration resulted in the greatest successes, and also the greatest challenges in the plan development. The REVI was able to successfully create a comprehensive plan for electric vehicles due to the various backgrounds that made up the working group members. The perspectives of each REVI member allowed the inclusion of specialized expertise and also added a layer of complexity to an issue; to comprehend and capture critical input from varying parties.

4.1.2.2 Leveraging Other Local Research, Outreach and PEV Initiatives

Outreach and information, such as workshops and trainings, related to PEVs and EVSEs, and marketed through the REVI has been identified in Tables 4 to 8 of this report. All local stakeholders contributing to the REVI shared a single, primary goal, to further the deployment

of PEVs. In support of this goal, substantial information sharing and cross marketing occurred, even amongst parties that, in other instances would not have work together. The REVI enabled a wider education and outreach effort than would otherwise have happened. SANDAG, CCSE and the San Diego Regional Clean Cities Coalition continue to work toward common goals for increasing regional PEV deployment.

4.1.3 Early Market Development

The REVI was met with PEV market developments that were unforeseen because it is still in the early stages. One example was the bankruptcy of ECOtality and its direct effect on the San Diego region. ECOtality was the lead agency for the EV Project, which provided the majority of the San Diego regions early PEV infrastructure and planning. San Diego became a first market for several car OEMs because of the EV Project. Various jurisdictions contracted with ECOtality to provide chargers under the EV Project. Since the bankruptcy filing, the future of the contracts is uncertain. As of January 2014, Car Charging Group, the company that purchased the existing Blink equipment, reached out to SANDAG as the REVI Chair. SANDAG has been making introductions to EV Project Participants that Car Charging Group has been unable to connect with thus far.

Although the delays faced by the EV Project have been difficult, SANDAG and the REVI continue to encourage and support the critical role state and federal government-funded projects play in establishing the PEV charging network. There is no way for PEV adoption to solidify and continue without public support to deploy chargers across the region, state and nation. State support of Multi-Charge San Diego, the EV Project, eVgo Freedom Stations and others are important to early-market EVSE deployment.

4.2 Conclusions and Major Findings

PEV ownership has experienced a dramatic increase in the past three years – in 2010, fewer than 20 people owned a PEV. By the end of 2012, there were more than 1,700 PEVs on San Diego roads. The number of PEVs increased rapidly between January and October 2013, adding over 2,200 PEVs to the region.

The REVI working group was a well-attended and positively embraced mechanism for addressing regional barriers to EVSE installation and PEV deployment. The working group also solidified relationships and sharing amongst public agencies in the region as they pertain to PEVs and EVSEs. Agencies include local governments, the Port, Airport, Caltrans, and SANDAG who all face similar issues. At the staff level, members of each agency recognize the value in continuing to meet and further address issues brought up at the REVI specific to public agencies.

The REVI and PEV Readiness Plan helped justify why public agencies should site EVSE for public use. A consensus was reached on this and has since opened up another level of questions to answer related to the siting, operations, maintenance, and electricity concerns to deploy EVSE in the public realm.

4.2.1 Shared Mobility Programs can further PEV Deployment (car2go)

San Diego is the first car2go city that offers an all-electric fleet. In the company's first year here, more than 12,500 San Diego residents have become car2go members. Collectively, San Diegans have taken more than 200,000 trips around town, with an average of 5,000-6,000 trips made per week and an average of 5 miles per trip, totaling over 25,000 miles traveled per week.

car2go installed a charging depot featuring 30 charging stations in their effort to continue to bring convenient electric cars for all of San Diego. This charging depot provided more flexibility to keeping the car2go fleet charged and opened more possibilities to help expand and improve the way they served the community. For their initiatives, car2go was presented with a mayoral resolution deeming November 29th as "car2go Day" for the City of San Diego. Based on its success in a limited City of San Diego geographic area, car2go and the City of Chula Vista launched a second all electric vehicle car sharing program for the city center areas.

4.2.2 Expanding EV Charging along Transportation Corridors

Over the course of REVI, SANDAG and Caltrans District 11 have been collaborating on issues surrounding siting EVSE at transit stations and park and rides. We are at the front end of discussions for how best to oversee the EVSE billing, data collection, and utility costs. Thus far we have been successful at a policy level with both agencies developing measures that identify our PEV charging role for transportation corridors. We have installed level 2 chargers at a local transit station and DCFC at a park-and-ride, which have now opened a new set of questions.

For transportation corridors, we must plan for high use during utility peak demand periods of evening rush hour. This can cause excessive utility demand charges, so we are investigating battery storage options with DCFC. Other than this 'operating' cost, we have found we need to determine the range of added costs for the upgrade of electric capacity needed at a site. It is unclear whether the cost will be in the low thousands or tens of thousands. Because of how site-specific utility upgrades can be, going forward we want to work with our utility on a range of capacity cost scenarios which are a much larger issue than initially thought.

Another issue to address for transit stations in the San Diego region is that SANDAG designs and builds transit stations which it turns over to the appropriate transit agency to operate: Metropolitan Transit Systems (MTS) or North County Transit District (NCTD). This has made integration of EVSE more challenging since one agency designs a site and another must then operate and pay for its continued use.

This finding is not meant to convey that this is an insurmountable barrier, only that we acknowledge it as a continuing one and are open to feedback from the state as to best approaches.

4.2.3 Support for State and Federal Projects while Remaining EVSE Provider Neutral

While the REVI intends to remain provider neutral, it does not want the San Diego region to lose out on its fair share of EVSE that will be deployed in the state by ChargePoint, NRG's eVgo, ECOtality (now Car Charging Group), etc. The REVI has facilitated collaboration with the Multicharge San Diego project, the EV Project and the aforementioned eVgo. Determining the appropriate balance of providing neutral information, while finding hosts in our region for state or federally funded EVSE projects, is something of which we will continue to be cognizant.

Although this report and additional supplemental information will show that the REVI has met its goals, there continues to be a need for further charging infrastructure market support. To support PEV market and achieve the Governor's goal of 1.5 million zero-emission vehicles on California's roads by 2025 will continue to be a challenge without further streamlining of PEVfriendly policies into local government codes and practices. We believe that city case studies that identify how similar cities were able to support EVSE permit fee reductions and/or simplified permit processes is a positive method to promote PEV friendly policies. The REVI

has been effective at distributing best practices and PEV fact sheets to the local governments, efforts will need to continue.

Locally, we have had success showcasing City of San Diego actions as catalysts for PEV adoption. The City offers streamlined permitting of residential installations, with online permitting and efficient inspection procedures. The City has issued an information bulletin that describes the permitting and inspection process for EVSE on an existing site or building. In the public space, San Diego requires EVSE installations in public areas to be made accessible to persons with disabilities in both new and existing construction. The REVI has endorsed both of these documents as regional best practices and has encouraged adoption of similar policies across the region.

4.3 Recommendations

4.3.1 Continued Access to the EV Project's Data on Charging Behavior

The quarterly reports and studies produced from early findings of the EV Project have been a critical source of information to understand charging behavior in the San Diego region. The reports that were required as per the DOE funding of the project ceased in the 2nd quarter of 2013. If it is possible for the DOE and/or CEC to require the purchasing company/ies of ECOtality Blink equipment to continue to produce studies and reports on the data, and the charging characteristics provided in ECOtality's earlier quarterly reports; that information would benefit our region in determining next steps for siting PEV chargers and concerns of the first generation of PEV adopters.

4.3.2 Recommendations for the San Diego Region

The following are a list of continuing efforts in the region led by the REVI and that individual members are planning to maintain.

- The REVI has been leveraged to address the ECOtality bankruptcy and its charging station network in the region, and to propose a regional solution. The REVI has facilitated the sharing of information and contacts with Car Charging Group, which purchased
- ECOtality's assets and continues to work with them to finalize projects that were contracted but not installed and operating yet.
- SDG&E, SANDAG, CCSE and the San Diego Regional Clean Cities Coalition partnered to develop an educational pamphlet for San Diego car dealerships (included as a resource in the PEV Readiness Plan). The pamphlet contains valuable information for consumers about time of use rates, where to find chargers, and information about incentives. The goals of the project are to educate local car dealers on PEVs and ensure that each new PEV driver in the region receives this pamphlet at the time of purchase. Continued coordination and outreach strategies will need to be developed and implemented.
- Caltrans and SANDAG plan to expand to other public agencies our discussions on utility upgrade costs pre-installation of EVSEs as well as operations and maintenance (O&M) for the continued use of chargers at public sites.
- CCSE as manager of CARB's Clean Vehicle Rebate Program could continue providing assessments of regional and statewide PEV adopters.

4.3.3 Web Portals and PEV Readiness Dissemination

As per the requirements of the CEC readiness agreement, a website has been developed in order to facilitate and coordinate the rapid adoption of PEVs and EVSEs in the San Diego

region. The website, Plug-in & Get Ready, found at http://energycenter.org/pluginready, is an information hub for consumers, local governments, electrical contractors, businesses, and other interested stakeholders. It is meant to act as an easy-to-use resource to increase knowledge of PEVs. The website is host to several regional fact sheets that were developed for community members and local agencies to answer common questions about PEV readiness. In addition, the REVI, public agencies and stakeholders can visit SANDAG at www.sandag.org/energy to download the San Diego Regional PEV Readiness Plan and related materials.

4.3.4 Implementing the PEV Readiness Plan

The REVI working group had strong local government and public agency representation from across the San Diego region, giving it the needed momentum for continued attendance. SANDAG has continued REVI efforts through ad hoc conference calls and meetings to mitigate barriers and seek funding to implement the PEV Readiness Plan. When the REVI meetings first began, the purpose was to craft a PEV Readiness Plan and share recommendations and best practices among the group members. Now the group works together to solve broader EVSE problems that reach beyond the scope of the PEV Readiness Plan and will continue to do so as long as PEV adoption remains on the rise in the region.

The REVI Chair and SANDAG team will work to integrate the PEV Readiness Plan into San Diego Forward: The Regional Plan, a "mega-plan" combining the SANDAG Regional Transportation Plan and its Sustainable Communities Strategy with the Regional Comprehensive Plan (Blueprint Plan). The PEV Readiness Plan will also be integrated into the San Diego Regional Climate Collaborative activities, the SANDAG Energy Roadmap Program for Local Governments, the San Diego Regional Clean Cities Coalition, the SANDAG Regional Energy Strategy and Regional Energy Working Group activities.

Chapter 5: Subcontractor List

- California Center for Sustainable Energy is the only subcontractors funded in whole or in part by the grant Recipient will be identified as per the contract terms and conditions.

GLOSSARY

ALTERNATIVE-FUEL VEHICLE (AFV)—A vehicle designed to operate on an alternative fuel (e.g., compressed natural gas, methane blend, electricity). The vehicle could be either a dedicated vehicle designed to operate exclusively on alternative fuel or a nondedicated vehicle designed to operate on alternative fuel and/or a traditional fuel.

ALTERNATIVE AND RENEWABLE FUELS AND VEHICLE TECHNOLOGY PROGRAM (ARFVTP)—Now known as the Clean Transportation Program, created by Assembly Bill 118 (Nunez, Chapter 750, Statutes of 2007), with an annual budget of about $100 million. Supports projects that develop and improve alternative and renewable low-carbon fuels, improve alternative and renewable fuels for existing and developing engine technologies, and expand transit and transportation infrastructures. Also establishes workforce training programs, conducts public education and promotion, and creates technology centers, among other tasks.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)—An international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

COMMISSION AGREEMENT MANAGER (CAM)–California Energy Commission employee tasked with managing contracts and projects funded by the Commission.

CALIFORNIA CODE OF REGULATIONS (CCR)—The official compilation and publication of the regulations adopted, amended, or repealed by state agencies pursuant to the Administrative Procedure Act (APA). Properly adopted regulations that have been filed with the Secretary of State have the force of law. The CCR is compiled into Titles and organized into Divisions containing the regulations of state agencies.[1]

CALIFORNIA CENTER FOR SUSTAINABLE ENERGY (CCSE)– a nonprofit energy program administration and advisory services organization with long-standing subject and market transformation expertise in renewable energy, clean transportation, building performance and energy efficiency that offer market transformation services, including rebate and incentive program design and administration, end-user engagement campaigns, policy guidance and workforce training and education.[2]

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA - pronounced See' quah)—Enacted in 1970 and amended through 1983, established state policy to maintain a high-quality environment in California and set up regulations to inhibit degradation of the environment.

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).

SAN DIEGO ASSOCIATION OF GOVERNMENTS (SANDAG)–A public agency that serves as the forum for regional decision-making. SANDAG builds consensus; makes strategic plans; obtains

[1] California Office of Administrative Law (https://oal.ca.gov/)
[2] CCSE can be found at https://energycenter.org/about-us

and allocates resources; plans, engineers, and builds public transportation, and provides information on a broad range of topics pertinent to the region's quality of life.[3]

SAN DIEGO GAS & ELECTRIC (SDG&E)– SDG&E is a regulated public utility that provides energy service to 3.6 million people through 1.4 million electric meters and 873,000 natural gas meters in San Diego and southern Orange counties.

SAN DIEGO REGIONAL ELECTRIC VEHICLE INFRASTRUCTURE WORKING GROUP (REVI)– Working group comprised of members from SANDAG, CCSE, Unified Port of San Diego, San Diego Regional Airport Authority, San Diego Gas & Electric, University of California San Diego, and Miramar College designated to develop a regional PEV readiness plan and associated fact sheets detailing components of plan.[4]

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (U.S. EPA)—A federal agency created in 1970 to permit coordinated governmental action for protection of the environment by systematic abatement and control of pollution through integration or research, monitoring, standards setting, and enforcement activities.

[3] Sandag can be found at https://www.sandag.org/index.asp?fuseaction=about.home
[4] REVI can be found at https://www.sandag.org/uploads/projectid/projectid_413_17388.pdf