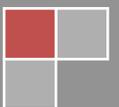


June 2016

# Transportation Electrification

This paper seeks to bridge the gaps between electricity and transportation infrastructure planning processes. The goal is to explore charging infrastructure deployment strategies and best practices that are compatible and synergetic with local, regional, and statewide land-use planning goals to reduce greenhouse gas emissions in the transportation sectors.

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## ACKNOWLEDGEMENT

The preparation of this paper benefitted from the expertise and valuable insights of many experts, who contributed by lending their valuable time to participate in interviews and help the author collect and organize information that forms the basis of this paper. Any errors made are strictly those by the author. Specifically, the author would like to thank the following individuals:

Elizabeth Grassi, Strategic Growth Council  
Noel Cristomo, Energy Division, CPUC  
Susan Freedman, SANDAG  
Brandon Rose, California Air Resources Board  
Matthew Nichols, City of Oakland  
Larry Rich, City of Long Beach

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## 1. Executive Summary

When state policy makers and stakeholders explore transportation electrification policies to promote fuel switching from petroleum-based fuels to electricity fuel, it is important to distinguish between what type of travel the policy seeks to transform. A comprehensive transportation electrification framework should address local, regional, and inter-regional transportation needs and resources associated with both passenger travel and freight movement.

“Transportation electrification” refers to the use of electricity from external sources of electrical power, including the electrical grid, for all or part of vehicles, vessels, trains, boats, or other equipment that are mobile sources of air pollution and greenhouse gases, and the related programs and charging and propulsion infrastructure investments to enable and encourage this use of electricity.<sup>1</sup>

For example, inter-regional travel between the counties of Fresno and Los Angeles serves a different set of economic purposes from intra-region travel between the cities of El Monte and Torrance. Accordingly, transportation infrastructure decisions which shaping travel demand are made by different and yet overlapping sets of planning and funding authorities, and vary widely depending on the location and region of the state. Local and regional planning authorities exert critical authorities which shape local and regional transportation systems.

Transportation infrastructure planning affects the day-to-day decisions of in-state movement of people and goods. Which mode of transportation? Which route? How long is the travel time? At what cost? These questions are the purview of transportation planners, and are less familiar concepts to electric infrastructure planners. There are many corollaries between the transportation and electricity infrastructure industries -- both are essential public service, capital intensive, concerned with peak and congestion management, and exert significant environmental impacts. Yet the parameters for electricity and transportation infrastructure planning, as well as the consumer motivations for the use the respective infrastructures, are wildly different.

This paper seeks to identify and bridge the gaps between electricity and transportation planning processes. As State policy makers embark on transportation electrification policies and utility programs to deploy electric charging infrastructure to support the wider use of electricity as a mobile fuel source, it is important to devise strategies that can be compatible and synergetic with local, regional, and statewide land-use planning goals to reduce greenhouse gas and other air pollutants.

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<sup>1</sup> This is the same definition provided by Public Utilities Code Section 237.5.



After exploring the state, regional, and local transportation planning processes, the extent to which these processes facilitate transportation electrification, and the unique purviews of complex layers of transportation decision makers, these are the key takeaways:

1. Federal funds to support local or regional transportation electrification initiatives are often sought directly by local government without active support by CPUC or its regulated electric utilities. The utilities should leverage lessons learned from federal funding opportunities to inform what type of charging infrastructure support is most needed within other cities within their service territory and region.
2. Municipal government decisions regarding land use plans shape regional travel behaviors, so it is unlikely that a one-size fits all transportation electrification strategy will be appropriate or sufficient for all regions.
3. There are existing state transportation programs with similar goals for reducing greenhouse gas and criteria pollutant emissions, while reducing disproportionate impacts to disadvantaged communities. The CPUC should consider partnerships or complementary strategies with these existing programs to minimize process duplication.
4. Local and regional government entities have widely different transportation funding plans and preferences on how to reduce greenhouse gas and mobile-source pollutants. CPUC's transportation electrification policy should include local and regional partners through a working group process, and consider local and regional initiatives already underway.
5. Transportation demand for inter-regional, intra-regional travel, and intra-city travels reflect very different economic needs within the transportation sector. Each geographic expanse requires different transportation electrification strategies involving different sets of transportation planning partners.
6. City governments can be powerful partners in transportation electrification due to their critical role of shaping local and regional transportation funding plans, and authority over zoning, building codes, project permitting, and inspection process. The CPUC should encourage utilities to identify a set of partner cities willing to share best practices with others within the region to pursue similar electrification projects.



7. A more cohesive framework of inter-governmental partnerships can provide more market certainty to encourage consumer adoption, and private market investment.

## 2. Purpose

Transportation electrification has been a part of the CPUC's effort to promote alternative-fueled vehicles since 2009.<sup>2</sup> Regulatory activities related to alternative-fueled vehicles have since evolved in response to on-going market needs and new legislative requirements.<sup>3</sup> Most recently, Senate Bill 350 (de León, Chapter 547, 2015) provided new guidance to the CPUC specific to promoting transportation electrification as a method to achieve the State's goal to reduce greenhouse gas emissions.<sup>4</sup> This paper is hence focused on transportation electrification accordingly without prejudice to vehicle technologies such as battery, plug-in hybrid, or fuel cell electric vehicle technologies.

For the purpose of this paper, "transportation electrification" refers to the use of electricity from external sources of electrical power, including the electrical grid, for all or part of vehicles, vessels, trains, boats, or other equipment that are mobile sources of air pollution and greenhouse gases, and the related programs and charging and propulsion infrastructure investments to enable and encourage this use of electricity.<sup>5</sup>

To build upon previous CPUC staff efforts on vehicle- grid integration and associated benefits and impact on the electricity grid,<sup>6</sup> this paper seeks to bridge the gaps between the electricity and transportation infrastructure planning processes. The goal is to explore charging infrastructure deployment strategies that are compatible and synergetic with local, regional, and statewide land-use planning goals to reduce greenhouse gas emissions in the transportation sectors.

CPUC is not alone in promoting wider adoption of electric transportation. Therefore, a framework for local, regional, and state-level partnerships among relevant planning agencies can help to address infrastructure barriers by leveraging efforts undertaken by local, regional, and state planning agencies to facilitate broader market certainty for private investment and adoption. A synergetic partnership framework can avoid duplication; help effectuate benefits to the electricity

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<sup>2</sup> See CPUC webpage on alternative-fueled vehicle proceedings at <http://www.cpuc.ca.gov/General.aspx?id=5597>.

<sup>3</sup> Legislative guidance on alternative-fueled vehicle policy is contained in Public Utilities Code Sections 237.5, 740.2, 740.3, 740.8, and 740.12.

<sup>4</sup> Full text of SB 350 (de León, Chapter 547, 2015) is available at [http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=201520160SB350](http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350).

<sup>5</sup> This is the same definition provided by Public Utilities Code Section 237.5.

<sup>6</sup> See CPUC Energy Division whitepaper on Vehicle-Grid Integration (VGI) at <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M080/K775/80775679.pdf> and an inter-agency VGI roadmap at <http://www.caiso.com/Documents/Vehicle-GridIntegrationRoadmap.pdf>



grid, and support local and regional goals to reduce greenhouse gas emissions from the transportation sector.

### 3. Transportation Infrastructure and Its Impact

In fiscal year 2015-16, the Legislative Analyst's Office estimates that \$28 billion in transportation revenue will be provided from all levels of government to support transportation projects across California.<sup>7</sup> The State's transportation system includes a vast network of roads, railways, airports, seaports, and walkways. The transportation sector alone accounts for 37 percent of the State's overall greenhouse gas emissions based on the latest available state-wide greenhouse gas inventory.<sup>8</sup> Within the transportation sector, on-road vehicle travels represent 90 percent of the in-state emissions, excluding those from inter-state air travel.<sup>9</sup>

The infrastructure necessary to support on-road travel is massive. California Department of Transportation (Caltrans) estimates that there are 357,800 lane-miles of highway and local roads within the State, with annual vehicle-miles of travel of approximately 328 billion miles based on 2013 data.<sup>10</sup> These figures represent the colossal scale of resources needed to maintain and fuel Californian's mobility needs, representing a proxy for the tremendous efforts necessary decarbonize the transportation sector.

From a transportation planner's perspective, greenhouse gas and other air pollution reduction strategies generally fall into the following broad categories:<sup>11</sup>

1. Fuel efficiency and/or fuel-switching to reduce emissions per mile traveled;
2. Travel demand management to reduce vehicle-miles traveled; and
3. Capacity and operations management to reduce congestion, unnecessary vehicle idling, or other fuel draining practices.

The first strategy listed above is where CPUC shares some jurisdiction with local, regional, and other state planning bodies due to its regulatory authority over electric utilities, which provide electricity as an alternative fuel to conventional gasoline and diesel. CPUC's oversight of the electricity infrastructure and its rate-setting authority over electric services with regards to investor-owned utilities are two important policy tools to facilitate transportation electrification.

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<sup>7</sup> Overview of Transportation Funding presented to California Assembly Transportation Committee by Legislative Analyst's Office at <http://www.lao.ca.gov/handouts/transportation/2015/Transportation-Funding-022315.pdf>

<sup>8</sup> 2015 GHG inventory by ARB at <http://www.arb.ca.gov/cc/inventory/data/data.htm>

<sup>9</sup> [http://www.arb.ca.gov/cc/inventory/data/tables/ghg\\_inventory\\_sector\\_sum\\_2000-13\\_20150831.pdf](http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_sector_sum_2000-13_20150831.pdf)

<sup>10</sup> 2015 Transportation Funding in California by Caltrans at [http://www.dot.ca.gov/hq/tpp/offices/eab/fundchrt\\_files/Finalized\\_Draft\\_2015\\_Transportation\\_Funding\\_in\\_CA.pdf](http://www.dot.ca.gov/hq/tpp/offices/eab/fundchrt_files/Finalized_Draft_2015_Transportation_Funding_in_CA.pdf)

<sup>11</sup> For more background on GHG reduction strategies in transportation sector, see <http://climate.dot.gov/ghg-reduction-strategies/index.html>



These policy tools are, however, only two among many more spread across other governmental entities on the local, regional, and state levels to reduce sector emissions.<sup>12</sup>

To explore how electrification fits into a transportation planner’s broader picture of infrastructure systems planning and build-out, we analyze the major layers of transportation funding, the criteria by which revenues are allocated, how projects involving electrification are considered for funding support, how utility programs can do to better accommodate or complement non-utility sector activities

## 4. Funding Sources for Transportation Electrification

In California, local governments support a little more than half of all transportation funding, federal government supply about one-quarter of the funding, with rest funded through a variety of state revenue sources (fuel tax, vehicle weight fees, and cap-and-trade auction revenues).<sup>13</sup> The exact breakdown does vary year to year, and is subject to revenue availability and appropriation processes by federal, state, and local government entities.

Unlike electricity infrastructure financing which relies on a combination of surcharges paid by utility customers, equity financing from utility shareholders (in the case of an investor-owned utility), and utility-issued bonds, transportation infrastructure financing relies on a complex myriad of mostly public revenue sources, each with its own set of legal requirements depending on the funding authorization. These legal requirements shape whether or not, and the extent to which funds can be used to support transportation electrification. Nonetheless, because transportation expenditures are almost always focused on either improving or expanding roads, bridge, or walkways to meet changing transportation demand and evolving land-use patterns, a deeper understanding of transportation funding activities can provide valuable insights in creating complementary strategies in the electricity sector.

### 4.1 Federal Funds

**Moving Ahead for Progress in the 21<sup>st</sup> Century:** According to Santa Clara Valley Transportation Authority, federal transportation funding is generally allocated to California based on the State’s contribution of revenues derived from federal excise tax on motor vehicle fuels.<sup>14</sup> The tax revenue is deposited into the federal Highway Trust Fund, and expended through the “Moving Ahead for Progress in the 21<sup>st</sup> Century” program (MAP-21) between highway and transit projects. In 2015-16, California received about \$7 billion in federal transportation fund which flows to transportation

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<sup>12</sup> Governor Jerry Brown’s Zero Emissions Vehicles Action Plan provides a breakdown of the actionable policy tools available to various state agencies, at [http://www.opr.ca.gov/docs/Governors\\_Office\\_ZEV\\_Action\\_Plan\\_\(02-13\).pdf](http://www.opr.ca.gov/docs/Governors_Office_ZEV_Action_Plan_(02-13).pdf)

<sup>13</sup> Overview of Transportation Funding, prepared by the Legislative Analyst’s Office (LAO) at <http://www.lao.ca.gov/Publications/Detail/3236>

<sup>14</sup> See Santa Clara Valley Transportation Authority’s primer on transportation funding at <http://www.vta.org/about-us/introduction-to-transportation-funding>



projects based on allocation process by Congress and the US Department of Transportation (US DOT).<sup>15</sup> US DOT is also responsible for ensuring compliance to federal requirements.

**Congestion Mitigation and Air Quality Improvement Program:** One important flexible funding program under MAP-21 with regards to alternative-fueled vehicle deployment is the Congestion Mitigation and Air Quality Improvement Program (CMAQ) for projects and programs in air quality non-attainment and maintenance areas that reduce ozone, carbon monoxide and particulate matter emissions from the transportation sector.<sup>16</sup> Many California cities and counties fall into these non-attainment and maintenance areas, and are hence qualified to receive support for activities to reduce air pollution from tailpipe emissions.<sup>17</sup>

Using CMAQ funds to establish publicly owned fueling facilities and other infrastructure needed to fuel alternative-fuel vehicles is an eligible expense.<sup>18</sup> Each project receiving CMAQ funding support must meet three basic criteria: (1) it must be a transportation project, (2) it must generate an emissions reduction, and (3) it must be located in or benefit a nonattainment or maintenance area. CMAQ provides up to 80 percent of a project. Some local jurisdictions in California have been able to partially rely on this funding source to support electric or plug-in electric vehicles programs.<sup>19</sup>

**Other competitive federal funding sources:** Certain federal funds are allocated on a competitive and as-available basis. One example is the “Low and No Emission Vehicle Deployment Program” (LoNo) under MAP-21 to support the conversion of transit buses to low- or zero-emission technologies.<sup>20</sup> San Joaquin Regional Transit District recently received a \$4.7 million federal grant through this program to purchase five battery-electric buses and install a charging station in Stockton.<sup>21</sup> Another example is the recent US DOT’s “Smart Cities Challenge,” which will provide \$50 million of transportation funds to a city to help modernize its transportation systems; 20 percent of this grant is matched by private philanthropy and will be dedicated toward

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<sup>15</sup> Based on LAO’s estimate that one quarter of the \$28 billion revenue in California for transportation purposes are derived from federal sources.

<sup>16</sup> A nonattainment area is an area considered to have air quality worse than the National Ambient Air Quality Standards as defined in the Clean Air Act Amendments of 1970. See more at <http://www.arb.ca.gov/desig/desig.htm>.

<sup>17</sup> See list of California cities and counties in federal designated non-attainment and maintenance areas: <https://www3.epa.gov/airquality/greenbook/ancl.html>

<sup>18</sup> See CMQA funding guideline: <https://www.fhwa.dot.gov/map21/factsheets/cmaq.cfm>

<sup>19</sup> For example, El Dorado County was able to obtain CMQA funds to install charging infrastructure and replace municipal fleets to plug-in hybrid electric vehicles. Read more at <https://edcgov.us/EVs.aspx>.

<sup>20</sup> See US DOT funding opportunity announcement at <https://www.transit.dot.gov/funding/applying/notices-funding/low-or-no-emission-program-low-no-program-2016-nofo-0>

<sup>21</sup> See San Joaquin Regional Transit District press announcement at [http://www.sanjoaquinrtd.com/electricbus/Assets/2015-2-6\\_San%20Joaquin-RTD-Receives-FTA-Funding-for-Electric-Buses.pdf](http://www.sanjoaquinrtd.com/electricbus/Assets/2015-2-6_San%20Joaquin-RTD-Receives-FTA-Funding-for-Electric-Buses.pdf)



transportation electrification efforts.<sup>22</sup> 11 cities in California have submitted proposals for the Smart grant competition, and the city of San Francisco has made it to the finalists round.<sup>23</sup> Federal Aviation Administration (FAA) also administers the Voluntary Airport Low Emission and Zero Emissions Airport Vehicle programs to support electrification of surface transportation at airports.<sup>24</sup>

Federal funds that are made available to states and municipalities on a competitive and as-available basis are not guaranteed. While important to support demonstration of low-emission vehicle technologies, these funds cannot be relied on for longer-term infrastructure planning purposes. These funding opportunities, however, provide valuable data points on which municipalities in California are interested in pursuing and piloting transportation electrification, and an opportunity to test different business applications of electrification.

Generally, federal funds to support transportation electrification projects are sought directly by local or regional planning bodies. These funds are sometimes, but not always, matched with state funds. Federal grant application processes to support local or regional electrification projects in California usually involve little or no participation by neither CPUC nor its jurisdictional utilities, despite a shared policy goal to support fuel switching from petroleum/diesel to electricity. This is an area where better information sharing can help identify likely local and regional partners to support wider electric vehicle adoption. The utilities should leverage lessons learned from federal funding opportunities to inform what type of charging infrastructure support is most needed within other cities within their service territory and region.

**Recommendation 1:** The CPUC should establish a tracking and information dissemination system regarding federal funding opportunities and federal funds received for transportation electrification, and identify local or regional project managers seeking and receiving federal or state support.

Lastly, federal tax credit on electric vehicle purchase remains one of key federal funds to encourage adoption of electric or plug-in hybrid electric vehicles. The federal Plug-In Electric Drive Vehicle Credit provides up to \$7,500 of tax credit toward electric vehicle purchase.<sup>25</sup>

<sup>22</sup> See US DOT funding opportunity announcement at <https://www.transportation.gov/smartcity/nofo>, and criteria for the transportation electrification portion of the competition at <http://www.vulcan.com/areas-of-practice/philanthropy/key-initiatives/smart-city-challenge>

<sup>23</sup> California cities of Fremont, Fresno, Riverside, Oakland, Oceanside, Sacramento, San Francisco, Long Beach, Chula Vista, San Jose, and Moreno Valley each submitted an application to US DOT.

<sup>24</sup> See FAA announcement: [http://www.faa.gov/news/press\\_releases/news\\_story.cfm?newsId=19495](http://www.faa.gov/news/press_releases/news_story.cfm?newsId=19495)

<sup>25</sup> See IRS tax credit guideline at <https://www.irs.gov/Businesses/Plug-In-Electric-Vehicle-Credit-IRC-30-and-IRC-30D>



## 4.2 State Funds

Vehicle fuel tax, state sales tax, vehicle weight fee, vehicle license and registration fee, tire sales fee, state bonds, and cap-and-trade revenues make up the general universe of state transportation funding sources. Each of these funding sources has specific restriction and implementing agency. The majority of the state funds are earmarked for road improvement or maintenance, but selected funds can be dedicated to either indirectly facilitate or directly support transportation electrification.

**State Fuel Excise Tax** generates approximately \$4.9 billion a year for transportation infrastructure.<sup>26</sup> This figure is generally allocated between local roadways, new construction projects, and highway maintenance and operations. New construction projects are selected through a process Caltrans and metropolitan planning organizations and approved by the California Transportation Commission. Usually these projects are dedicated toward roads and transit systems, and are not used to facilitate transportation electrification per se unless specifically programmed by Caltrans or proposed by a metropolitan planning organization.

**AB 32 Cap-and-Trade** is comparably smaller source of state funds for facilitating transportation electrification in the State. In 2015-16, \$1.7 billion was appropriated to support programs to reduce greenhouse gas emissions.

By state law, 60 percent of the cap-and-trade revenue is continuously appropriated for 4 programs: 20 percent to the Strategic Growth Council for the Affordable Housing and Sustainable Communities Program; 5 percent to California State Transportation Agency (CalSTA) to support the Low-Carbon Transit Operations targeting disadvantaged communities; 10 percent to CalSTA for the Transit and Intercity Rail Capital Program (TIRCP); and 25 percent to the High Speed Rail Authority for the High Speed Rail Project. The remaining 40 percent of cap-and-trade revenues are subject to annual budget appropriation process by the State Legislature to fund other greenhouse gas reduction programs such as the Low Carbon Transportation Incentive Program at ARB or programs to reduce water sector greenhouse gas emissions through the Department of Water Resources.<sup>27</sup>

Each of the 4 programs continually supported by cap-and-trade revenues includes some elements of transportation electrification, and can provide an opportunity for the CPUC in developing state-level partnerships to support complementary utility charging infrastructure deployment strategies.

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<sup>26</sup> See Caltran's overview of transportation funding in California at [http://www.dot.ca.gov/hq/tpp/offices/eab/fundchrt\\_files/Finalized\\_Draft\\_2015\\_Transportation\\_Funding\\_in\\_CA.pdf](http://www.dot.ca.gov/hq/tpp/offices/eab/fundchrt_files/Finalized_Draft_2015_Transportation_Funding_in_CA.pdf)

<sup>27</sup> See 2016 Annual Report on Cap-and-Trade Auction Proceeds prepared by ARB at [http://arb.ca.gov/cc/capandtrade/auctionproceeds/ci\\_annual\\_report\\_2016\\_final.pdf](http://arb.ca.gov/cc/capandtrade/auctionproceeds/ci_annual_report_2016_final.pdf)



**Fee on vehicle registration and tire sales** provide another important state revenue source to support alternative fueled vehicle programs at the CEC and ARB.<sup>28</sup> Because of the complex ecosystem of decision makers in California with regards to transportation policies and the wealth of knowledge generated through the State's funding programs, the CPUC can leverage experience and insights already established within other state agencies to inform the allocation of ratepayer funds for charging infrastructure deployment activities by investor-owned utilities.

**Recommendation 2:** The CPUC should identify linkages and possible improvements to interagency processes between the CPUC and each of the state agencies responsible for allocating state funds for transportation electrification projects.

### *4.3 Local Funds and Other Local Support*

**County Sales Tax** for transportation needs is levied in 21 out of 58 counties in California through voter-approved measures.<sup>29</sup> In counties where voters have approved county sales tax for transportation purposes, this county tax revenue provides the county planning agency with additional support and added programming flexibility toward improving local transportation infrastructure. 19 of such county local county transportation agencies have joined to form an association known as the Self-Help Counties Coalition (SHCC). According to SHCC, county tax revenues provide \$3-4 billion annually toward local transportation improvement to serve 81 percent of all California residents.<sup>30</sup> Funding priorities for local projects depend on the parameters of the voter-approved ballot measure, as well as the county's own transportation planning process.

In Los Angeles County, for example, county sales tax funds the operation of the Los Angeles Metropolitan Transportation Authority (LA Metro), which allocates a portion of the tax revenue toward member cities for their discretionary transportation needs. LA Metro uses the remaining revenue to provide transportation planning, transit operation, and road maintenance across the county. To address intermodal connectivity, LA Metro has executed two electric vehicle charging projects using county tax revenue, with matching funds from CEC, to install a total of 39 charging stations at 10 of its light rail stations, 8 of which are located within SCE's service area, 2 of which are in LADWP's service area.<sup>31</sup>

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<sup>28</sup> Background on California's portfolio low carbon transportation investments and air quality improvement programs at <http://www.arb.ca.gov/msprog/aqip/bkgrnd.htm>

<sup>29</sup> See Board of Equalization Table of District Taxes, Rates, and Effective Dates at <https://www.boe.ca.gov/pdf/boe105.pdf>

<sup>30</sup> See [http://www.selfhelpcounties.org/Brochure\\_Self-HelpCounties\\_011813.pdf](http://www.selfhelpcounties.org/Brochure_Self-HelpCounties_011813.pdf)

<sup>31</sup> See LACMTA project documents <https://www.metro.net/projects/ev/> and [http://media.metro.net/board/Items/2014/07\\_july/20140717conitem58.pdf](http://media.metro.net/board/Items/2014/07_july/20140717conitem58.pdf)



Not all self-help counties explicitly dedicate sales tax revenue to transportation electrification projects, and it is not clear whether all such revenues can legally be used for transportation electrification efforts. In some cases, county tax revenues are pooled with available funds from state and federal sources to support regional transportation electrification efforts, as is the case with Caltrain's Peninsula Corridor Electrification Project across San Francisco, San Mateo, and Santa Clara counties, which will convert diesel-hauled rail cars to an electric propulsion system interconnected to PG&E's electrical grid.<sup>32</sup>

Generally, whether or not, and the extent to which county tax revenues are used toward transportation electrification is decided by county governing boards or elected county officials, and reflects local transportation priorities. Due to this critical planning authority of county governments, transportation electrification policy should consider existing transportation initiative already underway within counties.

**Recommendation 3:** The CPUC should encourage the utilities to develop or participate in a working group with county planning officials representing counties served by a CPUC jurisdictional utility to gather and disseminate information on transportation.

**Local Ordinances and Incentives** as non-funding strategies adopted by individual cities exert significant and direct impact on the adoption of electric transportation. In addition to determining zoning requirements, cities are also responsible for permitting parking structures and destination centers, and therefore in a unique position to provide critical permitting decisions affecting charging infrastructure deployment.

The City of Palo Alto, through its building code updates, has required new commercial construction, including multi-family dwellings, mixed-use facilities, and hotels to support electric vehicle charging.<sup>33</sup> For new multi-family dwelling units, the city has required one charging outlet per unit, and at least 25 percent of the guest parking spots are required to be EV-ready. New hotels in Palo Alto are required to accommodate electric vehicles at 30 percent of their parking spaces. City of Long Beach is also pursuing similar city ordinance to make EV-ready parking spots be more widely available within its city boundary. The City of Riverside, also a provider of utility service to its residents, promotes EV adoption by providing a rebate of up to \$500 to residents for eligible EV purchases made a local car dealership.<sup>34</sup>

<sup>32</sup> More information on Caltrain's Peninsula Corridor Electrification Project information at <http://www.caltrain.com/projectsplans/CaltrainModernization/Modernization/PeninsulaCorridorElectrificationProject.html>

<sup>33</sup> See press release by City of Palo Alto at <http://www.cityofpaloalto.org/civica/press/display.asp?layout=1&Entry=1100>

<sup>34</sup> See City of Riverside's Electric Vehicle program at <http://www.greenriverside.com/go-green/electric-vehicles>



**Recommendation 4:** The IOUs should identify partner air districts within investor-owned utilities' service areas to pilot or demonstrate benefits of electrified modes of transportation.

## 5. California's Transportation Funding Allocation Process

**State Transportation Improvement Program (STIP)** is the biennial five-year plan adopted by the California Transportation Commission (CTC) for setting capital funding priorities for new transportation construction related to highway improvements, intercity rail and transit and active transportation infrastructure (for biking and walking). State law requires the CTC to update the STIP biennially, in even-numbered years. The most recent STIP was adopted in 2014 and development of the 2016 STIP is now underway. Transportation receiving STIP funding support are nominated by Metropolitan Planning Organizations (MPOs) and Caltrans. MPOs prepare regional spending plans known as "Regional Transportation Improvement Program" (RTIP) which accounts for 75 percent of the STIP funds. Caltrans prepare the "Inter-regional Transportation Improvement Program" (ITIP) for inter-regional projects to connect metropolitan areas, which make up the remaining 25 percent of the STIP.

STIP is an important process for integrating electrification into general transportation infrastructure planning because this process allocates significant state funds for transportation projects across all 58 counties in California.<sup>35</sup> Whether or not transportation electrification projects become part of STIP depends on the priorities of the individual Metropolitan Planning Organizations, Caltrans, and the CTC.

**Metropolitan Planning Organizations (MPOs)** play an important role in both funding allocation, as well as local and regional transportation project selection. Federal law requires Metropolitan Planning Organizations to prepare a master transportation plan, known as the "Regional Transportation Plan" or RTP to guide a region's transportation investments over a 20 to 25 year planning horizon. These plans must follow a general guideline set by the California Transportation Commission in consultation with ARB and Caltrans. A component of the RTP is the Regional Transportation Improvement Projects (RTIP) which is an input document into the STIP process for state funding consideration.

Because MPOs are typically represented by the various cities or counties within its planning area,<sup>36</sup> the RTP preparation process necessarily reflect the varying priorities of the member cities.

<sup>35</sup> [http://www.catc.ca.gov/meetings/agenda/2013Agenda/2013\\_10/Tab18\\_supplement.pdf](http://www.catc.ca.gov/meetings/agenda/2013Agenda/2013_10/Tab18_supplement.pdf)

<sup>36</sup> Some MPOs represent a single county while others represent multiple counties. Typically, a MPO is governed through a board consist of member cities within the MPO's foot print.



Typically, transportation projects are proposed to the MPO through the cities, and these proposed transportation projects take into consideration planned future land-use developments such as new housing stock additions and new planned commercial centers. A MPO evaluates a list of projects within the region, and produces a list of needed projects to nominate for state funding support. While specific detail of infrastructure development may be left to the individual cities, the RTP acts as a regional plan to provides incredible insights into the growth strategies of a particular region.

An important requirement related to the RTP is the Sustainable Communities Strategy requirement under SB 375 (Steinberg, Ch. 728, 2008). Each MPO must prepare a sustainable communities strategy (SCS) document as part of its RTP, and submit to ARB periodically for approval to ensure the plan would support land-use decisions to meet regional goals for greenhouse gas reduction by reducing vehicle-miles traveled. As an incentive, developers get obtain relief from certain environmental review requirements under the California Environmental Quality Act (CEQA) is a new residential and mixed-use project is consistent with a region's adopted CSC.

The RTP preparation and update process is an opportunity to learn about how a region's land-use and commute patterns may evolve over the 20-25 year planning horizon. Because RTPs include important factors like traffic congestion management, transit infrastructure expansion, and residential development goals, the outcomes of these plans do affect the commuting needs (distance, frequency, and mode) of city residents. For example, the Southern California Association of Governments (SCAG) has outlined specific electrification strategies as part of its most recently adopted RTP for major transportation corridors.<sup>37</sup>

MPO activities therefore represent a valuable opportunity for investor-owned utilities to ascertain the future charging infrastructure need of a particular area under development. For example, a transportation corridor improvement or regional redevelopment project may involve the need to re-install utility wires, and such projects represent an opportunity to install additional capacity to accommodate future neighborhood vehicle charging along the corridor.

**Recommendation 5:** The IOUs should identify model MPOs within their service areas to develop programs that accommodate region-specific charging infrastructure deployment and fuel-switching strategies based on existing regional initiatives.

**Air District (Air Quality Management or Control Districts)** are responsible for air quality management within each of their respective districts. There are 35 air districts in California, and each district has authority to adopt district-specific rules to address regional air pollution from

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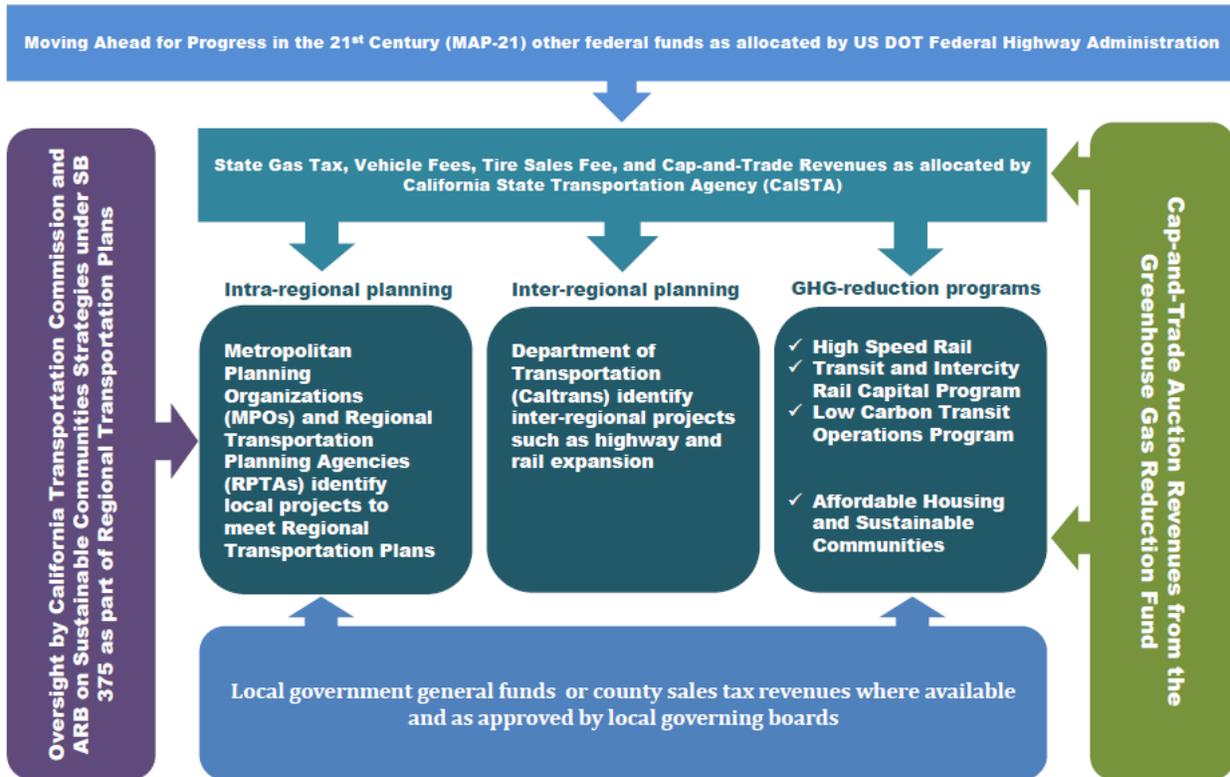
<sup>37</sup> See SCAG regional electric vehicle program information at <http://scag.ca.gov/programs/Pages/RegionalElectric.aspx>



mobile and stationary sources.<sup>38</sup> Air districts are also responsible for allocating available funds from the Carl Moyer program toward specific projects. Certain air district, specifically the Bay Area Air Quality Management District (BAAQMD), has been able to leverage litigation settlement funds toward electric vehicle demonstration projects.<sup>39</sup>

**Recommendation 6:** The IOUs should identify model MPOs within their service areas to develop programs that accommodate region-specific charging infrastructure deployment and fuel-switching strategies based on existing regional initiatives.

## Ecosystem of Transportation Authorities



<sup>38</sup> To access district-specific rules, see ARB compilation page: <http://www.arb.ca.gov/drdb/drdbtxt.htm>

<sup>39</sup> See BAAQMD report on plug-in hybrid electric vehicle car share demonstration project at <http://www.baaqmd.gov/plans-and-climate/bay-area-pev-program>



## 6. Overlaying Transportation and Electricity Systems

Privately-owned electric grid infrastructure is a multi-layer network of generation, distribution and transmission networks across vast regions of the state to deliver electricity to stationary sites, i.e. the customers' homes and agricultural, industry, or commercial facilities. Electric utility service areas overlap but do not represent one-to-one mapping to the layers of local and regional planning authorities that provide transportation programming to support the movement of people and goods across the state. Neither do utility service areas correspond neatly to air quality management or control districts responsible for managing local air quality from stationary and mobile sources.

To electrify the transportation system in California across different transportation end-use segments, it may be helpful to look at each layer of the State's transportation system and explore at unique type of regional economic activities which shape travel demands in different parts of the state. It is important to note each layer of transportation demand impact and interact with one another, and devise infrastructure deployment strategies accordingly.

### 6.1 Inter-Regional Transportation Electrification

In California, inter-regional transportation system is comprised of rail, aviation, waterway and the highway system to carry goods and passenger throughout the state and beyond the state. Airports and ports function as hubs, connected through networks of roads and rail right-of-ways.

**Highway Electrification** to deploy vehicle charging infrastructure along state highway is an area of keen interest because of the finite mileage range for commercially-available electric vehicles. A report prepared by the Idaho National Laboratory based on national data from US Department of Energy's EV Project concluded that, while the majority of vehicle charging was done at home and work, direct-current (DC) fast charging along travel corridors were found to effectively enable long-distance range extension for battery electric vehicles.<sup>40</sup> This report further concluded that the most highly used DC fast chargers tended to be located close to interstate highway exits, serving both local vehicles as well as vehicles traveling through the area.

"West Coast Green Highway" is an highway-specific electrification initiative to promote inter-state and inter-regional electrification by placing fast charging stations along the Interstate-5 in Washington State, Oregon, and California as part of an inter-state memorandum of understanding.<sup>41</sup> Both Washington State and Oregon have successfully deployed a network of charging stations along key highway corridors to enable electric vehicle range extension, creating a "backbone system" for EV charging. AeroVironment operates the charging stations in both Washington and Oregon;

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<sup>40</sup> Summary reports of electric vehicle demonstration projects funded by the American Recovery and Reinvestment Act of 2009 (ARRA) prepared by Idaho National Laboratory at <https://avt.inl.gov/project-type/ev-project>

<sup>41</sup> See Memorandum of Understanding on Alternative Fuels Corridor Project at <http://www.westcoastgreenhighway.com/pdfs/Tri-StateMOUAlternativeFuelsCorridor.pdf>



customers have the option to either purchase an unlimited charging plan for a flat monthly fee or pay per charging session.<sup>42</sup>

In terms of infrastructure deployment to support inter-regional electrification, California has lagged behind Washington and Oregon on creating a systematic network of fast charging stations along its key highway corridors. While public fast charging stations have been successfully deployed in California along highways in urban centers by private entities, oftentimes with some public funding support, such as by eVgo (NRG), Tesla, ChargePoint, Blink, and others, Tesla is the only private entity pursuing charging station installation along inter-regional highway corridors in non-urban area for exclusive use by Tesla customers.

A recent report prepared for the CEC concluded that there are significant gaps in charging infrastructure deployment along inter-regional corridors between major metropolitan areas.<sup>43</sup> Indeed, CEC identified this market gap and plans to install 104 fast chargers along major inter-regional corridors through the ARFTP program.<sup>44</sup> CEC has recently issued two grant funding opportunities for installation of DC fast chargers at targeted inter-regional corridors.<sup>45</sup> Caltrans Division of Research and System Information also recently embarked on study to assess the feasibility of alternative fuel or electric charging systems at highway roadside areas.<sup>46</sup>

There are some competing factors to consider regarding charging infrastructure deployment along highway corridors, including access to high-voltage utility lines for a highway corridor under consideration and the potential for equipment under-utilization in more remote areas. The lack of private investment in charging infrastructure to support inter-regional travel warrants closer analysis in areas where utility-owned charging infrastructure along key inter-regional corridors could provide benefit to the grid, while providing coverage in harder-to-reach non-urban areas. For example, areas projected to have excessive renewable and charging infrastructure demand.

Caltrans is a key state agency partner that the utilities should consult with when devising an inter-regional electrification strategy, given its role in inter-regional capital improvement and construction. Caltrans has recently revised its 2016 Inter-regional Transportation Improvement Program (ITIP) for 2016, and has released a list of projects to pursue within its available budget.<sup>47</sup>

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<sup>42</sup> See pricing plan for EV charging along the highway corridor in Washington and Oregon: <http://www.evsolutions.com/ev-network>

<sup>43</sup> Consultant Report prepared by AESC for CEC Alternative and Renewable Fuel and Vehicle Technology Program at <http://www.energy.ca.gov/2015publications/CEC-600-2015-015/CEC-600-2015-015.pdf>

<sup>44</sup> See CEC 2015-16 ARFTP program investment plan update at <http://www.energy.ca.gov/2014publications/CEC-600-2014-009/CEC-600-2014-009-CMF.pdf>

<sup>45</sup> See CEC ARFVTP grant funding opportunity announcements at <http://www.energy.ca.gov/contracts/transportation.html#GFO-15-603>

<sup>46</sup> See feasibility study announcement by Caltrans Division of Research, Innovation and System Information at [http://www.dot.ca.gov/research/researchreports/current\\_research/PlanningPolicySystemInfo/docs/Task2979\\_RNs\\_11-2015.pdf](http://www.dot.ca.gov/research/researchreports/current_research/PlanningPolicySystemInfo/docs/Task2979_RNs_11-2015.pdf)

<sup>47</sup> See Caltrans Office of Capital Improvement Programming at <http://www.dot.ca.gov/hq/transprog/ocip.htm>



One avenue for state energy agencies to pursue would be to consult and coordinate with Caltrans and its 12 districts on identifying strategic siting of fast charging stations along key highway corridors scheduled for construction work within Caltrans planning horizon.

**Recommendation 7:** The CPUC should develop criteria and identify highway corridors for deployment of utility programs for charging infrastructure in coordination with Caltrans and CEC.

**The Transit and Intercity Rail Capital Program (TIRCP) and the Low Carbon Transit Operations Program (LCTO)** are funded through cap-and-trade revenues are intended to reduce greenhouse gas emissions through expanding transit infrastructure and improving transit services. Inter-city transit or rail projects including electrification are nonetheless eligible to receive funding support.

In 2015, the first TIRCP funding cycle, CalSTA awarded \$224 million for various transit and rail improvement projects across the state, including \$24 million of cap-and-trade funding for a Bus Rapid Transit (BRT) project using electrified buses to provide intra- and inter-city services in Lancaster and Palmdale.<sup>48</sup> CalSTA has released a call for project for the 2016 funding cycle,<sup>49</sup> as well as a guidance document on how projects involving transportation electrification can qualify for awards.<sup>50</sup> For example, a project that includes installation of vehicle charging equipment at transit station located within disadvantaged communities would meet CalSTA's criteria.

Similarly, in the first LCTO funding year 2014-15, CalSTA awarded 7 transportation projects including electrification as a project element. These projects included the purchase of electric buses, installation of charging infrastructure at transit stops or stations for buses and light-duty electric vehicles, or neighborhood electric car-sharing services to support access to transit. Because at least 50 percent of the LCTO project awards must benefit disadvantaged communities, last-mile electrification efforts can benefit these communities accordingly.

CalSTA has released its 2015-16 program guideline which specifies how projects including transportation electrification as a project element would be considered.<sup>51</sup> It is currently reviewing 2015-16 applications, and the process warrants a closer look to see how many projects including electrification elements are proposed and ultimately awarded for funds.<sup>52</sup>

<sup>48</sup> See <http://calsta.ca.gov/res/docs/pdfs/2015/Agency/TIRCPAwardSummary06302015.pdf>

<sup>49</sup> [http://calsta.ca.gov/res/docs/pdfs/2016/Agency/TIRCPCallforProjects\\_02052014.pdf](http://calsta.ca.gov/res/docs/pdfs/2016/Agency/TIRCPCallforProjects_02052014.pdf)

<sup>50</sup> [http://calsta.ca.gov/res/docs/pdfs/2016/Agency/TIRCPGuidelines\\_02042016.pdf](http://calsta.ca.gov/res/docs/pdfs/2016/Agency/TIRCPGuidelines_02042016.pdf)

<sup>51</sup> See [http://www.dot.ca.gov/hq/MassTrans/Docs-Pdfs/Cap&Trade/lctop.guidelines.fy15-16\\_112415.pdf](http://www.dot.ca.gov/hq/MassTrans/Docs-Pdfs/Cap&Trade/lctop.guidelines.fy15-16_112415.pdf)

<sup>52</sup> See list of applicants: [http://www.dot.ca.gov/hq/MassTrans/lctop\\_1516\\_Submit\\_Apps.html](http://www.dot.ca.gov/hq/MassTrans/lctop_1516_Submit_Apps.html)



**Recommendation 8:** The CPUC should develop criteria for deploying last-mile charging infrastructure to complement projects receiving funds from the Transit and Intercity Rail Capital Program and the Low Carbon Transit Operations Program.

**Inter-regional Freight Electrification and Port Electrification** pertain to efforts to reduce air pollutant emissions by switching from diesel-fueled trucks or rail cars to an electric propulsion system. ARB has recently initiated a new stakeholder process to improve freight efficiency and transition to zero-emission technologies in response to a Governor’s executive order.<sup>53</sup> ARB has received a series of pilot proposals, including many proposing to use heavy-duty electric propulsion technology. These expanded efforts to reduce diesel combustion complement ARB’s existing Carl Moyer program, which provides funding to encourage the voluntary purchase of cleaner-than-required engines, equipment, and emission reduction technologies in areas where air quality does not meet federal clean air standards.<sup>54</sup>

To date, all three large investor owned utilities have participated in fuel-switching from diesel fuel to either electricity or natural gas at major ports to varying degrees. Specifically, SCE has an approved tariff to support electrification at the Port of Long Beach.<sup>55</sup> Aside from the consideration of this particular electrification program, the CPUC has not been actively involved in electrification efforts within the heavy-duty sector. This is an area which warrants closer regulatory consideration due to the disproportionate impact of freight movement on disadvantaged communities throughout the state.

**Recommendation 9:** The CPUC should examine rules and devise policies to support transition of diesel-fueled freight technologies to electric propulsion systems. Strategies to support disadvantaged communities should include not only light-duty vehicle adoption among households within these communities, but also heavy-duty vehicle solutions to address impact from freight movement through these communities.

<sup>53</sup> See ARB webpage on sustainable freight at <http://www.arb.ca.gov/gmp/sfti/sfti.htm>

<sup>54</sup> For more background on the Carl Moyer Program: <http://www.arb.ca.gov/msprog/moyer/moyer.htm>

<sup>55</sup> See SCE Rate Schedule ME at <https://www.sce.com/NR/sc3/tm2/pdf/CE358.pdf>



## ***6.2 Intra-regional Electrification***

**Strategic Growth Council** allocates 20 percent of the annual AB 32 Cap-and-Trade revenue from the Greenhouse Gas Reduction Fund for the Affordable Housing and Sustainable Communities program. This program is focused on promoting greenhouse gas reduction through sustainable land-use policy with focus on transit access and affordability. It provides grants and affordable housing loans for compact transit-oriented development and related infrastructure and programs that reduce greenhouse gas emissions. These projects are intended to increase the accessibility of housing, employment centers, and key destinations via low-carbon transportation options resulting in fewer vehicle miles traveled and mode shift. Funding opportunities are open to the following types of organization:

- Local governments (city, county, city/county)
- Local transportation agencies
- Public housing authority
- Transit agency or operator
- Regional transportation planning agency
- Congestion management agency
- Joint powers authority
- School district
- Facilities district
- University or community college district
- Developer (public, private, or non-profit)
- Program operator (public, private, or non-profit)

The main goal of the Affordable Housing and Sustainable Communities program is to reduce overall vehicle miles traveled and encourage wider adoption of less carbon-intensive forms of transportation modes for new or substantially rehabilitated affordable housing units.

Under the latest program guideline, the maximum allowable funds are inversely tied to the number of available parking space per unit for the housing project. Projects with fewer parking spaces per unit (less than 0.5 parking spaces per unit) are eligible for a higher level funding support than projects with more parking spaces per unit (up to 2 spaces per unit). This requirement, however, exempts parking spaces dedicated toward car share, electric vehicle charging, zero-emissions vehicles, and ADA-accessible parking. Therefore, a project under consideration can include additional electric vehicle charging spaces without compromising funding support.

Because Affordable Housing and Sustainable Communities Program is specifically dedicated toward new construction or substantially rehabilitated housing, there is be a natural synergy to be explored with the electric charging infrastructure deployment goals with regards to multi-unit



dwellings and benefits for disadvantaged communities. Because the projects under review for grants are either new or substantially rehabilitated housing units, and have obtained either site control or majority of the project financing, with actual needs for new utility wire installation; there may be overall project cost-savings from avoiding future retrofits to accommodate on-site or neighborhood access to electric charging infrastructure.

**Recommendation 10:** The IOUs should identify optimal charging station sites located at or adjacent to projects receiving Strategic Growth Council’s Affordable Housing and Sustainable Communities grant to support either resident or neighborhood access.

## 7. Issues for Future Consideration

In summary, both electricity and transportation sectors face complex challenges, and funding support for transportation electrification from either sector is finite and stretched. There are many opportunities for partnership to meet the State’s goal reduces greenhouse gas and co-pollutant emissions from mobile sources, and those identified in this paper are not exhaustive. Due to the different underlying economic drivers shaping transportation demand in different part of the state, a regulatory framework should be flexible and accommodate local and regional transportation system characteristics. There is no shortage of issues for further consideration, such as the role of community choice aggregation or direct access providers, the appropriate strategy for the non-road sectors (water-borne, aviation, and off-road), or the strategy to support electrification in the “shared mobility” sector.



## 8. Additional References and Resources

San Joaquin Valley Plug-In Electric Vehicle Coordinating Council's EV Readiness Plan

<https://energycenter.org/programs/pev-planning/san-joaquin>

Southern California Association of Government's Regional Electric Vehicle Program

<http://scag.ca.gov/programs/Pages/RegionalElectric.aspx>

Zero-Emission Vehicles in California: Community Readiness Guidebook by Governor's Office of Planning and Research

[https://www.opr.ca.gov/s\\_zero-emissionvehicles.php](https://www.opr.ca.gov/s_zero-emissionvehicles.php)

Guide to the Lessons Learned from the Clean Cities Community Electric Vehicle Readiness Projects prepared for the US Department of Energy

<http://www.c2es.org/publications/guide-lessons-learned-clean-cities-community-electric-vehicle-readiness-projects>

California Transportation Electrification Assessment Phase 1 Final Report prepared by ICF for CalETC

[http://www.caletc.com/wp-content/uploads/2014/09/CalETC\\_TEA\\_Phase\\_1-FINAL\\_Updated\\_092014.pdf](http://www.caletc.com/wp-content/uploads/2014/09/CalETC_TEA_Phase_1-FINAL_Updated_092014.pdf)

Bay Area Air Quality Management District PEV Program

<http://www.baaqmd.gov/plans-and-climate/bay-area-pev-program>