CALIFORNIA ENERGY COMMISSION

California Energy Commission

Clean Transportation Program

FINAL PROJECT REPORT

ChargePoint California Program: No City Left Behind

Prepared for: California Energy Commission

Prepared by: ChargePoint

Gavin Newsom, Governor

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California Energy Commission

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PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program, formerly known as the Alternative and Renewable Fuel and Vehicle Technology Program. The statute authorizes the 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-08-010 to provide funding opportunities for projects which have been awarded funding from the U.S. Department of Energy under a federal funding opportunity announcement for specified transportation projects. In response to PON-08-010, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards on February 22, 2010. The agreement was executed as ARV-09-007 on November 10, 2010 in the amount of $3.4 million.

ABSTRACT

The ChargePoint California project will increase the public's awareness of the availability of electric vehicle charging stations and drive an accelerated adoption of electric vehicles as they enter the California market. The California Energy Commission awarded ChargePoint a $3.417 million grant under PON-08-010, the first solicitation issued under the Clean Transportation Program, formerly knowns as the Alternative and Renewable Fuels and Vehicles Technology Program. ChargePoint's proposal, No City Left Behind, would install charging infrastructure in three major California metropolitan regions, track and measure how the chargers were adopted and used, analyze use and requirements for future installations, and participate in state-wide electric vehicle infrastructure working group. ChargePoint exceeded their charger installation goal by 14 percent, found that installation costs were higher than estimated in 2009, and found that additional work was required to integrate charging infrastructure into demand response programs.

Keywords: ChargePoint California, plug-in electric vehicles, electric vehicle charging stations, demand response, EV infrastructure, EV adoption, Electric Vehicle Supply Equipment, Plug-in Electric Vehicle infrastructure

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EXECUTIVE SUMMARY

Widespread consumer use of electrified transportation will create benefits for the environment, consumer economics, and national security. There are many challenges in developing a viable and flourishing consumer market for electric vehicles. Among the myriad technical challenges are the challenges of market perception and acceptance.

One of the current and future obstacles to electric vehicle adoption is the lack of sufficient charging infrastructure available to electric vehicle owners for charging. The principal barriers for widespread adoption of electric vehicle supply equipment infrastructure are:

Funding

ChargePoint has been actively commercializing electric vehicle supply equipment around the nation and the world and has encountered customers with real objections, such as,

- "We don't have funding, especially for a future need."
- "There are no cars that will utilize the stations if we buy now."

However, plug-in electric vehicles are coming to California and the CEC funding for electric vehicle supply equipment will make it easier for site-owners to make the decision to install this equipment. The ChargePoint California project will provide free charging stations to selected sites. Moreover, bringing in the Federal funding component will allow the CEC and ChargePoint to bring scale to the deployment program.

Lack of Electric Vehicle Products in California

One obvious principal barrier to electric vehicle supply equipment deployment by site owners is that there is currently a lack of commercially available electric vehicles on the market in California. By deploying electric vehicle supply equipment based on the automakers targeted markets supporting cities that have locations for installation, and leveraging federal money into the program, the CEC funding will help lure the electric vehicle car manufacturers to enter the California market before other states and provide consumers with assurances that widespread infrastructure will be available.

The main goal of this project is to increase consumer awareness of the availability of electric vehicle charging stations and accelerate adoption of electric vehicles as they begin to enter the California marketplace at the end of 2010. This goal will be met by leveraging CEC grant funding with the U.S. Department of Energy funding to accelerate cities and automakers' decisions to deploy and announce electric vehicle charging infrastructure, via local and national media, before the vehicles enter the market. The California program will become the national model of a public private partnership with national and statewide support.

The objectives of this project are to cost effectively achieve the following:

- Objective 1: Install 1,290 electric vehicle supply equipment in three regions in California, Los Angeles, Bay Area and Sacramento that are level II stations with networking capabilities.
- Objective 2: Track and measure station adoption and utilization rates over the duration of the project.
- Objective 3: Track and calculate equivalent greenhouse gas emissions and gasoline displaced by the project made possible by this grant funding.
- Objective 4: Analyze usage trends to forecast future station locations.
- Objective 5: Participate in a state-wide electric vehicle infrastructure working group.

Results

The ChargePoint California program increased the awareness of the availability of electric vehicle charging stations by leveraging CEC grant funding with the U.S. Department of Energy funding. ChargePoint successfully deployed 1,473 charging stations in residential, multi-family buildings, workplace and public locations in the three regions of Bay Area, Los Angeles and Sacramento. The ChargePoint California program became a model for public private partnerships with national and statewide support.

ChargePoint successfully deployed 1,473 charging stations funded by the CEC grant.

Table ES-1: Deployed Stations in California Funded by the CEC

Type	Number of Charging Stations
Residential	1,148
Commercial	231
Multi family	94
Total	1,473

Source: ChargePoint

ChargePoint successfully deployed 2,138 charging stations funded by CEC and U.S. Department of Energy grants.

Table ES-2: Deployed Stations in California Funded by the CEC and U.S. Department of Energy Grants

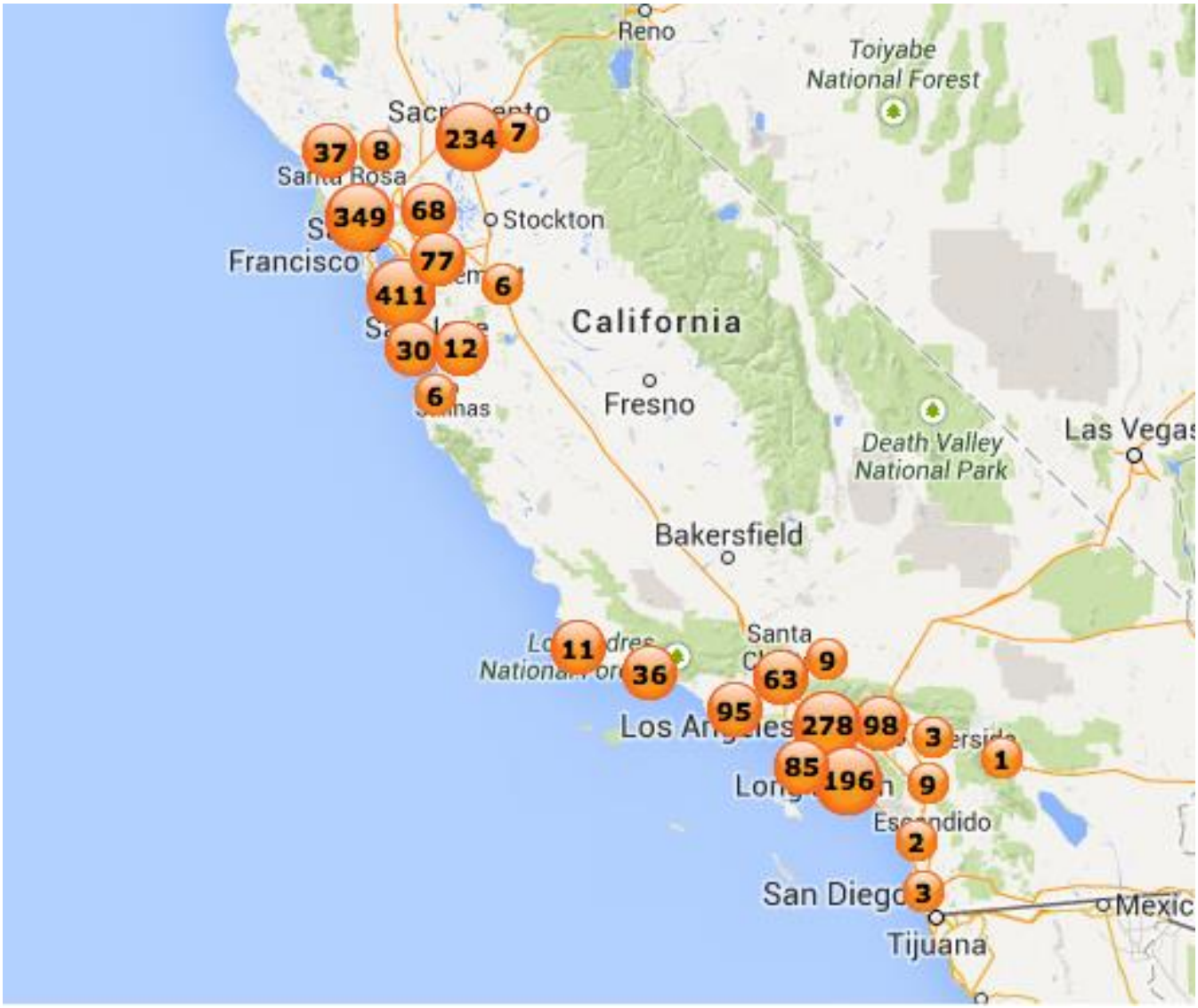
Type	Number of Charging Stations
Residential (Including MDU)	1,228
Commercial	840

Type	Number of Charging Stations
Workplace	70
Total	2,138

Source: ChargePoint

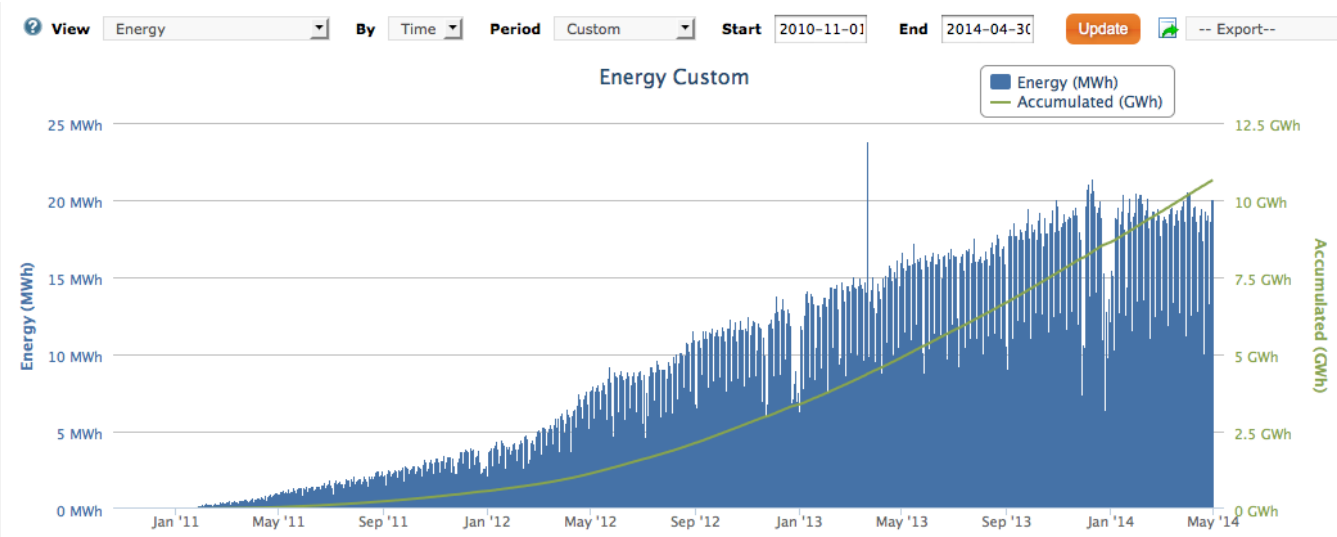
Figures ES-1 and ES-2 show the locations of electric vehicle supply equipment installations and the total amount of energy used for charging between January 2011 and May 2014.

Figure ES-1: Charging Stations Deployed in California, Funded by the CEC and U.S. Department of Energy



Source: ChargePoint

Figure ES-2: Energy Consumed by All California Grant Stations



Source: Report Generated from ChargePoint Portal

CHAPTER 1:
Project Tasks

Project Background

The CEC awarded ChargePoint a $3.417 million grant in 2010. A portion of this funding will be used to match ChargePoint's May 2010 award by the U.S. Department of Energy (U.S. DOE) for the program entitled ChargePoint America. The remainder of this funding will be used to develop a new residential program in California, with an emphasis on multi-dwelling units and homes without garage charging capabilities. We refer to that program as ChargePoint California.

The ChargePoint America Grant

The ChargePoint America (CPA) program demonstrates the viability and economic and environmental benefits of electric vehicle (EV) charging infrastructure. Like many other industries, the speed with which electric transportation will be utilized by consumers and fleet operators is dependent upon the existence and robustness of charging infrastructure. The CPA program is intended to spur a rapid increase in the use of EVs. The CPA program is intended to help support the commercial launch of the Nissan Leaf and Chevrolet Volt.

The overall objective of CPA is to work with City/Area partners throughout the United States to install approximately 4,600 EV charging stations (home, public and commercial).

The program is being developed to support the initial markets targeted by automakers such as Nissan and General Motors. The program includes development of a Regional Allocation Plan.

Funding

In May of 2010, the United States Department of Energy awarded funding to ChargePoint to conduct site surveys, develop public-private partnerships, complete installations and conduct press events to support a $30 million grant for EV Infrastructure deployment in the United States. In November of 2010, the CEC awarded ChargePoint a grant for $3.417 million. A portion of this grant will focus on supporting the U.S. DOE ChargePoint America grant in California.

Both of these grants are designed to address a major obstacle to widespread consumer adoption of battery electric vehicles (BEVs); range anxiety, or consumer perception that early market BEVs have limited range. Range anxiety has been one of the most significant barriers to widespread adoption of EVs. Increased availability and visibility of charging stations in California will allow existing plug-in hybrid electric vehicle (PHEV) owners to charge their vehicles at the stations deployed as a part of this grant. This will result in increasing total EV miles traveled, thus reducing greenhouse gas (GHG) and gasoline usage. In Japan, the mere existence of charging infrastructure reduces range anxiety and increases total EV miles traveled. Before charging infrastructure was deployed, a trial of EVs resulted in 203 km

traveled per month. After stations were deployed, the mileage driven on electricity increased to 1,472 km per month. Thus, by easing the physiological stress of range anxiety, consumers were more apt to use their EVs and travel further. The success of this project will encourage existing PHEV/EV owners to increase vehicle usage.

The ChargePoint California Program

ChargePoint will use a portion of the funds on one of the most challenging residential segments for vehicle supply equipment. The focus will be on residential EV charging for those individuals that live in multi-family dwelling units (MDU) or homes without garages. ChargePoint continues to work with commercial real estate owners, vehicle owners, vehicle manufacturers, government entities, utility companies and other stakeholders to gain insights toward developing a turnkey product offering to service this need. ChargePoint plans to deploy charging stations through this program to serve as a model for penetrating this difficult market segment.

ChargePoint has spent years studying the challenges in rolling out EV charging infrastructure in the MDU environment. ChargePoint is the only provider today that has the technology to address the business model issues unique to developers and rental property owners that can meet the needs of the EV owners in the first critical years of market deployment in California.

The main goal of this project is to increase consumer awareness of EV charging stations in support of EV adoption as Nissan Leafs and Chevrolet Volts enter the marketplace at the end of 2010. This goal will be met by leveraging CEC grant funding with the U.S. DOE funding to accelerate cities and automakers' decisions to deploy EVs charging infrastructure into early adopter markets. The California program will become the national model of a public private partnership with national and statewide support.

Objectives and Tasks

Objectives of the Agreement

The objectives of this Agreement are to cost effectively achieve the following:

- Objective 1: Install 1,290 electric vehicle supply equipment (EVSE) in three regions in California, Los Angeles, Bay Area and Sacramento that are level II stations with networking capabilities.
- Objective 2: Track and measure station adoption and utilization rates over the duration of the project.
- Objective 3: Track and calculate equivalent GHG emissions and gasoline displaced by the project made possible by this grant funding.
- Objective 4: Analyze usage trends to forecast future station locations.
- Objective 5: Participate in a statewide EV infrastructure working group.

Task 2: Station Allocation, Permitting, and Installations

EVSE Coordination

The goal of this task is to provide a coordinated response to the deployment of EVSE in California and to maximize the public benefit.

The specific activities conducted by ChargePoint in this task are:

- Develop regional allocation plans in consultation with key CEC staff and stakeholders in each region. The plan will focus on residential, multi-dwelling units, workplace, public, and fleets, commercial and retail, including:
    - Develop strategy to integrate residential installations with estimated OEM plug-in electric vehicle deployment by geographic location.
    - Develop the MultiCharge San Francisco program to provide charging infrastructure for multi-dwelling units (MDUs) and homes without garages.
    - Identify attributes to make workplace charging a priority.
    - Develop outreach plans for workplace charging.
    - Prioritize and identify state and municipal government fleets that have more need for state funds.
    - Develop strategy to identify, prioritize and support public infrastructure on public property.
    - Successfully complete marketing and advertising campaigns.
    - Identify viable charging sites based on customers' response.
    - Develop strategy to mitigate stranded assets
    - Create and execute a public outreach development plan

EVSE Deployment

The goal of this task is to ensure that each local region has an opportunity to participate in determining the deployment of stations within their region. Discussions with key stakeholders, including cities and local utilities will provide a forum to collaborate on the deployment.

The specific activities to be conducted by ChargePoint in this task are:

- Create and submit site development plans to the CEC. The site plan will include site surveys, installation designs, permitting, and installation quotes.
- Develop contracts for installers and submit a draft of the contract to the CEC.
- Develop site owner contract and submit a draft copy of the agreement to the CEC. The agreement will include site owner responsibility, site preparation, access to site, insurance and indemnity information.

- Track and monitor installation activities after permitting has been completed with contractors and site owners.
- Facilitate communications between contractors, site owners, and ChargePoint.
- Ship charging stations to installation site after agreements are signed.
- Provide technical support to site owners and installers on an as needed basis.
- Integrate newly installed Charging Stations into ChargePoint's network operations system (NOS) after charging stations are installed.
- Ensure that all EV charging stations are accessible on the ChargePoint portal.

ChargePoint California Independent System Operator (California ISO) Demonstration Project

Project Background

Renewable energy is a major source of energy to the California electrical grid. The generation of energy varies with environmental conditions (wind and sunlight). Renewable energy is creating supply gaps due to windless and non-sunny days. The California ISO is currently experiencing two peaks of energy demand during the day, one energy peak in the morning and another peak in the evening. An imbalance between supply and demand can lead to a blackout on the electrical grid. Reducing or shifting load can stabilize the electrical grid. California ISO has identified EV charging stations as a method to fill the supply gaps caused by renewable energy.

Pilot Demonstration Project

ChargePoint is working on a Pilot Demonstration Project with California ISO. The Pilot project will demonstrate demand response, frequency regulation, and ancillary services using EV charging stations.

An early warning to the grid's stability is its frequency. The grid frequency in each part of the nation's power system is carefully controlled to maintain a normal frequency of 60 hertz (Hz). Grid frequency is a grid-wide indicator of any mismatch between generation (supply) and load (demand) on the grid. A change in frequency can be a key indicator of major grid events, such as: a generator tripping off; major loads switching on or off; or an unscheduled interruption of power flows through transmission lines. If not addressed quickly enough, an imbalance between supply and demand can lead to a blackout such as the rolling California blackouts in 2001, or the Northwest Blackout of 2003 that affected nearly 55 million people in Canada and the United States.

The project will enable charging stations to shift load, curtail load and accept excess supply to demonstrate demand response, frequency regulation and ancillary services. The technology will help save precious minutes in the fight to avoid blackouts and brownouts on the energy grid. The ChargePoint technology will provide very low cost demand response and frequency

regulation to help reduce electricity rates, improves the reliability of the grid, and enable renewables.

The technology will provide a greater installed base to aggregate loads for demand curtailment and frequency regulation, thereby avoiding the need to run inefficient GHG emitting peaker power plants.

Project Goals

- 100KW load
- 70 Charging Stations
- Bid in California ISO market

Benefits of Pilot Project

- Integration of EVSE's into Demand Response programs
- Load shedding and load shifting to reduce demand charges
- Impact of EVSE demand response on drivers
- Understanding the behavior of drivers
- Efficient management of the charging stations
- Economic benefits by participating in demand response programs and California ISO market
- No impact on drivers since charging rate will be tapered
- Charging stations will never be turned off

The specific activities conducted by ChargePoint in this task are:

ChargePoint reviewed documentation received from California ISO on the application programming interface and agreements. Reviewed the project scope and milestone and planned to implement the project in multiple phases.

- Defined the project scope and prepared a project plan for the energy services project. Reviewed all the requirements and agreements. California ISO raised bundled load as an issue and we discussed the issue with the California Public Utilities Commission (CPUC) and are looking forward to their advice on the issue.
- Continued discussions with the CPUC and California ISO on the energy services pilot project. We identified Olivine as a scheduling coordinator and had discussion with them. We are planning to reach out to direct access customers instead of bundled customers at this time since rule 24 is not signed. We decided to keep the load at 100KW as per feedback from California ISO. We are also working with California ISO on using ChargePoint's meter instead of utility grade meter. We are making progress on the API

development effort. We are planning to reach out to recruit customers for the pilot project.

CHAPTER 2:
Results for Charger Installations and Energy Consumption

Charger Installations

ChargePoint installed 1,473 charging stations throughout California with the funds provided by the CEC grant. See Table 1.

Table 1: Deployed Stations in California funded by the CEC

Type	Number of Charging Stations
Residential	1,148
Commercial	231
Multi family	94
Total	1,473

Source: ChargePoint

ChargePoint deployed an additional 2,138 charging stations that were funded primarily by the Department of Energy. The CEC contributed funding for labor for these stations. **For purposes of this report, these stations are not included in the final benefit calculations.**

Table 2: Deployed Stations in California funded by the CEC and U.S. DOE Grants

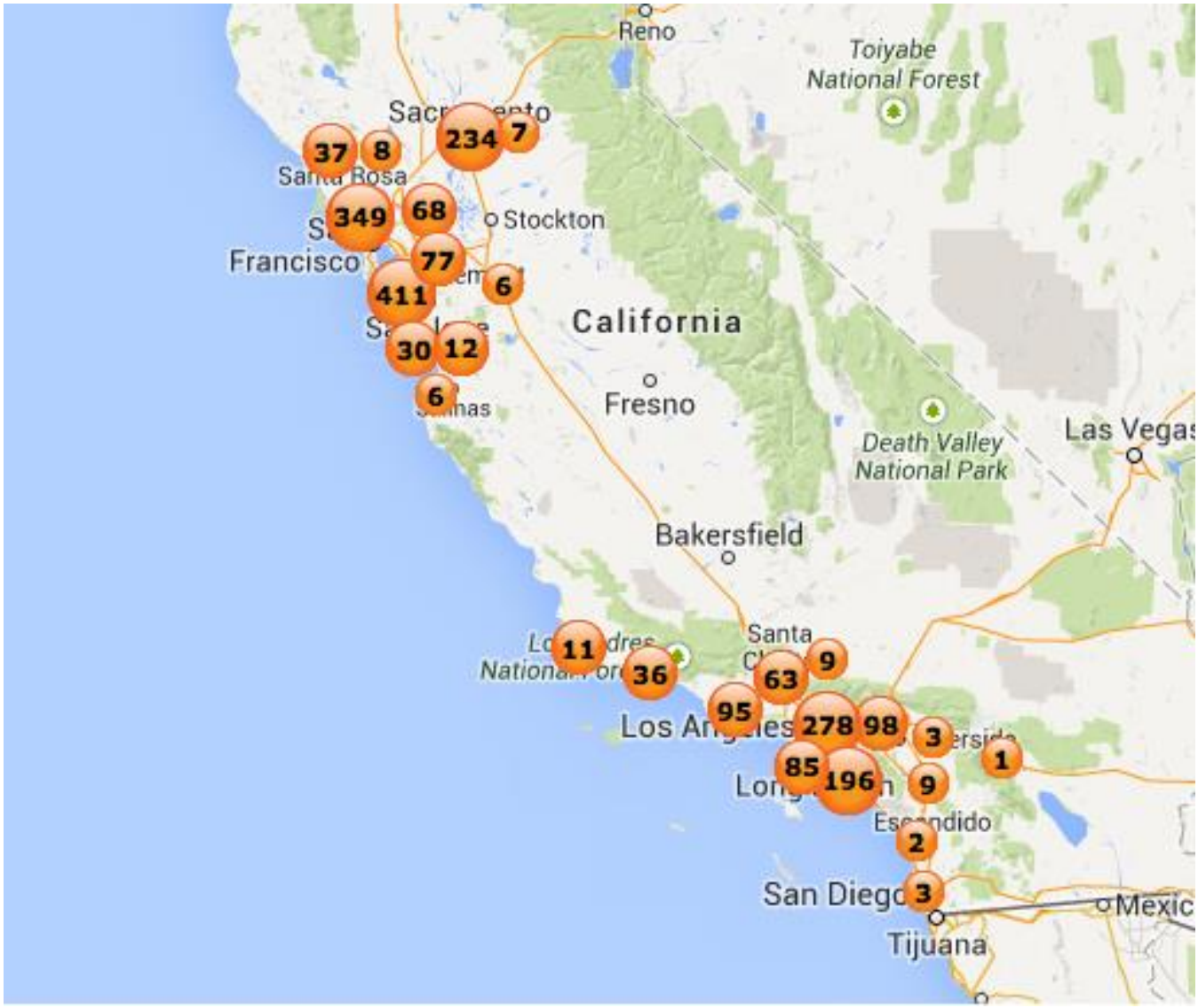
Type	Number of Charging Stations
Residential (Including MDU)	1,228
Commercial	840
Workplace	70
Total	2,138

Source: ChargePoint

Charger Locations and Quantities

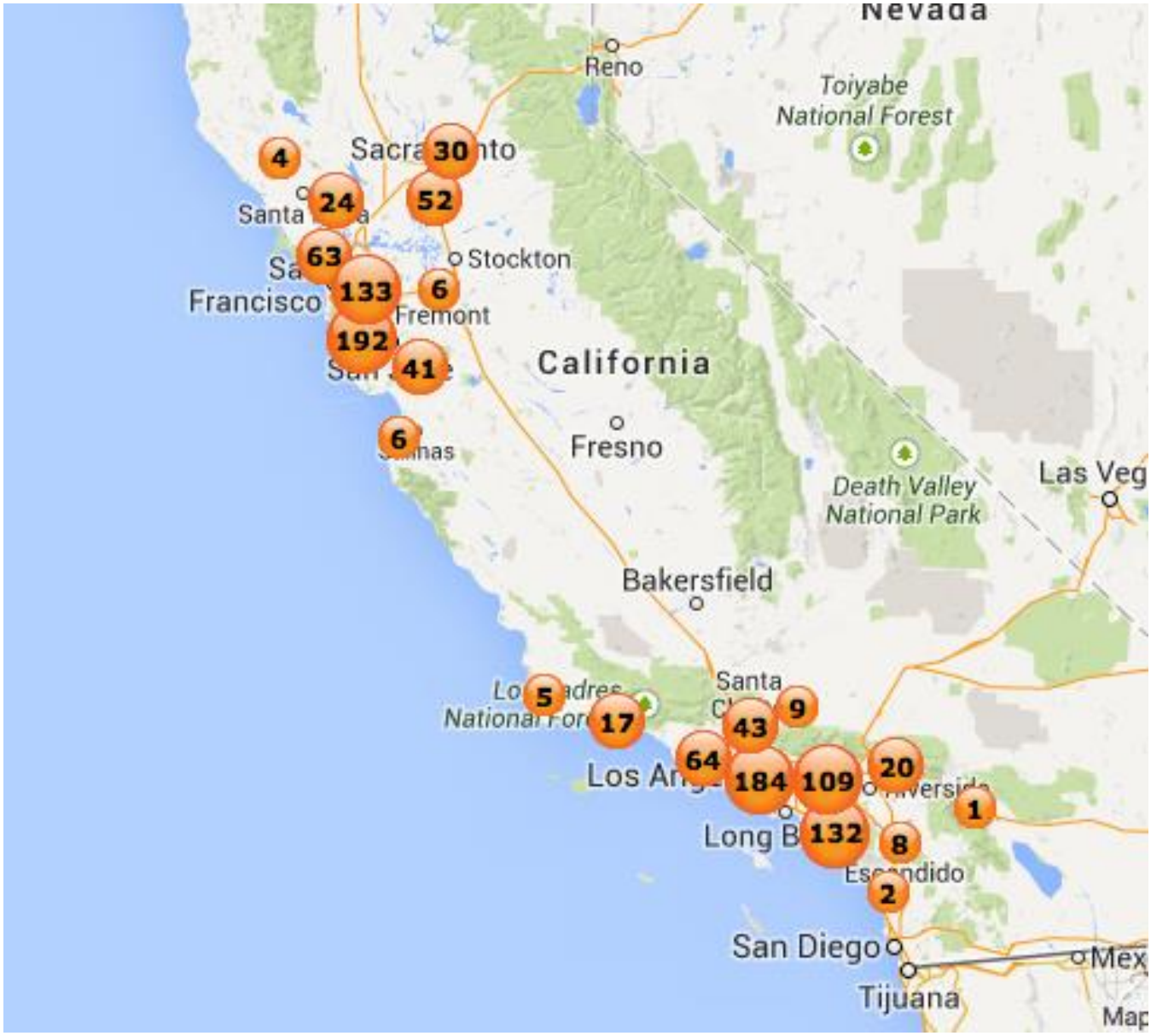
Figures 1 through 8 depict residential and commercial charger installation locations and quantities for Northern California, Southern California, and the Sacramento region.

Figure 1: Charging Stations Deployed in California, Funded by the CEC and U.S. DOE



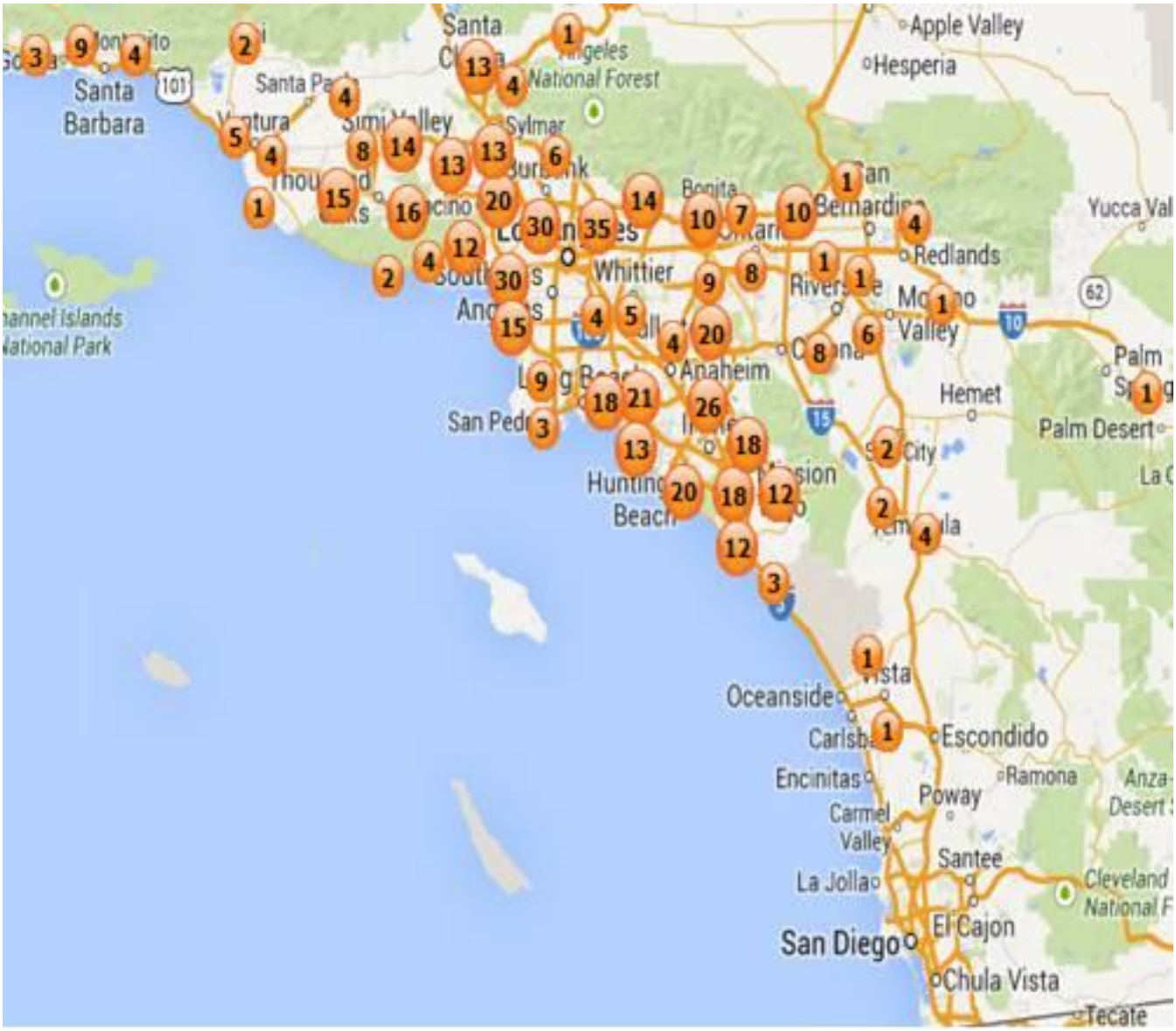
Source: ChargePoint

Figure 2: Residential Charging Stations Deployed and Funded by Grant



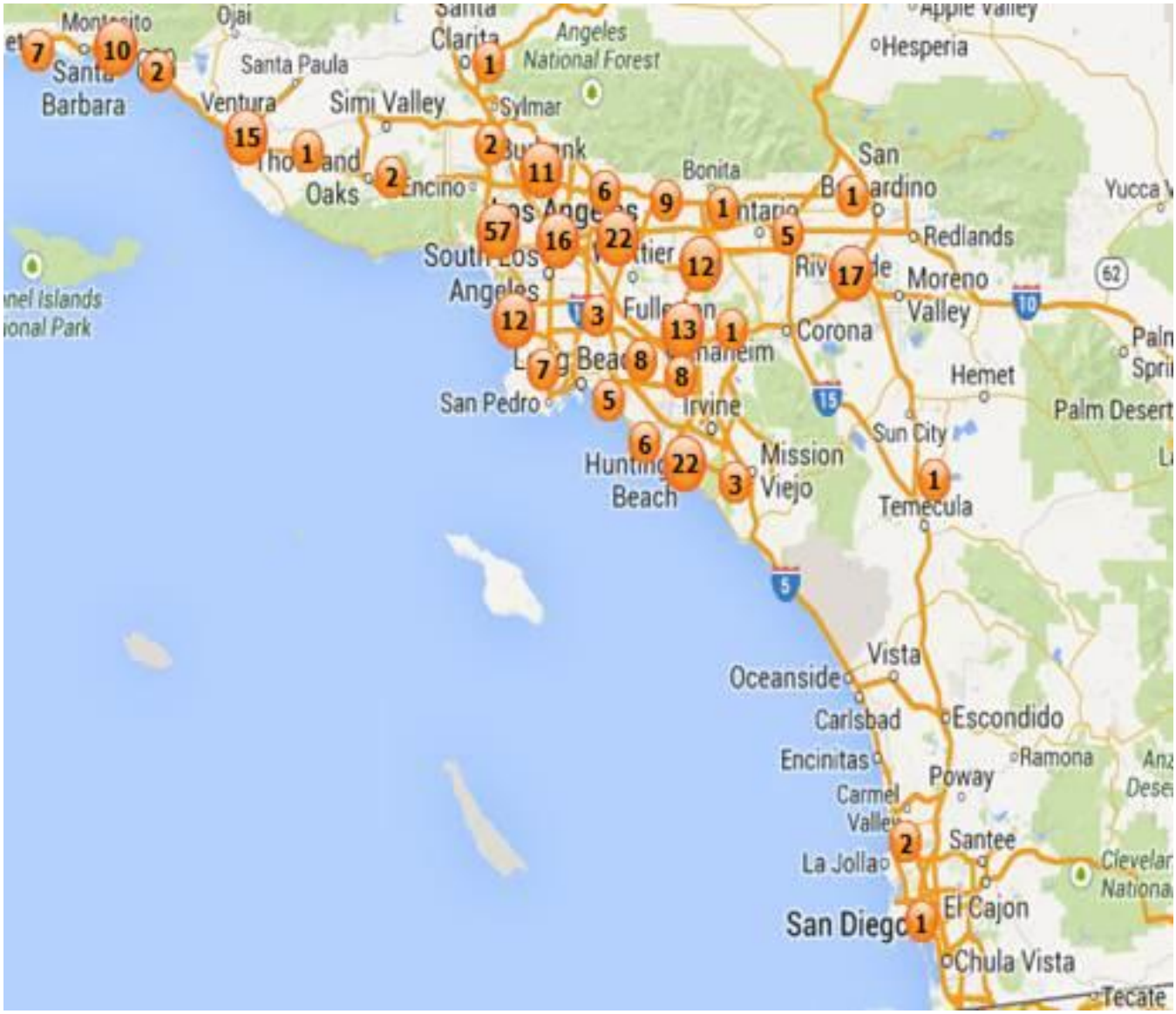
Source: ChargePoint

Figure 3: Los Angeles Region Deployed Residential Charging Stations



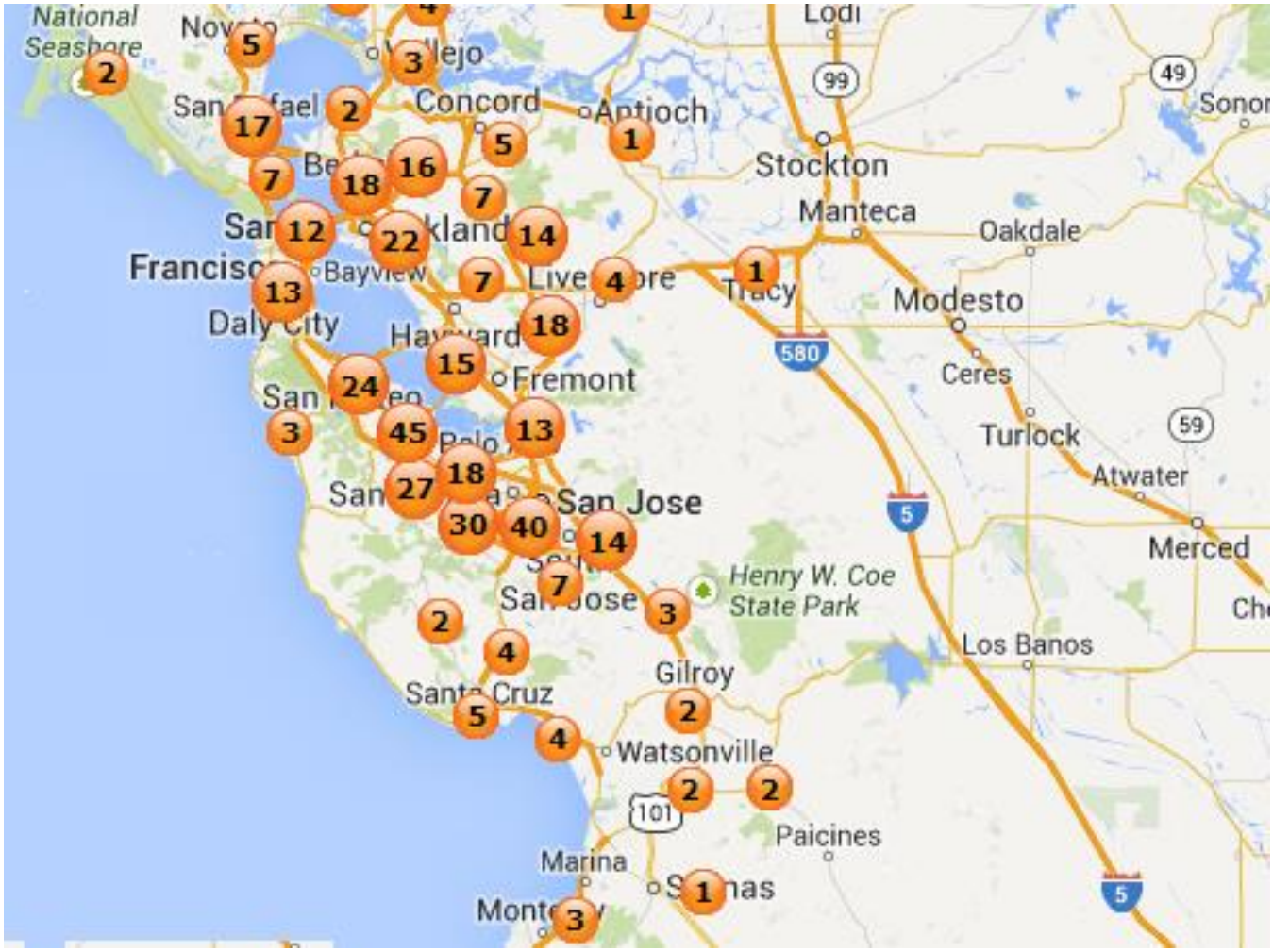
Source: ChargePoint

Figure 4: Los Angeles Region Deployed Public Charging Stations



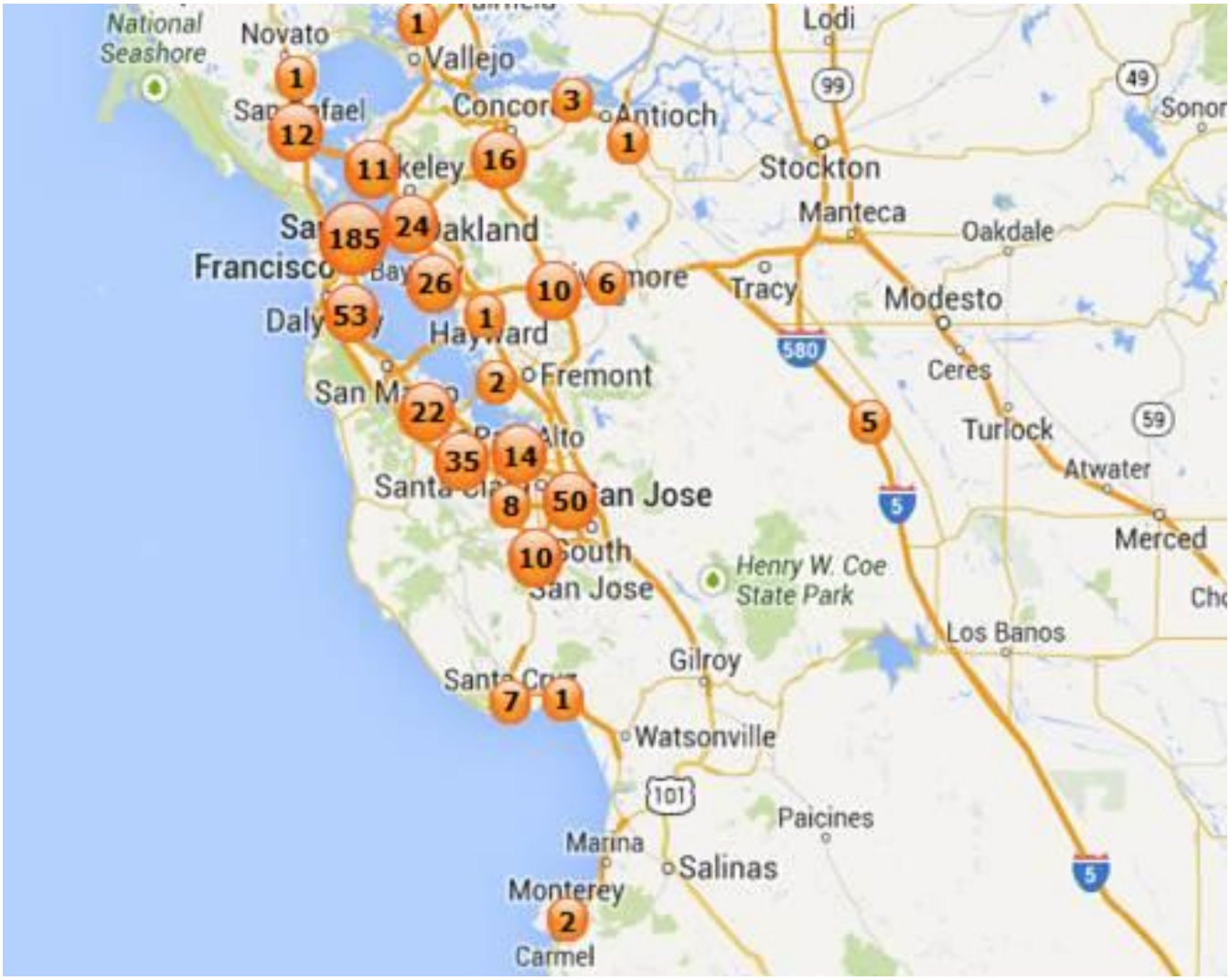
Source: ChargePoint

Figure 5: San Francisco Bay Area Deployed Residential Charging Stations



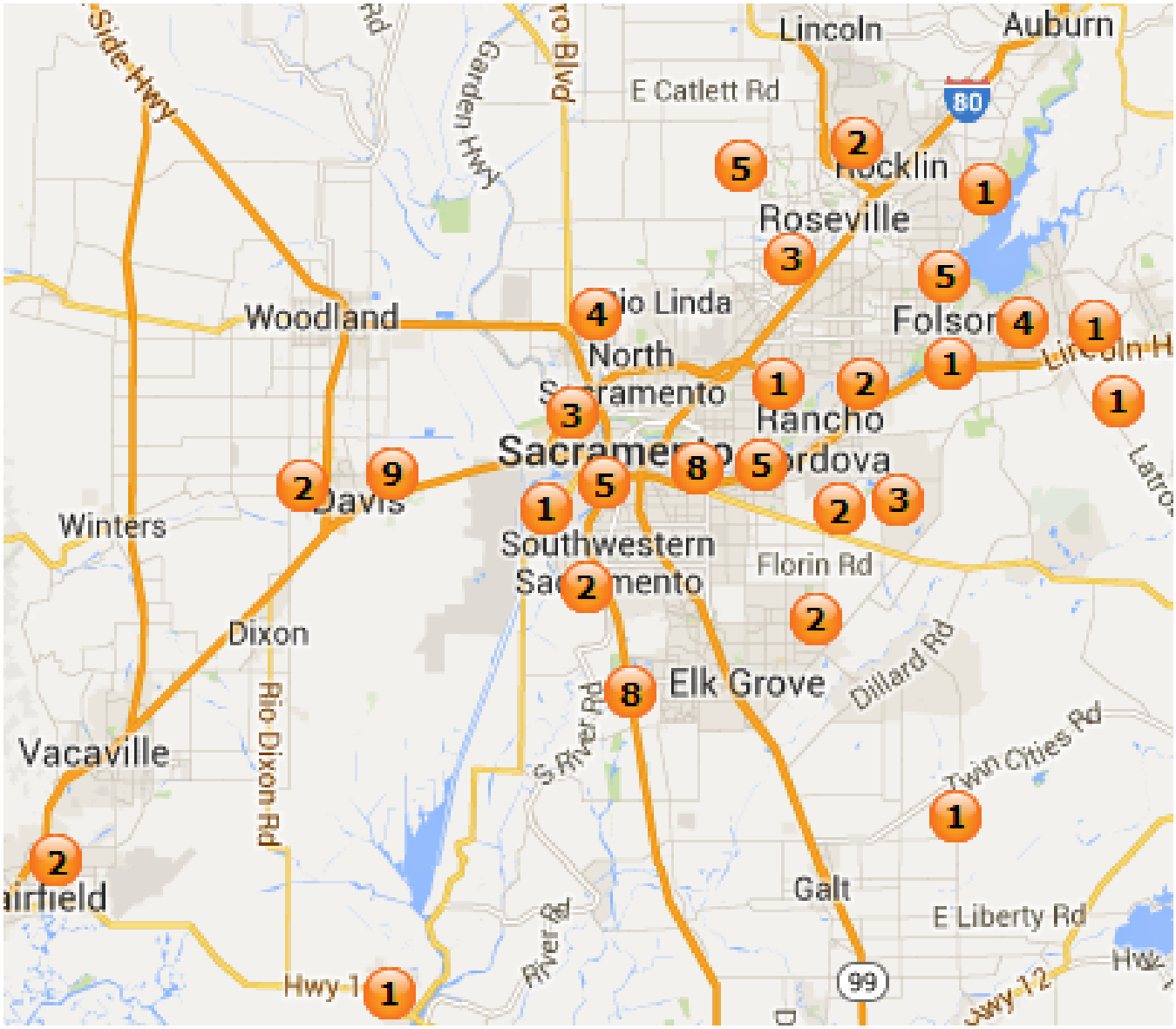
Source: ChargePoint

Figure 6: San Francisco Bay Area Deployed Public Stations



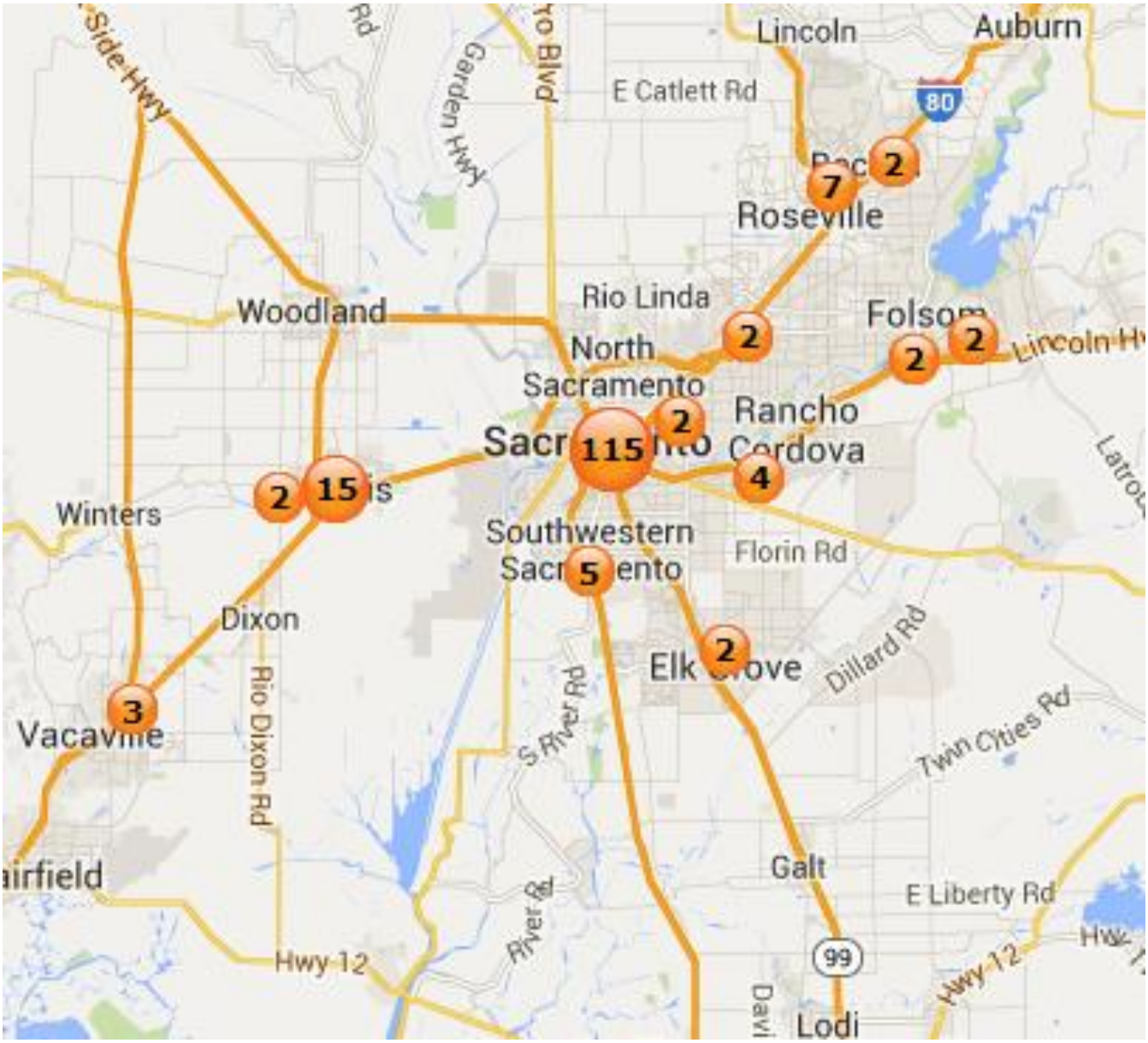
Source: ChargePoint

Figure 7: Sacramento Deployed Residential Charging Stations



Source: ChargePoint

Figure 8: Sacramento Deployed Commercial Charging Stations



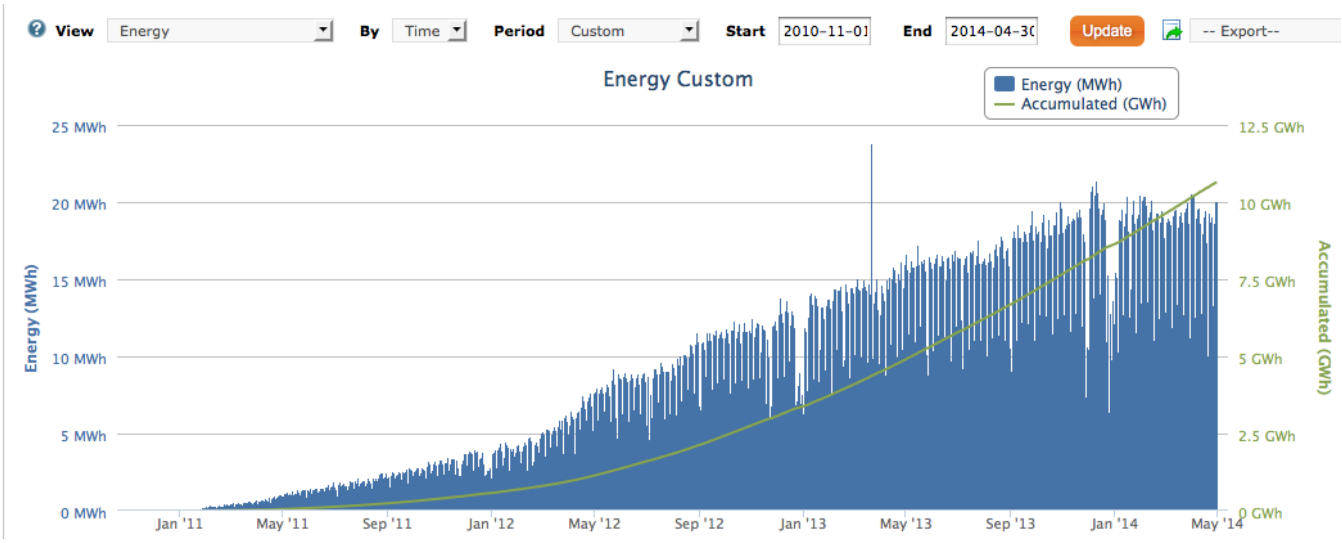
Source: ChargePoint

Energy Consumption

Figures 9 through 11 display energy consumption from the installed EV chargers from January 2011 to April 2014. The figures show total energy consumption and then energy consumption for the commercial and residential stations.

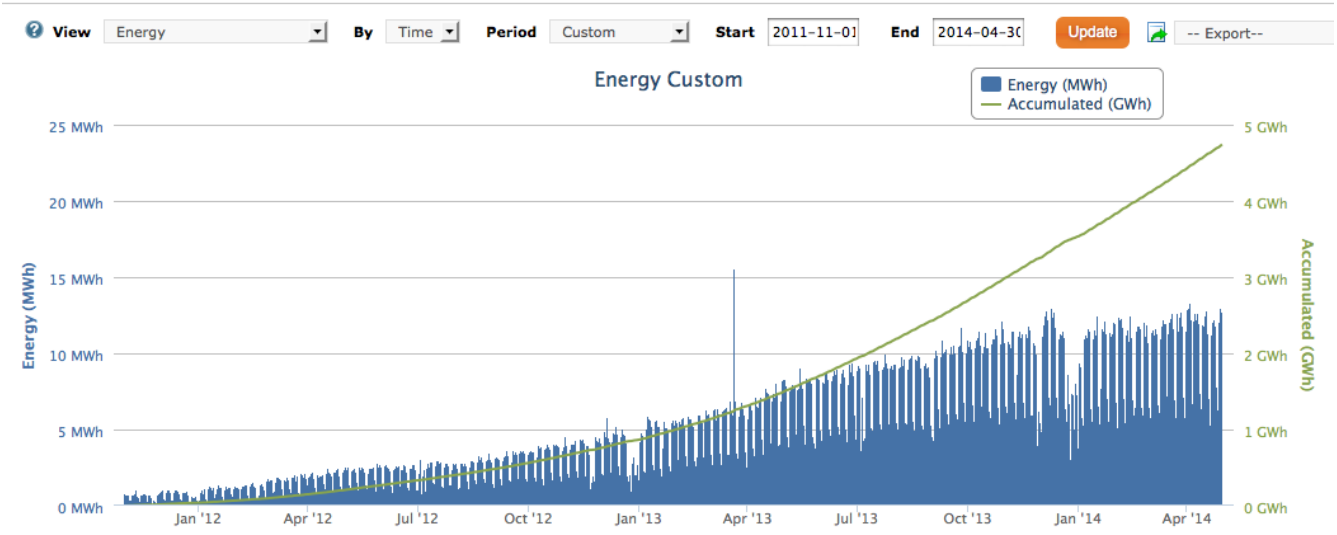
Figures 12 and 13 show charging data and load profiles for the greater Los Angeles region and the San Francisco Bay Area and Sacramento regions.

Figure 9: Energy Consumed by All Grant Stations



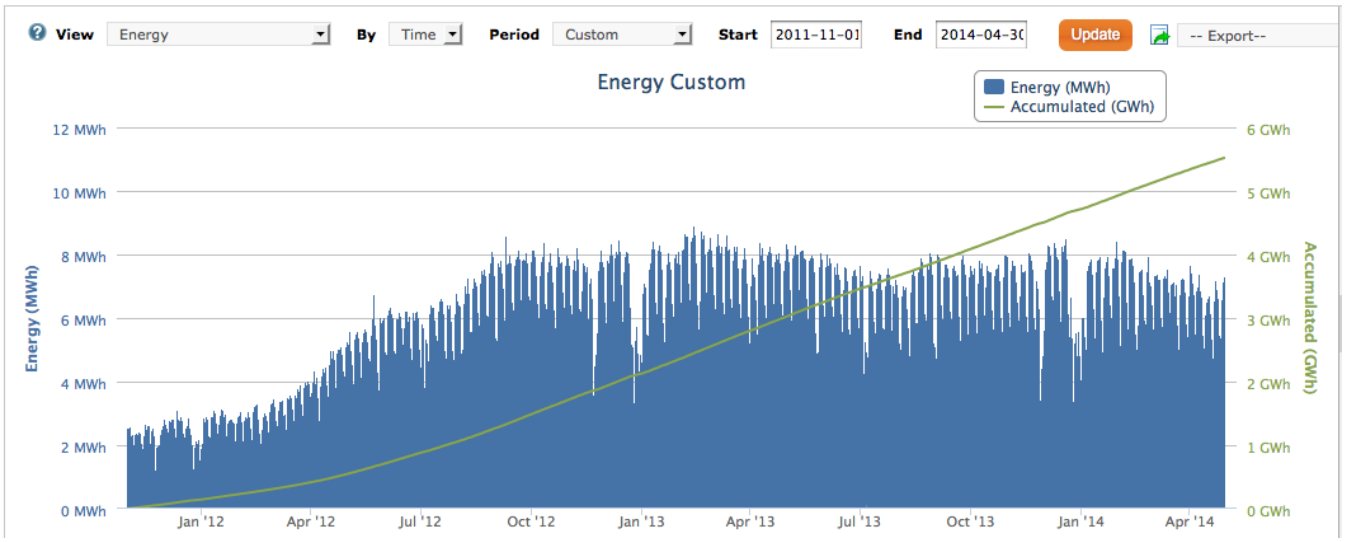
Source: Report Generated from ChargePoint Portal

Figure 20: Energy Consumed by Commercial Stations



Source: Report Generated from ChargePoint Portal

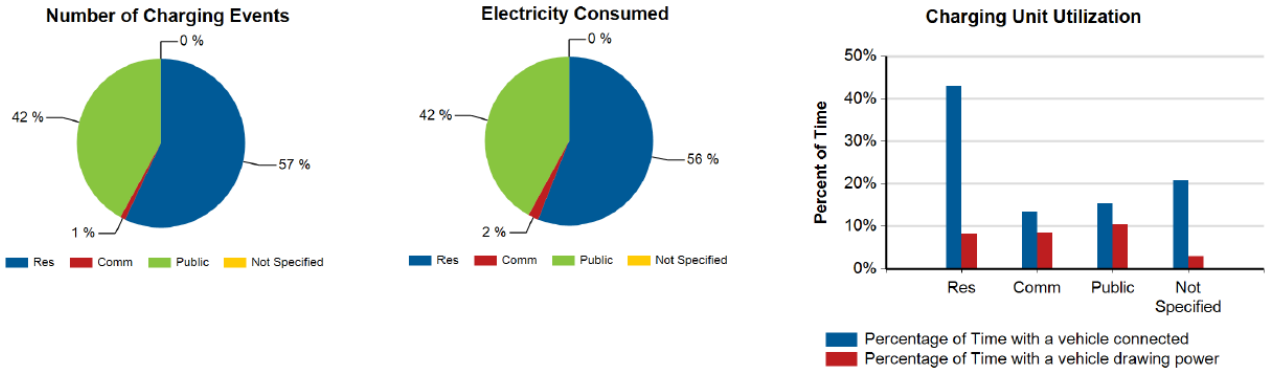
Figure 11: Energy Consumed by Home Stations



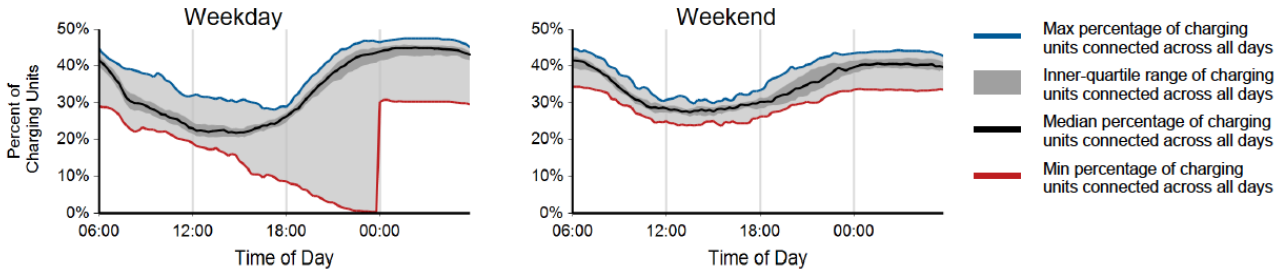
Source: Report Generated from ChargePoint Portal

Figure 12: Los Angeles Region Charging Data

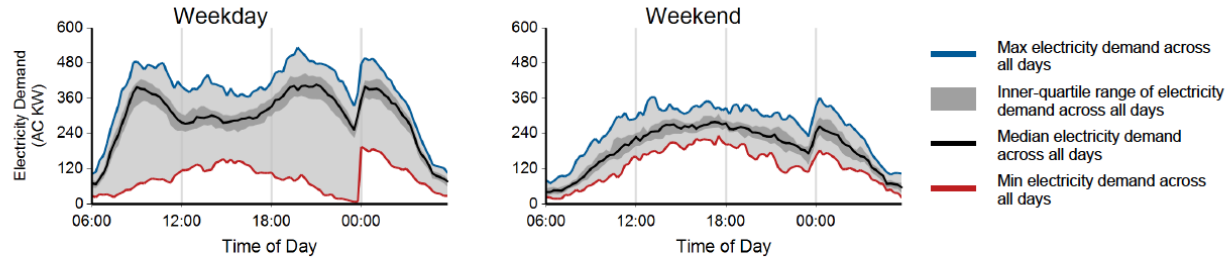
Charging Unit Usage - By Type	Residential	Private Nonresidential	Publicly Accessible	Not Specified	Total
Number of charging units[1]	532	14	271	3	820
Number of charging events[2]	42,322	1,066	31,128	78	74,594
Electricity consumed (AC MWh)	312.59	9.49	234.71	0.58	557.36
Percent of time with a vehicle connected	43%	13%	15%	21%	33%
Percent of time with a vehicle drawing power	8%	8%	10%	3%	9%



Charging Availability: Range of Charging Units with a Vehicle Connected versus Time of Day Percentage



Charging Demand: Range of Aggregate Electricity Demand versus Time of Day



[1] Includes all charging units that were in use during the reporting period and have reported data to the INL

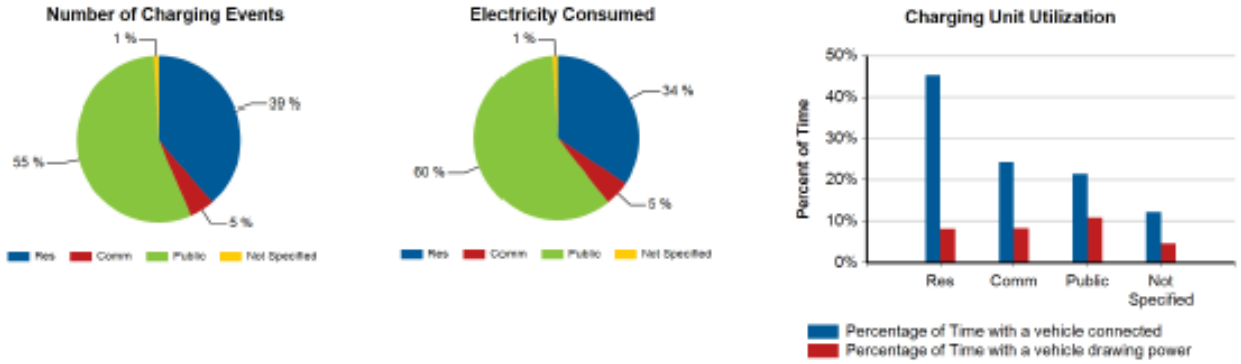
[2] A charging event is defined as the period when a vehicle is connected to a charging unit, during which period power is transferred

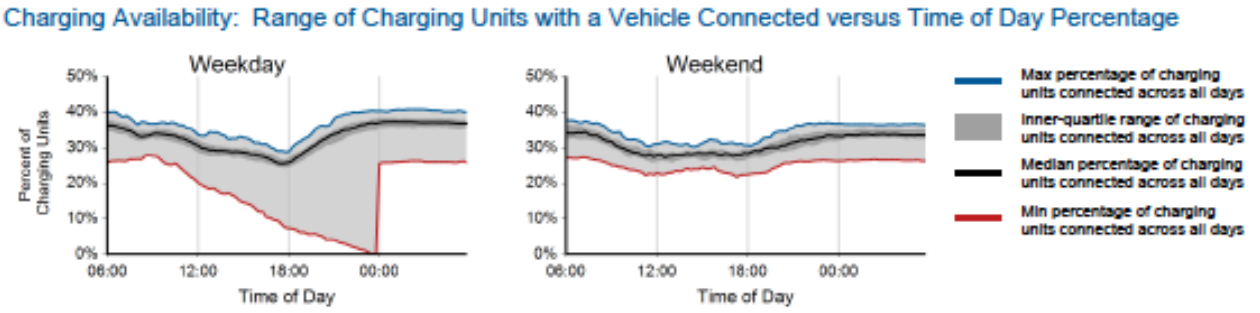
Note: Weekends start at 6:00am on Saturday and end 6:00am Monday local time

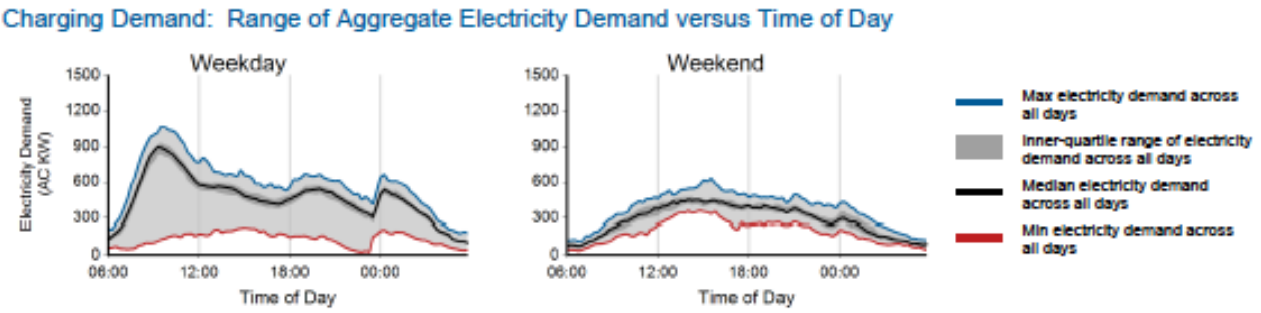
Source: INL October 2013 – December 2013 Report

Figure 13: Sacramento/San Francisco Region Charging Data

Charging Unit Usage - By Type	Residential	Private Nonresidential	Publicly Accessible	Not Specified	Total
Number of charging units[1]	510	65	560	21	1,156
Number of charging events[2]	40,669	5,072	58,350	993	105,084
Electricity consumed (AC MWh)	298.57	44.18	516.25	8.96	867.97
Percent of time with a vehicle connected	45%	24%	21%	12%	32%
Percent of time with a vehicle drawing power	8%	8%	11%	5%	9%







[1] Includes all charging units that were in use during the reporting period and have reported data to the INL

[2] A charging event is defined as the period when a vehicle is connected to a charging unit, during which period power is transferred

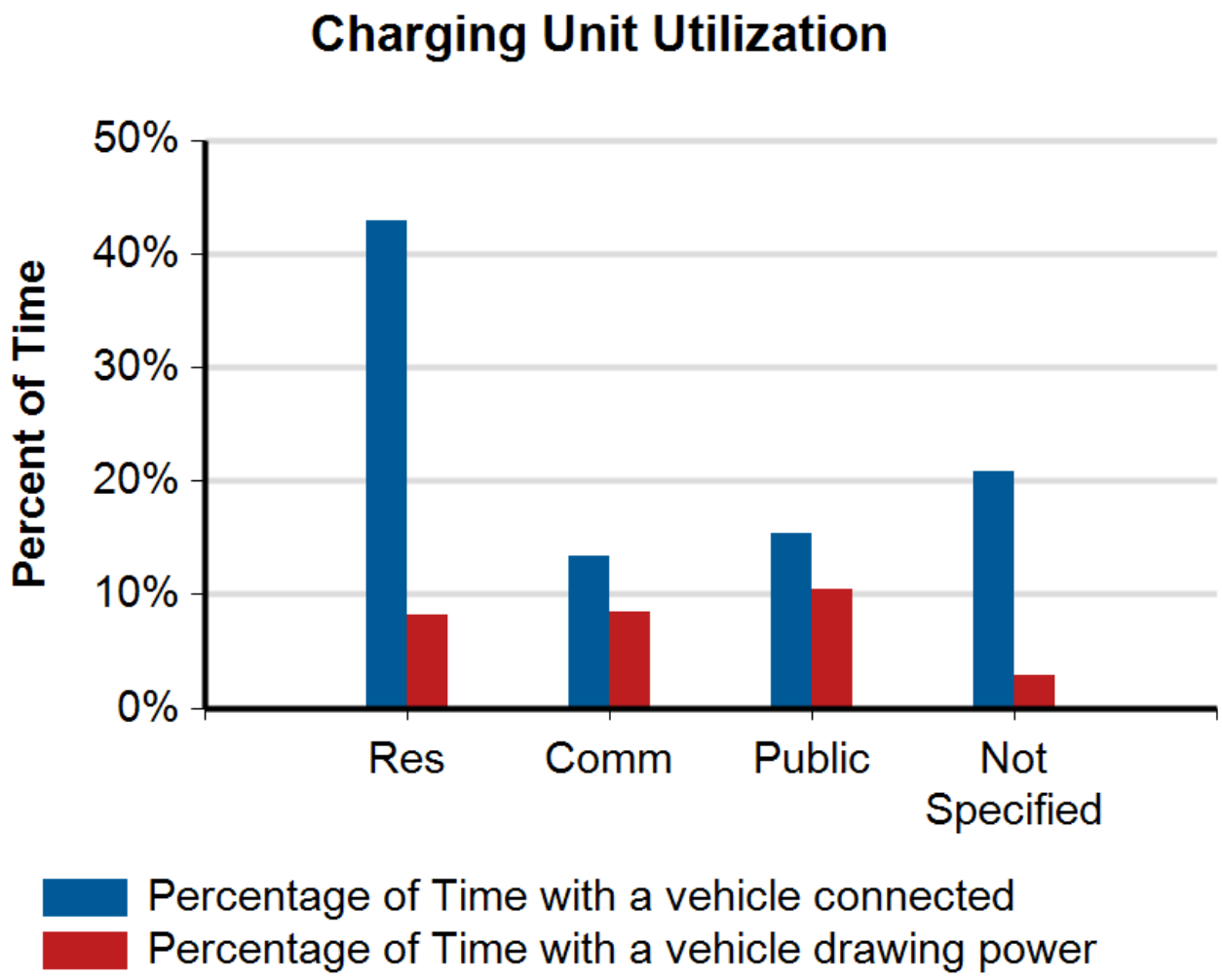
Note: Weekends start at 6:00am on Saturday and end 6:00am Monday local time

Source: INL October 2013 – December 2013 Report

Charging Utilization Rates

ChargePoint tracked and measured station adoption and utilization rates over the duration of the project. Charging station adoption rate was slow at the beginning of the program but later picked up as more EV's came on to the market, eventually exceeding the grant goals. Our operational goal was to deploy 1,290 charging stations in three regions in California and we exceeded our goals and deployed 1,473 charging stations. These stations cumulated in 1,115,549 charging events through December 31, 2013. The utilization rate of residential stations is over 40 percent and over 10 percent for commercial stations. Figure 14 shows the charging station utilization rate for the Los Angeles Region. The inset chart from Figure 13 shows the charging station utilization rate for the Sacramento – San Francisco Regions.

Figure 14: Charging Unit Utilization



Source: ChargePoint

ChargePoint analyzed usage trends to forecast future station locations. Usage trends were analyzed on a regular basis. One finding is that there are more EVs than charging

infrastructure at workplaces and multi-family housing. In many public places, there is a dearth of charging stations. Based on the current trend more charging infrastructure is needed in workplaces, multi-family housing, and public places.

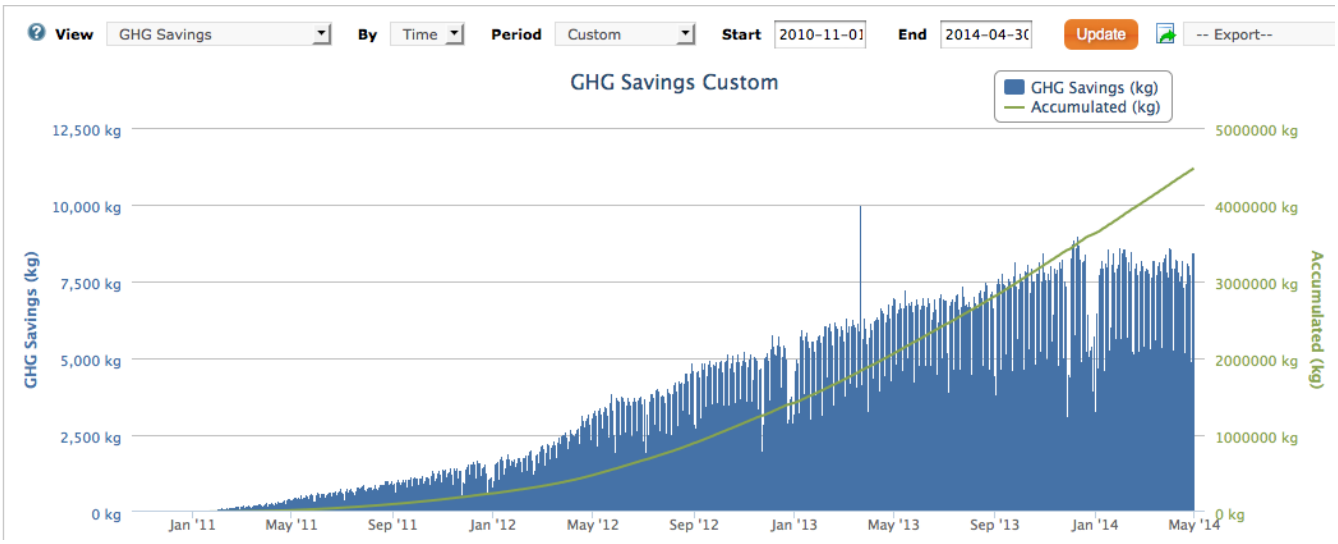
CHAPTER 3:
Project Benefits

GHG Reduction Benefits

ChargePoint tracked and calculated GHG emissions and gasoline displaced on the project. Drivers used the 1,473 charger stations over 1.1 million times during the project study period of January 2011 to May 2014. This usage level generated 4,474,765 kilograms of GHG savings (4,474 metric tons) and displaced 1,337,077,000 gallons of gasoline. The U.S. Environmental Protection Agency's (U.S. EPA's) formula was used in the calculation of GHG savings and gasoline displaced. The U.S. EPA formula can be found with the U.S. EPA's energy resources calculator (http://www.epa.gov/cleanenergy/energy-resources/calculator.html).

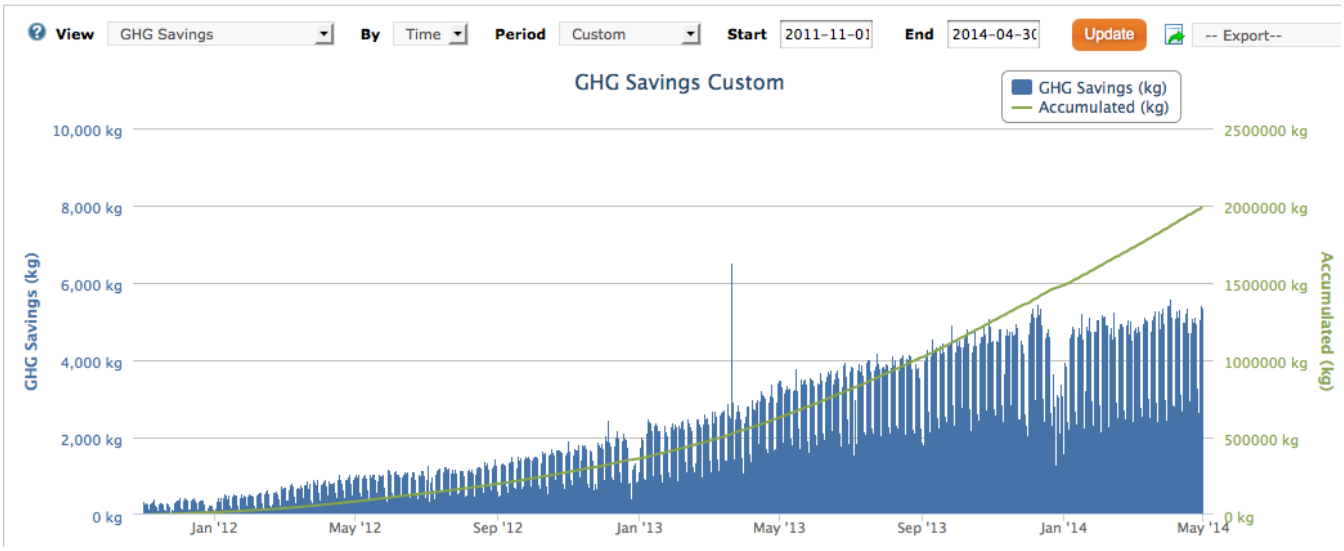
Figures 15, 16 and 17 show GHG reductions by all stations, commercial stations and residential stations respectively.

Figure 15: GHG Savings by All California Grant Stations



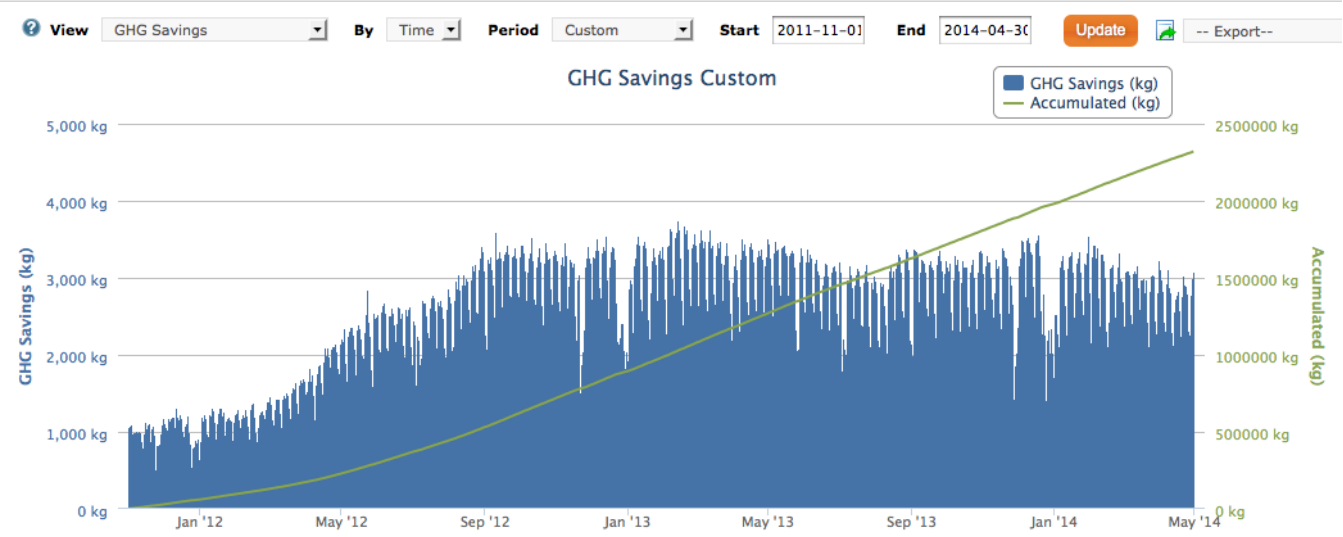
Source: Report Generated from ChargePoint Portal

Figure 16: GHG Savings by California Commercial Stations



Source: Report Generated from ChargePoint Portal

Figure 17: GHG Saving by California Home Stations



Source: Report Generated from ChargePoint Portal

Petroleum Reduction Benefits

Reducing consumption of petroleum within a region provides economic benefits since petroleum expenditures tend to leave a region (due to the high level of petroleum imports). This is not true for electricity purchases, which tend to remain in local communities. In addition, because electricity is cheaper than petroleum as a transportation fuel (on a per mile basis), moving from conventional vehicles to EVs gives households more disposable income that can be used for local goods and services.

Emission Reduction Benefits

From an environmental standpoint, EVs are cleaner than conventional vehicles, particularly for pollutants such as nitrogen oxides, volatile organic compounds, fine particulate matter, and carbon monoxide (CO). EVs also reduce emissions of GHGs. By reducing these emissions, EVs may reduce regulatory compliance cost pressures on stationary sources. Those sources, facing lower compliance costs, would be able to redirect those cost savings towards employee compensation, capital investment, and other productive uses.

Economic Benefits

ChargePoint, the developer of software and hardware for this project, is a California-based firm located in Campbell California currently employing over 100 people. This project will have an impact on ChargePoint's ability to retain these current jobs and through the commercialization of this new technology, create new ones. ChargePoint's ability to export products and services benefits California economically. Initially the contract manufacturer in San Jose, California, which resulted in manufacturing sector jobs, manufactured the products. The primary job type directly created and/or retained by this project will be in engineering, sales, marketing and manufacturing. Fifteen ChargePoint employees directly worked on this project and several others indirectly worked on the project.

New jobs are also being created in the battery manufacturing industry and in the construction, operation, and maintenance of a California charging infrastructure network.

The project has boosted local and California economy with electric car sales and charging stations sales as California accounts for 50 percent of the EV sales. The cost of an EV is higher than a gasoline vehicle. The state benefits from the sales tax on EVs and the charging stations.

From a micro-economic standpoint, electricity prices are significantly less volatile than gasoline prices. Over the past 25 years, electricity prices have risen steadily but slowly. Electricity prices have risen by an average of less than two percent per year in nominal terms and have actually fallen in real terms. The price of gasoline, on the other hand, is expected to rise by 65 percent between 2009 and 20151.

ChargePoint Fundraising Success

ChargePoint recently secured additional $22.6 million funding, raised $110 million to date and the investors include Kleiner Perkins, Braemar Energy, Rho Capital Partners, Voyager Capital, Siemens, Toyota and BMW. The press release can be found at:

1 Energy Information Administration/Annual Energy Report 2008, pp 261

- "Charge Point Raises an Additional $22.6 Million in Venture Capital Funding" (https://www.chargepoint.com/about/news/chargepoint-raises-additional-226-million-venture-capital-funding/)
- "Coulomb Technologies Announces Completion of Series D Financing Raising $47.5 Million" (https://www.chargepoint.com/about/news/coulomb-technologies-announces-completion-series-d-financing-raising-475-million/)
- "BMW i Ventures Announces Strategic Investment in Coulomb Technologies" (https://www.chargepoint.com/about/news/bmw-i-ventures-announces-strategic-investment-coulomb-technologies/)

GLOSSARY

BATTERY ELECTRIC VEHICLE (BEV) - Also known as an "All-electric" vehicle (AEV), BEVs utilize energy that is stored in rechargeable battery packs. BEVs sustain their power through the batteries and therefore must be plugged into an external electricity source in order to recharge.

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

- Forecasting future statewide energy needs
- Licensing power plants sufficient to meet those needs
- Promoting energy conservation and efficiency measures
- Developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels
- Planning for and directing state response to energy emergencies.

CALIFORNIA INDEPENDENT SYSTEM OPERATOR (California ISO) – Maintains reliability on one of the largest and most modern power grids in the world, and operates a transparent, accessible wholesale energy market. The organization works diligently around the clock to meet the electricity needs of consumers, while increasing the amount of renewable energy to usher in the clean, green grid of the future.[2]

CALIFORNIA PUBLIC UTILITIES COMMISSION (CPUC) - A state agency created by constitutional amendment in 1911 to regulate the rates and services of more than 1,500 privately owned utilities and 20,000 transportation companies. The CPUC is an administrative agency that exercises both legislative and judicial powers; its decisions and orders may be appealed only to the California Supreme Court. The major duties of the CPUC are to regulate privately owned utilities, securing adequate service to the public at rates that are just and reasonable both to customers and shareholders of the utilities; including rates, electricity transmission lines and natural gas pipelines. The CPUC also provides electricity and natural gas forecasting, and analysis and planning of energy supply and resources. Its main headquarters are in San Francisco.

2 California Independent System Operator (http://www.caiso.com/about/Pages/default.aspx)

CARBON MONOXIDE (CO) - A colorless, odorless, highly poisonous gas made up of carbon and oxygen molecules formed by the incomplete combustion of carbon or carbonaceous material, including gasoline. It is a major air pollutant on the basis of weight.

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

ELECTRIC VEHICLES (EV) – A broad category that includes all vehicles that are fully powered by electricity or an electric motor.

GREENHOUSE GASES (GHG) – Any gas that absorbs infra-red radiation in the atmosphere. Greenhouse gases include water vapor, carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), halogenated fluorocarbons (HCFCs), ozone (O3), perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs).

PARTICULATE MATTER (PM) - Unburned fuel particles that form smoke or soot and stick to lung tissue when inhaled. A chief component of exhaust emissions from heavy-duty diesel engines.

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

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

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.