CALIFORNIA ENERGY COMMISSION

California Energy Commission

Clean Transportation Program

FINAL PROJECT REPORT

County of Riverside Economic Development Agency Electric Vehicle Infrastructure Expansion Project

Prepared for: California Energy Commission

COUNTY OF RIVERSIDE EDA ECONOMIC DEVELOPMENT AGENCY

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PREFACE

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

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

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

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the Energy Commission's annual Clean Transportation Program Investment Plan. The Energy Commission issued PON-13-606 to provide funding opportunities for Electric Vehicle Charging Infrastructure. In response to PON-13-606, the recipient submitted an application for proposed funding from the Energy Commission's Notice of Proposed Awards April 4, 2014. The agreement was executed as ARV-13-046 on August 12, 2014.

ABSTRACT

The County of Riverside Economic Development Agency applied for and received a California Energy Commission grant (ARV-13-046) for the installation of 45 electric vehicle charging stations across Riverside County. This final report documents the project objectives, data collection and analysis, project performance, benefits, and innovation and sustainability. The project completed the installation of three Direct Current Fast Chargers and 42 Level 2 at various county facilities throughout Riverside County. This report provides an overview of various observations and lessons learned during the project.

Riverside County's Electric Vehicle Infrastructure Expansion Project addressed local demand and regional needs through the development of a regional electric vehicle network. The project was designed to address the lack of destination, corridor, and workplace electric vehicle charging stations. Through the installation of the additional 45 electric vehicle charging stations, the number of existing charging stations has doubled in Riverside County.

Keywords: County of Riverside, County of Riverside Economic Development Agency, electric vehicle charging stations, electrical vehicle infrastructure, workplace charging, destination charging, corridor charging, transportation electrification

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EXECUTIVE SUMMARY

The County of Riverside was awarded a California Energy Commission grant to develop an electric vehicle infrastructure expansion project. The County of Riverside Economic Development Agency Electric Vehicle Infrastructure Expansion Project deployed 87 charging ports, of which 84 charging ports are at the 240 Volt Level 2 and three are at the 480 Volt Level 3 which is often called direct current fast charger. The new charging stations were installed at 27 various Riverside County facilities. This report seeks to provide an overview of observations and lessons learned during the completion of the Project.

Station Categories

A combination of corridor, destination, and workplace charging station locations were chosen for this project.

- Corridor Stations – Corridor stations are within one mile of a major freeway. These stations were sited so that it is possible to drive from Riverside to Blythe using an electric vehicle with good range.
- Destination Stations – Destination stations are sites where drivers are likely to spend 1-4 hours of time. A few of the sites selected for this type of station include the County Fairgrounds, Crestmore Manor, and Western Riverside Animal Shelter.
- Workplace Stations – Workplace stations are sites with a large number of County employees. Workers are welcome to plug in an electric car.

Goals and Objectives

The project addressed the following goals and objectives:

- Addressed local demand and regional needs through the development of a regional electric vehicle charging network.
- Asserted regional leadership by aligning with Regional Plug-in Electric Vehicle plans.
- Increased zero emission vehicle market penetration by adopting a market vision and business plan for fueling infrastructure.
- Delivered air quality benefits to the region including reduction in greenhouse gas emissions.

CHAPTER 1:
Goals and Plans

Overview

The County of Riverside's Economic Development Agency (EDA) Electric Vehicle (EV) Infrastructure Expansion Project deployed a total of 87 charge points, of which 84 charge points are at the Level 2 240 Volt, and three are at the Level 3 480 Volt. All the requirements of the grant were met. Three sites were removed from the proposed list due to insurmountable American with Disabilities Act (ADA) challenges and those charging stations were moved to the remaining 27 sites. Refer to Appendix A, EV Project-Station Count Table, for the detailed listing of site locations and number of stations/charge points installed. A project preceded this one at seven other sites across the County. Through the installation of the additional 45 electric vehicle service infrastructure equipment, the number of existing charging stations has doubled in Riverside County and an online map is available for public use.[1]

Operational Goals and Objectives

The Economic Development Agency did this Project to address the concerns regarding the lack of EV infrastructure in the region. The market for plug-in electric vehicles (PEVs) is expanding. Before this project, the County PEV Infrastructure was altogether lacking, with only 44 electric vehicle chargers existing in the region according to the Western Riverside Council of Governments' (WRCOG), PEV Atlas and Coachella Valley Association of Governments' (CVAG) draft PEV Readiness Plan. There was not enough infrastructure in 2015 to support the PEV surge in Riverside County, which is expected to reach 57,000 by 2022. The Project goals were to support the growth of electric vehicles as a method of transportation in the region and to increase the adoption of PEVs. EDA has met the Project goals through the implementation of the following objectives:

- Objective 1: Coordinate the regional agencies and site hosts to specifically address the need for workplace, corridor and destination charging along major interstates in the Riverside County region.
- Objective 2: Provide and install 45 electric chargers in locations that are easily accessible to the public, safe, well lit, and well maintained.
- Objective 3: Train site participants on usage of the station hardware and software to enable them to set pricing policies to generate revenue, enable efficient on site policies

[1] Riverside County's EV charging locations https://www.rivcoenergy.com/ev-charging-stations

to maximize station usage, determine electricity use, use maintenance features for ongoing operations and maintenance planning, and use on-going reporting functions.

- Objective 4: Track and measure station adoption and utilization rates over the duration of the project.
- Objective 5: Track and calculate equivalent greenhouse gas emissions and gasoline displaced by grant funding.
- Objective 6: Analyze usage trends to forecast future station locations in the region.

The siting of charging infrastructure is a key component of successful EV deployment and requires the consideration of a multitude of factors. EDA carefully selected sites that would address the lack of EV infrastructure in the areas of workplace, corridor, and destination locations. Each site was vetted against criteria defined in the Coachella Valley Association of Governments Draft Plug-in Electric Vehicle Readiness Plan, the Western Riverside County Plug-in Electric Vehicle Deployment Plan, the 2014 Riverside County Employee EV Use Survey, and data collected by the ChargePoint network. Table 1 shows the three types of targeted sites chosen: workplace charging with 60 ports, destination charging with 14 ports, and corridor charging with 13 ports.

Table 1: Types of Charging Station Locations

Charging Type	Stations	Locations	Ports
Workplace Charging	30 stations	16	60 ports
Destination Charging	7 stations	4	14 ports
Corridor Charging	8 stations	7	13 ports
Total	**45 Stations**	**27**	**87 Ports**

Source: County of Riverside

New locations were carefully selected to ensure that the County did not place new EV charging stations in areas that would compete with existing stations. At the time of the submission of the grant application, there was very little data available on planned EV charging stations.

Signage

To raise public awareness of charger availability and to attract EV, signage was placed at freeway exits, at the end of freeway exit ramps, along streets and in parking areas. Exit signs with arrows at the end of each freeway ramp show the way to turn off the ramp. Street directional signs with arrows indicate the most direct path of travel to the charging site. Two

directional signs (from opposite directions) are right before the entrance to each parking area where a charger is located.

All the charging stations have signs that prohibit parking while not charging, prohibit non-electric vehicle parking, and limit the total parking time to four hours for Level 2 stations and 30 minutes for Direct Current Fast Chargers. Figure 1 shows the parking space painted with green lines and "EV Only" warnings.

Figure 1: Parking Space Marking at Perris Fleet

Source: County of Riverside EDA

Plan to Optimize Use

The goal of EDA's station usage plan is to maximize station utilization through the pricing policies, amended county parking ordinance, and charging space signage. Signage has been purchased and installed at each site to declare certain parking spaces for exclusive EV use with distinctive pavement painting. No EV can be fueled if non-EV cars park within reach of the chargers. Fewer EV will have a turn if some stay longer than is needed to top off. The County Parking Ordinance 626 set the charging rates for Level 2 and DC fast charging stations as well as enforcement of charging limits and the hours available to charge vehicles. The ordinance also includes operational guidelines to optimize the use of the stations.

Pricing Plan

EDA worked with ChargePoint on drafting pricing policies for the Level 2 stations and DC Fast Chargers. The goal of the pricing plan is to, at the minimum, recoup the County's costs for station network service, maintenance plan, and electricity. Another goal is to set the rate for the use of stations in such a way that EV drivers will use the stations and allow for the implementation of operational guidelines for optimal use. On December 11, 2018, the Riverside County Board of Supervisors approved the initiation of a proposal to establish new rates for EV charging stations and adopt an order to initiate an amendment to Riverside County Ordinance No. 626. The adoption of the initial rate proposal directs EDA to prepare and process new EV charging rates. In 2020, the pricing was based on length of time and kWh used: $0 per hour for the first 4 hours, $2 per additional hour, plus $0.34 per kWh.

Current financial modeling indicates limited cost recovery opportunities available for this technology. This rate structure challenge has come under further County scrutiny and will be carefully monitored throughout the use of the stations. Setting competitive rates to include cost recovery while encouraging drivers to use our stations will be a challenge during the first

year. The hope is that, as drivers increase their usage, the revenues and rates might also increase to include full cost recovery. Although the costs are part of the challenge, Riverside County places a high value on the contributions made to improved air quality by the EV charging station use.

Operations and Maintenance Plan

EDA purchased a comprehensive maintenance plan from ChargePoint for all stations purchased through the grant. The ChargePoint Assure plan guarantees uptime of 98 percent annually for all stations with prorated refunds for station problems, on-site repair work, automated monitoring of the station, and sends email notifications to EDA staff if a station has an issue. Additionally, the County has developed a complimentary maintenance program to ensure the ongoing operation and maintenance of the stations. The program includes routine data and safety tests, daily monitoring of the ChargePoint network software to detect any failure modes, quarterly cleaning of the display, head and pedestal/base units, visual inspection of electrical components, minor repairs, non-warranty work such as vandalism, and comprehensive testing of the unit to assess appropriate electrical current and voltage.

Installation

At each site the County made detailed plans for electrical service to exact parking spaces. In Figure 2 individuals from ChargePoint, Angeles Construction (contractor), and County departments of Project Management, Maintenance, and others discussed station siting.

Figure 2: Siting Team at Library in Desert Center, California

Source: County of Riverside EDA

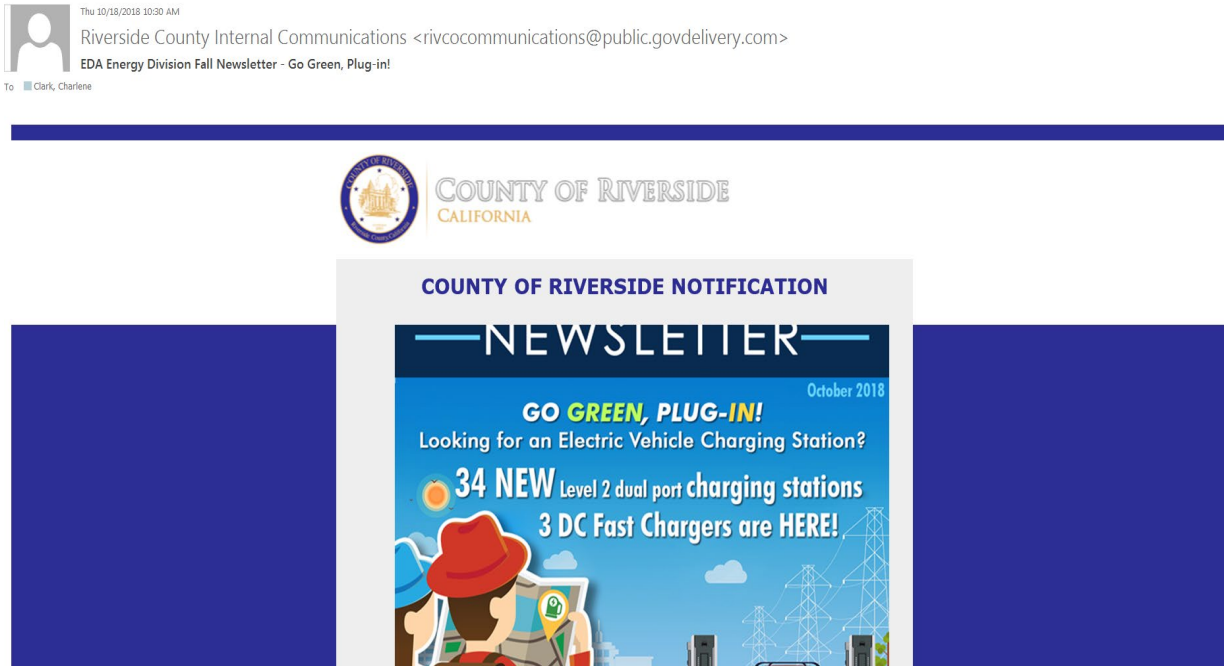
Several contracts were issued. For example, the County provided a transformer, panel, and three dual port charging stations for the Riverside County Innovation Center. The Notice to Proceed was issued to Dalke & Sons Construction, Inc., a local company, on May 8, 2018 for

the $69,000 contract. Dalke provided concrete pads, trenching, conduit, ADA sidewalk pathway, pavement markings, wheel stops and labor for the new electrical infrastructure.

Marketing Plan

The marketing plan for the Electric Vehicle Infrastructure Expansion grant is focused on high-penetration, low-cost public and social media to promote public awareness of the availability of EV charging stations throughout Riverside County. The marketing is an ongoing activity to distribute updated EV charging infrastructure information and assist in the adoption of EVs. This marketing plan is part of Riverside County's larger effort in building a sustainable future. EDA Energy and Marketing teams designed and sent multiple email blasts to nearly 20,000 Riverside County employees as in Figure 3.

Figure 3: Newsletter to all Riverside County Employees Announces Chargers



Source: County of Riverside EDA

The EDA Energy and Communication teams made a coordinated marketing effort through social media platforms. The goal of the campaign was to increase the public's awareness about EVs and charging infrastructure. The marketing campaign promoted reducing greenhouse gas emissions thus improving the overall air quality for residents.

On November 26, 2018, the new EDA Energy Division website was launched to share the project. The EV charging station web page (https://rivcoenergy.com/ev-charging-stations) highlights the California Energy Commission's EV Infrastructure grant and shows their locations.

CHAPTER 2: Data Collection and Analysis, Project Performance

Data Collection and Analysis

On May 30, 2017, the Palm Desert Sheriff Station EV charging station was the first charging station activated under the California Energy Commission (Energy Commission) grant. The County's Riverside University Health System EV charging stations were the last to be installed.

Each DC fast charger serves only one parking space. Figure 4 shows that the device fits in the parking space with the car.

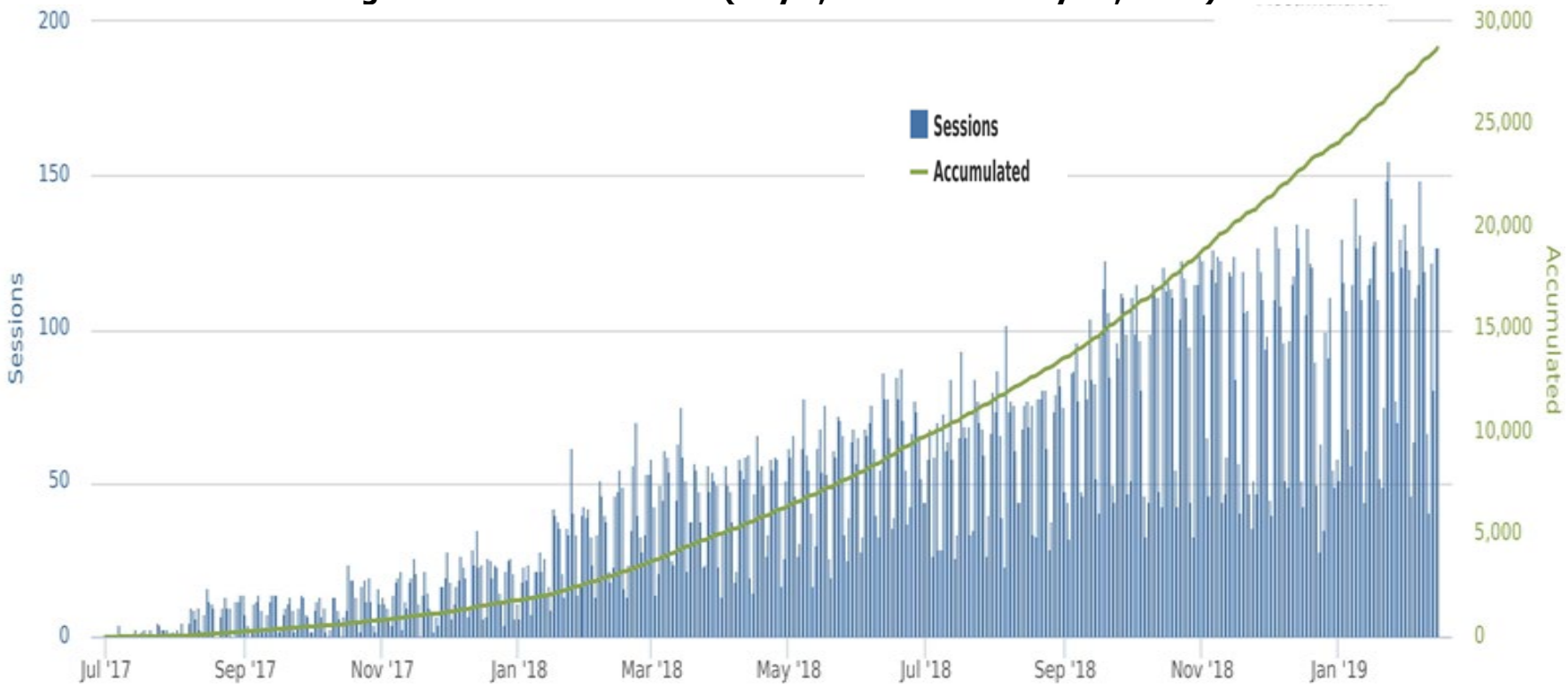
Figure 4: DC Fast Charger at Temecula County Administrative Center

Source: County of Riverside EDA

Capacity and Actual Use of Charging System

The ChargePoint website allows the County to show, monitor, and report on every ChargePoint station installed. ChargePoint's online portal also sends emails about station issues. ChargePoint's extensive reporting options include energy used in kilowatt-hours (kWh), greenhouse gas (GHG) savings, sessions, session length, unique drivers, and average utilization. As of February 14, 2019, the total number of charging sessions was 28,726. Figure 5 shows a spiky growth in daily sessions. During December 2018 45 to 50 sessions were common for slow days and during the maximum day there were 150 sessions.

Figure 5: EV Sessions Data (July 1, 2017 – February 14, 2019)



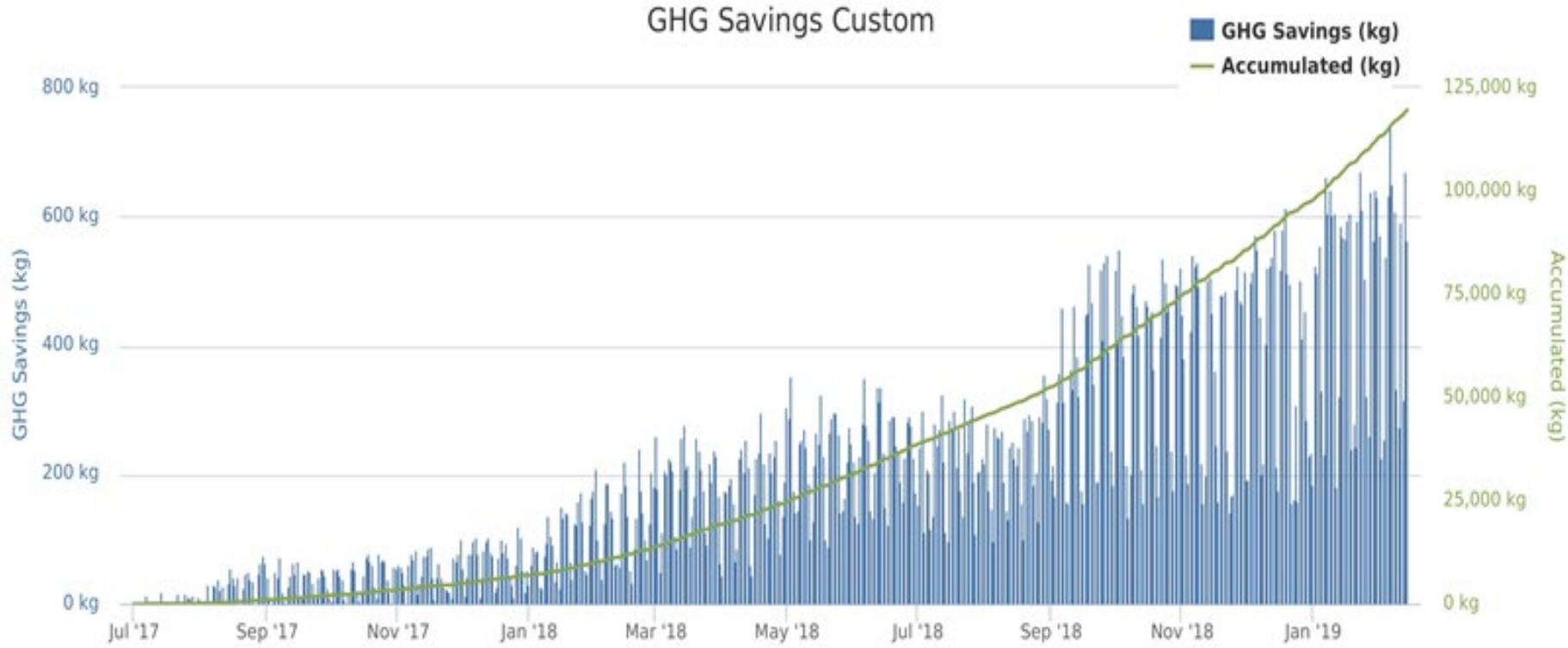
Source: County of Riverside ChargePoint Data

Since July 1, 2017, the county has dispensed 285,000 kWh of energy. The use of the 45 EV charging stations has displaced 36,000 gallons of gasoline. This has resulted in a reduction of 120,000 kilograms (kg) of GHG emissions[2] shown in irregular daily

[2] County of Riverside ChargePoint GHG Data

gains over the 19 months in Figure 6. The reduction of GHGs is equivalent to removing 120 metric tons of carbon dioxide (CO_2) from Riverside County air which is equal to removing 25 passenger cars driven for one year.[3]

Figure 6: GHG Reductions (July 1, 2017 – February 14, 2019)



Source: County of Riverside ChargePoint GHG Data

[3] United States Environmental Protection Agency, Greenhouse Gas Equivalencies Calculator (https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator)

Prior to the installation of 45 EV charging stations under this project, the County had dispensed 35,600 kWh from July 1, 2016 – June 30, 2017. During that timeframe, as shown in Table 2, the County was able to reduce GHGs by 14,900 kg or almost 15 metric tons of CO_2. This is equivalent to reducing 3 passenger vehicles driven for one year.[4]

Table 2: Non-Grant EV Sessions Summary (July 1, 2016 – June 30, 2017)

County of Riverside Station Name	**Charging Sessions**	**Sum of Energy (kWh)**	**Sum of GHG Savings (kg)**	**Estimated Gasoline Savings (gallons)**
12th St. Parking	1,334	10,700	4,500	1,300
Indio Law Library	250	1,700	700	200
Indio Parking Structure	50	500	200	60
Supervisors Parking	229	1,400	600	200
Administrative Center Parking	731	4,900	2,000	600
Riverside Centre Parking	1,298	8,100	3,400	1,000
Southwest Justice Center	728	8,300	3,500	1,000
Grand Total	**4,620**	**35,600**	**14,900**	**4,360**

Source: County of Riverside ChargePoint Sessions Data

Below in Table 3, the statistics tell that the installation of 45 additional EV charging stations has increased the kWh of energy dispensed and gallons of gasoline saved significantly. Comparing the GHG reductions from July 1, 2016 – June 30, 2017 to July 1, 2017 – February 14, 2019, use of the additional EV charging stations reduced GHGs by 700 percent. The estimated amount of gasoline displaced has increased from 4,360 gallons to 35,700 gallons. The Riverside University Health System Hospital is the most frequently used station with 3,600 charging sessions, while the Lake Tamarisk Library station is the least utilized station with 73 charging sessions during the 19 and a half months.

[4] United States Environmental Protection Agency Greenhouse Gas Equivalencies Calculator (https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator)

Table 3: EV Charging Summary (July 1, 2017 – February 14, 2019)

Station Name	Charging Sessions	Average Charging Session Time (Hr:Min:S)	Sum of Energy (kWh)	Sum of GHG Savings (kg)	Sum of Gasoline Savings (gallons)
ACR BOX SPRINGS	850	1:47:30	7,800	3,300	990
BCTC FIRE	143	1:58:02	2,000	390	120
BCTC SHERIFF ADMIN	128	2:00:48	1,100	450	130
BLYTHE ADMINISTRATIVE CENTER	200	1:42:08	1,900	900	240
CABAZON FLEET	117	0:56:30	540	230	70
CORONA ADMINISTRATIVE CENTER	3,262	2:08:00	33,100	13,100	3,900
CRESTMORE MANOR	227	9:48:08	800	320	100
DPSS ADM	602	0:37:27	6,800	2,900	860
DPSS ADM	423	2:21:55	4,700	1,960	600
DPSS CLIENT SERVICES	1,845	2:05:26	13,300	5,600	1,700
DPSS MH	2,460	2:46:24	29,200	12,300	3,700
HEMET ADMINISTRATIVE CENTER	1,329	1:36:32	9,500	4,000	1,200
INDIO FAIR	449	1:50:48	4,540	1,900	570
LAKE TAM LIBRARY	73	1:47:04	580	240	70
LDS DETENTION	819	2:47:05	8,100	3,400	1,020
MEYERS MH	1,379	1:52:46	12,800	5,400	1,600
MONROE PARK	659	2:48:01	9,550	4,010	1,200
MONROE PK	282	0:39:19	3,000	1,260	380
PALM DST SHERIFF	320	2:07:43	3,300	1,400	420
PERRIS FLEET	912	1:33:09	6,500	2,740	820
PERRIS SHERIFF	700	2:27:07	9,400	3,950	1,200
RCIC	1,320	1:40:49	7,060	2,970	900
RIV FLEET	922	2:13:15	10,230	4,300	1,300
RUHS	3,606	2:59:03	53,140	22,320	6,700

Station Name	Charging Sessions	Average Charging Session Time (Hr:Min:S)	Sum of Energy (kWh)	Sum of GHG Savings (kg)	Sum of Gasoline Savings (gallons)
SAN JAC ANIMAL SHELTER	450	1:39:34	4,150	1,740	520
SOUTHWEST JUSTICE	1,535	2:11:12	15,230	6,400	1,900
TEM ADMINISTRATIVE CENTER	377	0:32:57	3,950	1,660	500
TEM ADMINISTRATIVE CENTER	2,214	1:45:25	17,850	7,500	2,240
W RIV ANIMAL SHELTER	1,123	1:36:27	7,620	3,200	960
Grand Total	**28,726**		**284,670**	**119,560**	**35,700**

Source: County of Riverside ChargePoint Data

Proposed Project Performance Compared with Actual Project Performance

On July 15, 2014, the County of Riverside accepted the California Energy Commission Electric Vehicle Infrastructure Grant. The main objective of the grant was to address local EV demand and regional needs through the installation of 45 EV charging stations. This project has met the main objective and it has doubled the number of existing public electric vehicle charging stations in Riverside County. The County has collaborated with regional agencies such as WRCOG and CVAG to identify strategies to accelerate PEV adoption and share charging station session data and usage patterns. EDA staff has developed project coordination activities to include operation and maintenance plans, charging station usage plans, and pricing plans to optimize EV station usage. A high-penetration, low-cost public and social media marketing plan has been designed to promote the public awareness of the recently installed EV charging stations.

The County is making full use of ChargePoint's web-based networked system to monitor and measure utilization rates over the duration of the grant. EDA staff are able to track and analyze EV charging station sessions data to ascertain reductions of GHG emissions, energy dispensed, and gallons of gasoline saved. Riverside County is making a substantial leap forward through the implementation of this grant, yet the work will not end here. EDA is committed to leading the way for regional infrastructure to continue to promote healthy strategies to reduce GHG emissions. All goals and objectives proposed in the application were met.

CHAPTER 3: Project Benefits, Innovation, Sustainability, Lessons Learned

Project Benefits

Work with Regional Agencies

County staff have developed cooperative relationships with the Southern California Association of Governments, WRCOG, and CVAG. The County has received several letters of support from Southern California Association of Governments, CVAG, Los Angeles County Economic Development Corporation. In addition, the County strategically selected sites that aligned with WRCOG's and CVAG's EV Readiness plans to serve as a model for other municipalities. EDA staff has been in contact with WRCOG's Clean Cities and Energy and Environmental group to share charging session data and usage patterns. The County's EV charging session data will be incorporated into WRCOG's Clean Cities Coalition annual report, which is shared with U.S. Department of Energy's Alternative Fuels Data Center program. The new EV charging station locations will also be visible on the Alternative Fuels Data Center station. As part of the coordination efforts with WRCOG, EDA will be sharing the newly installed station locations with WRCOG's member agencies and Western Riverside Energy Partnership program thus assisting local jurisdictions in promoting alternative transportation options for their citizens. EDA staff will further these efforts by sharing data and usage patterns with CVAG Environmental Resource staff to ensure continued regional planning efforts of alternative fuels.

Increase in Number of EV Miles

As PEVs continue to be deployed and EV charging infrastructure expanded in Riverside County, the County's understanding of driver behavior is evolving. To-date, the County's EV charging session date continues to depict increases in utilization, energy dispensed, and gallons of gasoline saved thus increasing the number of EV miles driven. Additionally, this project increases the number of EV miles driven by addressing range anxiety. A key component of the implementation of this grant was to address corridor charging. Under this grant, the County installed eight EV stations along interstate 10, 215, and 91 corridors, which are major transit corridors between Riverside, Los Angeles, and San Bernardino Counties.

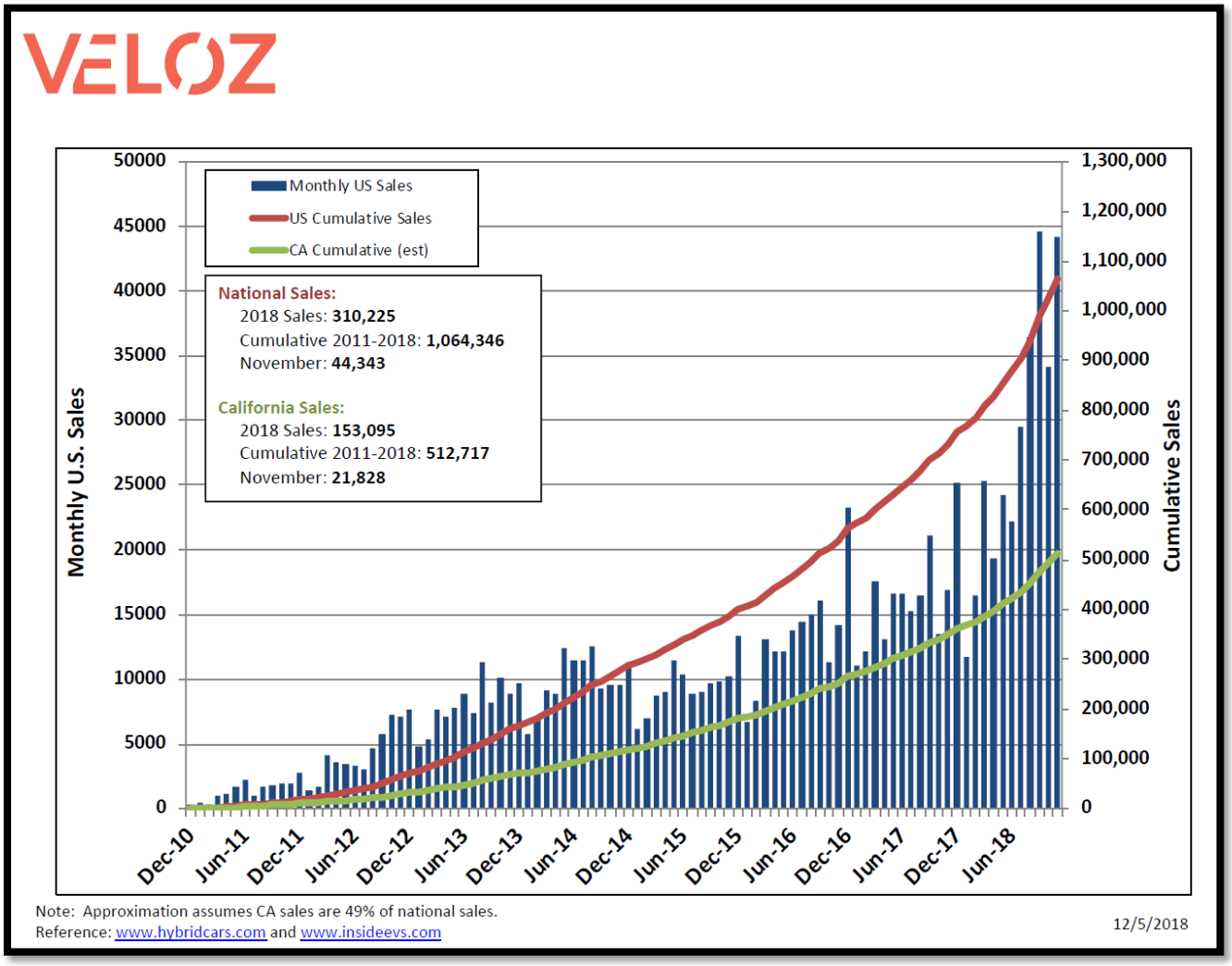
Since the installation of the EV charging stations, EV charging station interest has increased from internal County departments such as Riverside County Sheriff, Riverside University Health System Behavioral Health, and Riverside County Department of Waste Resources to name a few. EDA staff has consulted with external entities such as the City of Perris and the City of Santa Monica, sharing EV charging station best practices. As local interest and demand continues to increase, so will the number of EV miles traveled. There will also be less dependence on foreign oil.

Consumer Investment in EVs

Sales for EVs is trending up in Southern California and will continue to grow with the establishment of more EV Charging stations and new models being produced from

manufacturers, such as the Tesla Model 3. Figure 7 shows that as of June 2018, California's cumulative 2011- 2018 EV car sales reached 512,717.

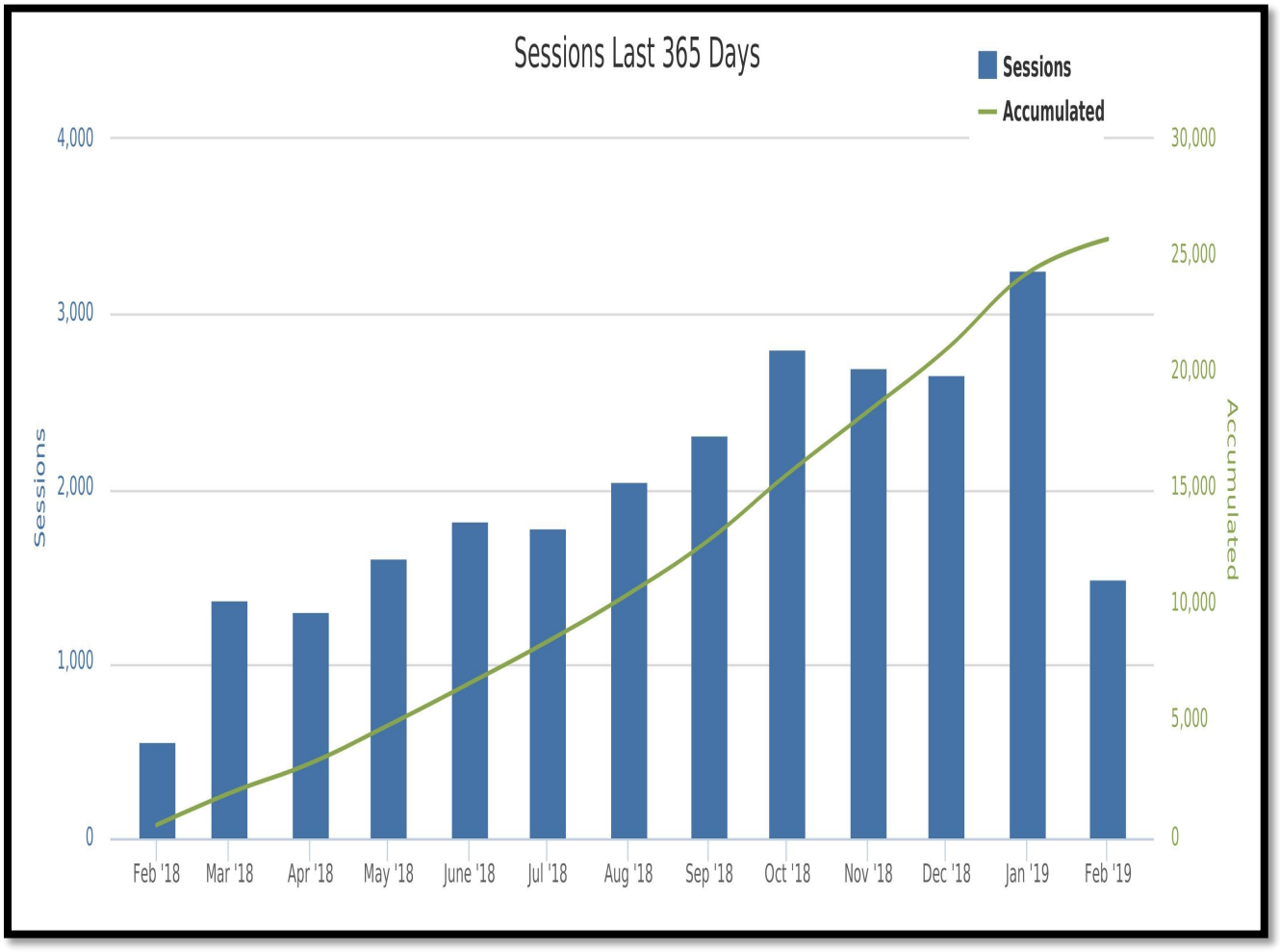
Figure 7: California EV Car Sales 2011-2018



Source: Veloz https://www.veloz.org/

The installation of the additional 45 EV charging stations serves as an outward demonstration to the public that adoption of EVs is growing in Riverside County. The County's Energy Commission EV charging session data continues to increase as adoption of EVs increase and charging infrastructure expands. Over the past year, the Figure 8 shows the EV charging station use has increased from 559 sessions in February 2018 to 1,482 in February 2019. January 2019 was the highest month of Energy Commission EV station usage with 3,259 charging sessions.

Figure 8: EV Sessions Data (February 2018 – February 2019)



Source: County of Riverside ChargePoint Sessions Data

Reduction in Cost of California's Charging Network

As with any newer technology, the cost of initial deployment is higher, and as technology advances and the participation increases, prices for equipment usually decrease. This project set out with the intentions to generate increased demand for EVs and the infrastructure needed to sustain them, however, unforeseen challenges were encountered. The new ADA requirements for EV charging stations increased both the complexity and cost of the project. While economies of scale should have been reached, the ADA compliance requirements introduced an additional $3,325 in direct consultant cost as well as match labor costs that were unforeseen.

Direct and Indirect Economic Benefit

The newly constructed infrastructure for the use of electric vehicles provides a direct economic benefit. According to the American Lung Association's State of the Air 2018 report[5], San Bernardino County led in air pollution (ozone) with 146 unhealthy days and Riverside County was second with 122 unhealthy days thus creating two of the worst areas for air pollution in Southern California. Improved air quality results in healthier communities that will decrease costly hospital visits while improving overall health. Improving overall health will increase productivity and people will have more opportunities to directly impact the economy.

This project utilized local contractors with employees who live in the region. Their dollars spent on materials and wages paid directly stimulate the local economy, which has lagged in the recovery from the Great Recession. By implementing this grant, County of Riverside has increased business attraction opportunities through downstream activities such as EV sales, maintenance and repairs, battery recycling, and vehicle sharing.

Innovation

Typically, financing is scarce for homeowners in low-income communities. The Western Riverside Council of Governments developed a regional-scale Property Assessed Clean Energy program, known as the PACE program which allows the debt of rewiring a house to support an EV to stay with the house when it is sold. Thus, the local governments in the Western Riverside region of California also had the ability to finance solar power for the same houses and cars. Innovatively, in 2013, the WRCOG program expanded (an effort called "California HERO") to allow jurisdictions throughout the state to join WRCOG's Program and allow property owners in more jurisdictions to participate. WRCOG is now the largest bond issuer of the property assessed clean energy program in the United States. One of the main reasons that the WRCOG program is such a success is that it was born out of collaboration.

Sustainability of the Project

Demand Response

As EV charging increases and demand on the electrical grid rises, the ability to have demand response capabilities is crucial. ChargePoint's web-based networked capability offers a demand response opportunity to control potential increased electrical demand charges. EDA staff will activate this system when a communication to reduce demand from a utility is received.

Power Sharing

The County has deployed the latest technology in EV charging infrastructure, the ChargePoint brand CT4023 Level 2 charger, which increased charge spot capacity and doubled the number of vehicles served at each unit.

Reduced Equipment and Installation Costs

[5] American Lung Association, State of the Air 2018 Report, April 18, 2018 (https://www.lung.org/local-content/california/our-initiatives/state-of-the-air/2018/state-of-the-air-2018.html)

The equipment was purchased at a reduced price. The stations were partially installed by EDA Maintenance staff as well as contractors which reduced installation costs.

Reduced Operation and Maintenance Costs

EDA has purchased the ongoing maintenance plan to keep costs at a minimum. The goal is to keep the stations in optimal operational use to ensure maximum useful life, which is expected to be about 10 years.

Disadvantaged Communities Receive the Benefits

In 2013, Riverside County met the threshold requirements to be considered an economically disadvantaged community by being at least 1 percent point higher in a 24-month average unemployment rate and 80 percent less for per capita income. Riverside County continues to meet the threshold requirements to be considered an economically disadvantaged community per Table 4 below.

Table 4: Southern California Unemployment & Per Capita Income

Place	24-Month Average Unemployment Rate (BLS) - May 2018	2016 Per Capita Personal Income (BEA)
United States, Average	4.42%	$49,571
State of California, Average	4.82%	$56,374
Riverside County	5.33%	$36,782

Source: The Bureau of Labor Statistics (BLS) (http://www.bls.gov/) & Bureau of Economic Analysis (http://www.bea.gov/)

The benefits explained above are flowing to economically disadvantaged communities and communities with poor air quality. Electric vehicles have zero emissions where they are used. The County of Riverside has been afforded the opportunity to reduce air pollution levels in the region through the implementation of this grant.

Lessons Learned

Project Results Applicable to Other Charging Sites

Throughout the implementation of this grant, EDA staff has been diligent in capturing lessons learned. As mentioned previously, the new ADA requirements for EV charging stations increased both the complexity and cost of the project, which contributed to delays. In addition, the construction phase of the grant ran into challenges with contractors and site changes.

It would have been time-saving to review the impact of the ADA requirements at each site earlier. Bi-weekly or monthly construction meetings with the contractor, fiscal, and project management team would have been beneficial for updating deliverables and budget

amendments. While the ADA challenges caused construction delays, they have provided invaluable best practice information as we look to future EV charging station infrastructure projects. EDA staff have been able to immediately share EV ADA best practices with internal county departments and external municipalities as they consider EV infrastructure projects. Many of the project results are applicable to similar types of charging sites in other counties.

Riverside County is grateful for the opportunity to bring an additional 45 EV charging stations to our local region. The knowledge gained over the course of the implementation of the grant has proven valuable increasing staff experience in developing polices, adopting rates, and utilization patterns. As the County of Riverside engages in future statewide initiatives and leverages funding opportunities, EDA staff can immediately apply the lessons learned from this grant thus making us better partners in building a healthier and sustainable community.

Glossary

AMERICAN WITH DISABILITIES ACT (ADA) - ADA refers to the Americans with Disabilities Act of 1990, which is one of the most significant federal laws governing discrimination against persons with disabilities. This Act prohibits discrimination against individuals with disabilities in employment, housing, education, and access to public services. The ADA defines a disability as any of the following: 1. "a physical or mental impairment that substantially limits one or more of the major life activities of the individual." 2. "a record of such impairment." or 3. "being regarded as having such an impairment."[6]

BUREAU OF ECONOMIC ANALYSIS (BEA) – A part of the U.S. Department of Commerce, the Bureau Of Economic Analysis is an independent, principal federal statistical agency that promotes a better understanding of the U.S. economy by providing timely, relevant, and accurate economic accounts data in an objective and cost-effective manner. Although a relatively small agency, BEA produces some of the most closely watched and influential economic indicators, such as gross domestic product (GDP) and the trade balance, that directly affect decisions made by policy makers, business leaders, and the American public. (http://www.bea.gov/)[7]

BUREAU OF LABOR STATISTICS (BLS) - The Bureau of Labor Statistics of the U.S. Department of Labor is the principal federal agency responsible for measuring labor market activity, working conditions, and price changes in the economy. (http://www.bls.gov/)

CARBON DIOXIDE (CO2) - A colorless, odorless, non-poisonous gas that is a normal part of the air. Carbon dioxide is exhaled by humans and animals and is absorbed by green growing things and by the sea. CO2 is the greenhouse gas whose concentration is being most affected directly by human activities. CO2 also serves as the reference to compare all other greenhouse gases (see carbon dioxide equivalent).

COACHELLA VALLEY ASSOCIATION OF GOVERNMENTS (CVAG) - is the regional planning agency coordinating government services in the Coachella Valley. By providing solutions to the common issues of the local governments and tribes that are its members, CVAG promotes a better quality of life and balanced growth for residents of Central and Eastern Riverside County. [8]

DIRECT CURRENT (DC)—A charge of electricity that flows in one direction and is the type of power that comes from a battery.

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[6] DisabilityAct (https://definitions.uslegal.com/)

[7] Bureau of Economic Analysis defined (https://www.commerce.gov/bureaus-and-offices/bea)

[8] California Local Government Planning (https://calcog.org/)

ECONOMIC DEVELOPMENT AGENCIES (EDA) - includes local planning and zoning commissions or boards, community development agencies, and other local agencies and institutions responsible for regulating, promoting, or assisting in local economic development.

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).

KILOGRAM (kg) - The base unit of mass in the International System of Units that is equal to the mass of a prototype agreed upon by international convention and that is nearly equal to the mass of 1000 cubic centimeters of water at the temperature of its maximum density.

KILOWATT-HOUR (kWh) -The most commonly used unit of measure telling the amount of electricity consumed over time. It means one kilowatt of electricity supplied for one hour. In 1989, a typical California household consumes 534 kWh in an average month.

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

WESTERN RIVERSIDE COUNCIL OF GOVERNMENTS (WRCOG) - developed a regional-scale PACE program, which allows local governments in the Western Riverside region of California to finance and install solar and makes energy efficiency improvements affordable.

APPENDIX A:

The Temecula County Administrative Center, the Monroe Conference Center in Indio, and the Department of Public Social Services Administration in Riverside received Level 3 chargers. All the rest of the chargers in Table 5 are Level 2.

Table 5: EV Project Station Count Table

Site Name	Site Address	City	Charging Level	Number of Stations	Number of Ports
Ben Clark Training Center--Sheriff Administration	16791 Davis Avenue	March Air Reserve Base	Level 2	2	4
Ben Clark Training Center--Fire Administration	16930 Bundy Avenue	March Air Reserve Base	Level 2	1	2
Perris Sheriff	137 N. Perris	Perris	Level 2	1	2
Perris Fleet	308 E. San Jacinto Av	Perris	Level 2	1	2
Hemet County Administrative Center	880 N. State St	Hemet	Level 2	1	2
San Jacinto Valley Animal Shelter	581 S. Grand Av	San Jacinto	Level 2	1	2
Temecula County Administrative Center	41002 County Center Drive	Temecula	Level 2	1	2
Temecula County Administrative Center	41002 County Center Drive	Temecula	Level 3	1	1
Southwest Justice Adult Detention Center	30755-B Auld Rd	Murrieta	Level 2	1	2
Southwest Justice Juvenile Detention Center	30755-C Auld Rd	Murrieta	Level 2	1	2
Larry D. Smith Detention Center	1627 S. Hargrave St	Banning	Level 2	1	2
Cabazon Fleet Services	50208 Main St	Cabazon	Level 2	1	2
Riverside County Fairgrounds	82503 Highway 111	Indio	Level 2	2	4
Monroe Conference Center	44119 Monroe Street	Indio	Level 2	2	4
Monroe Conference Center	44119 Monroe Street	Indio	Level 3	1	1

Site Name	Site Address	City	Charging Level	Number of Stations	Number of Ports
Site Name	**Site Address**	**City**	**Charging Level**	**Number of Stations**	**Number of Ports**
Palm Desert Sheriff Station	73705 Gerald Ford Road	Palm Desert	Level 2	1	2
Blythe County Administrative Center	240 N. Broadway	Blythe	Level 2	1	2
Lake Tamarisk Library	43880 Lake Tamarisk Drive	Desert Center	Level 2	1	2
Department of Public Social Services Client Services	10281 Kidd Street	Riverside	Level 2	2	4
Meyers Mental Health Building	3075 Myers Street	Riverside	Level 2	2	4
Department of Public Social Services Administration	4060 County Circle Drive	Riverside	Level 2	1	2
Department of Public Social Services Administration	4060 County Circle Drive	Riverside	Level 3	1	1
Mental Health Administration	4095 County Circle Drive	Riverside	Level 2	2	4
Corona County Admin Center	505 S. Buena Vista Avenue	Corona	Level 2	1	2
Western River County Animal Shelter	6851 Van Buren Boulevard	Riverside	Level 2	1	2
Riverside County Innovation Center	3450 14th Street	Riverside	Level 2	3	6
Riverside County Fleet Services	4293 Orange Street	Riverside	Level 2	1	2
Riverside Assessor-County Clerk-Recorder	6221 Box Springs Blvd.	Riverside	Level 2	1	2
Riverside University Health System Hospital	26520 Cactus Avenue	Moreno Valley	Level 2	8	16

Site Name	Site Address	City	Charging Level	Number of Stations	Number of Ports
Crestmore Manor	4600 Crestmore	Riverside	Level 2	1	2
TOTALS FOR 27 SITES				**45**	**87**

Source: County of Riverside ChargePoint Data