CALIFORNIA ENERGY COMMISSION

California Energy Commission

Clean Transportation Program

FINAL PROJECT REPORT

Ontario CNG Station, Inc. New Public Access Electric Vehicle Charging

Prepared for: California Energy Commission

Prepared by: Ontario CNG Station, Inc.

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PREFACE

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

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

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

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the CEC's annual Clean Transportation Program Investment Plan Update. The Energy Commission issued PON-13-606 to fund electric vehicle charging infrastructure in four categories to support growth of electric vehicles as a conventional method of transportation and adoption of plug-in electric vehicles over a wide range of California's population and socio-economic classes. In response to PON-13-606, the recipient submitted an application which was proposed for funding in the Energy Commission's Notice of Proposed Awards July 3, 2014, and the agreement was executed as ARV-13-049 on August 14, 2014.

ABSTRACT

Convenient access to alternative fuel and electric charging stations is essential for the statewide adoption of alternative fuel vehicles, especially in Southern California. A network of electric chargers is needed to fill the void that exists in statewide electric charging infrastructure. Lack of attention to electric vehicle technology in this area of the state had been reflected in the limited adoption of this alternative fuel.

Ontario CNG Station, Inc. brought public access electric vehicle charging equipment to their gas station located at 1850 East Holt Boulevard, Ontario (San Bernardino County). It is reliably serving the public in an ideal location on the approach to Ontario International Airport; adjacent to I-10; and near I-15, SR-60 and I-210, and critically positioned between San Bernardino and Las Vegas.

Designed from the inception by Atabak Youssefzadeh (Architect) of Ontario CNG Station, Inc. and Keith Sharpe (Engineer) of Allsup Corporation, a fast charger and a Level 2 charger are conveniently situated in front of the station. The locations of the chargers were carefully designed to serve the electric vehicle clients safely and close to the station entrance.

Alternative fuels such as electricity not only provide a cleaner, safer, and healthier environment for us and our children, but at the same time decrease our dependence on foreign fossil fuels as well.

Keywords: Electric vehicle charging station, fast charger, Level 2 charger, Ontario CNG Station, Inc., Clean Transportation Program, alternative fuel

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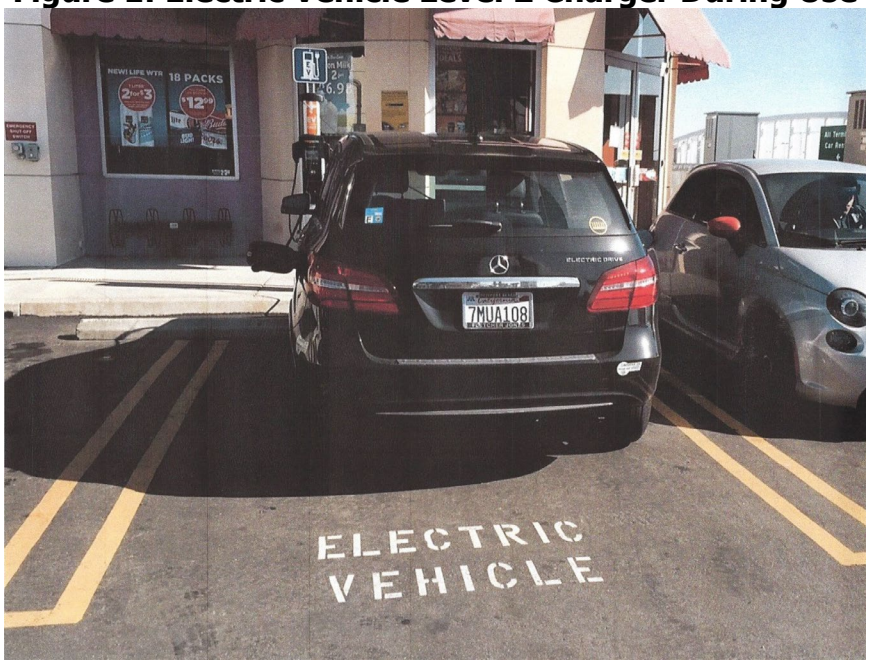
EXECUTIVE SUMMARY

Ontario CNG Station, Inc., doing business as Ontario 76, used California Energy Commission grant funds to put in three new electric car chargers at 1850 E. Holt Blvd, Ontario, California. Two of the chargers are installed in front of the station and one on the side, all in well-lit areas for the safety and convenience of the public. The project supports plug-in electric vehicles as a conventional method of transportation. The two direct current fast chargers and the one Level 2 charger (Figure 1) are for public use 24 hours a day, 7 days a week.

Figure 1: Electric Vehicle Level 2 Charger During Use



Source: Ontario CNG Station, Inc.

This project provided temporary construction jobs. The construction began in early 2015 and was completed in August 2016. The construction of a bridge next to the station caused delays.

Over six months, Ontario CNG Station, Inc. staff observed customers combining the use of the electric chargers with getting food from the convenience store and washing their car in the onsite car wash. Customer comments were very positive.

During the first six months 3,200 minutes of charging were sold. Level 2 chargers, which are slower, were used for longer durations, averaging an hour to an hour and a half. The fast charger was used for 12 to 23 minutes on average.

The chargers are currently being used daily. Ontario CNG Station, Inc. would like to eventually have photovoltaic solar panels installed on the fuel dispenser canopies. Until then, the California energy has a portion of renewable electricity for the electric chargers and the cars have zero emissions to benefit the environment and future generations.

CHAPTER 1:
Project Background and Objectives

Ontario CNG Station, Inc. is a franchise with Conoco Philips petroleum fuels and the Circle K system convenience store in the City of Ontario, 35 miles east of Los Angeles, in San Bernardino County. Ontario CNG Station, Inc. is the first hub station to dispense gasoline, biofuel, compressed natural gas, electricity, and hydrogen. Hub stations accelerate development of multiple alternative fuels through synergistically overlapping permitting processes, educating the public on the many fuel types, and creating a meeting point for alternative fuel vehicle owners.

Project Background

Global climate change threatens California with hotter, dryer summers. The trees are dying in the mountains and fish populations decline in the rivers. The air is polluted, especially in the Southern California Air Quality Management District where 15 million residents are in a basin surrounded by mountains. The transportation sector is the biggest contributor to smog and accounts for approximately 40 percent of California's greenhouse gas (GHG) emissions. As documented throughout numerous California policy and regulatory materials, increased use of zero emission vehicles (ZEV) provide multiple benefits in addition to reducing GHG emissions, such as reducing conventional pollutants, operating quietly and cleanly, allowing home refueling, and lowering operating and fuel costs. As such, California Governor's Executive Order B-16-2012 orders that the California Air Resources Board, the California Energy Commission, the Public Utilities Commission and other relevant agencies work with the Plug-in Electric Vehicle Collaborative and the California Fuel Cell Partnership to achieve, among other benchmarks:

By 2015, the State's major metropolitan areas will be able to accommodate ZEVs

- with infrastructure plans
- with streamlined permitting

By 2020, the State's infrastructure will be able to support up to one million ZEVs

Ontario CNG Station, Inc. conducted a survey which found that the public was heavily in favor of installing electric chargers at this location; market demand existed. Therefore, electric chargers were the perfect fit for the public at this particular location. The station acknowledges the other benefit of alternative fuels, the traffic increase to the station, carwash, and convenience store.

With the support of the California Energy Commission, by having electric vehicle chargers installed onsite Ontario CNG Station, Inc. has been able to achieve the following:

- Address the scarcity of local, publicly accessible electric chargers in the area.
- Overcome the financial burden of constructing the electric chargers.
- Avoid emissions of carbon dioxide (CO2), oxides of nitrogen (NOx), particulate matter (PM), and carbon monoxide (CO) from entering the Southern California air.

Goals and Objectives of the Agreement

The Clean Transportation Program was designed to help attain the state's climate change policies. It provided financial support for this project to:

- 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.
- Expand the alternative fueling infrastructure available to the Interstate 10 and Interstate 15 transportation corridors.

Electric vehicles (EVs) were more commercially viable and available than ever in 2014 in greater Los Angeles. However, the 2014 lack of publicly accessible electric vehicle supply equipment (EVSE) limited mainstream EV deployment. This "Installation of a New Public Access Electric Vehicle Charging Facility in Ontario, California Project" sought to provide a cleaner, safer, and healthier environment for the residents of Southern California. It provided construction jobs as in Figure 2.

Figure 2: Project Provided Construction Jobs

Electrician jobs were supported by this project including installation of one 3000 Amp Siemens panel with breakers for $37,000.

Goal of the Agreement

The goal of this Agreement is to provide cost competitive and sustainable electricity for EV customers. To accomplish this, Ontario CNG Station, Inc. successfully installed electric

chargers dispensing California's ever-improving partly renewable electricity at a very reasonable price to the public.

Objectives of the Agreement

Secondary goals that were also achieved include:

- Increasing knowledge of electric vehicles for the station customers and residents of Ontario.
- Encouraging the proliferation of electric charging vehicles by providing publicly accessible stations to the public.
- Reducing emissions of NOx, PM, and greenhouse gases within the City of Ontario, California and San Bernardino County.
- Complementing and not interfering with efforts to achieve and maintain federal and state ambient air quality standard, reduce toxic air containment emissions, and realize air quality benefits in the Southern California Phase 2 reformulated gasoline program.
- Collect data about charging.

Figure 3 shows the small footprint of the pay-per-use Level 2 charger which can charge 2 cars at once. Figure 4 shows the fueling door open on a car charging at the same charger installed in front of the store door.

Figure 3: Slim Bollard-Mounted Level 2 Charger

Figure 4: Electric Vehicle Level 2 Charger During Use

The touch screen shown in Figure 5 is easy for a novice to operate.

Figure 5: Touch Screen on EV Level 2 Charger is Simple

CHAPTER 2:
Activities Performed

The California Energy Commission grant contract ARV-13-049 scope of work focused on the charging facility design, construction, and installation of electric vehicle charging equipment according to the manufacturing recommendations. It also entailed data collection and reporting on the facility operation after the facility became operational.

Project Administration

The project administration included communicating with the Energy Commission in reports and invoicing, plus managing subcontractors. Figure 6 shows the subcontractors doing underground work.

Figure 6: Specific Jobs Resulted from this Project

Source: Ontario CNG Station, Inc.

Project Design

The design and engineering of the project were undertaken by Atabak Youssefzadeh (Architect) and Keith Sharpe (Engineer). The plans were submitted and after two revisions the City of Ontario accepted the plans and issued the permit to construct.

Permits

All necessary permits and approvals were identified and obtained from the City of Ontario, which is the lead agency for all developments within the city limits. The permit required submission of all the construction documents to the City of Ontario for their site plan review and final approval.

All the regulatory inspections were under the authority of the City of Ontario. All the regulations were followed, including making all the corrections issued by the inspector to receive the final permit to start the project.

Project Construction

Rimma Construction Inc. of Los Angeles was the general contractor for the project. Construction jobs on excavation equipment continued by this state supported transportation project as shown in Figure 7.

Figure 7: Excavation Equipment

The project required a new transformer, new exterior concrete pads, an electrical breaker panel, and underground electrical and data conduit from existing buildings to the charger locations. The ChargePoint equipment arrived substantially assembled. Figure 8 shows the DC fast charger new in the box with two types of charging cables. The subcontractors, under the supervision of the general contractor and representatives of Ontario CNG Station, Inc., completed the project. After the completion of construction and the final inspection, the City of Ontario Inspector issued the final permit for the electrical chargers and the project was opened for public use.

Figure 8: ChargePoint DC Fast Charger New in the Box

Equipment

The team chose to install one dual port ChargePoint brand CT4021-GW1 Level 2 commercial charging station with the maximum capacity of 7.2 kilowatt (kW). The six-foot tall enclosure is bollard mounted.

ChargePoint charging stations have many safety and connectivity features. Power measurement accuracy is +/- 2 percent. Plug-out detection is by power termination per JEVS G104 (CHAdeMO) and SAE J2931 (CCS1) specification through a programmable logic controller. The electric car chargers by ChargePoint are complex electronic devices programmed to report sales interactions with clients and collect the money.

Ontario CNG Station, Inc. installed two single port, dual connector, direct current (DC) fast charging stations. The ChargePoint Express 200 has a maximum capacity of 50 kW. The customer sees a screen that starts with an offer of help and a toll-free number as shown in Figure 9.

Figure 9: ChargePoint DC Fast Charger Screen CPE200T

Only one car can charge at a time, yet there are two connectors for different systems. The ChargePoint DC fast charger has an oversized button to initiate a timed charging session. Touchless credit card activation is a popular feature. The device can add 200 miles of range to the battery per hour.

CHAPTER 3:
Results

Temporary construction jobs were created by this project. By August 2016 the publicly accessible electric vehicle supply equipment was completely installed. Figure 10 shows the mountains in the distance and the DC fast charger near the street. Several customers immediately commented that the fast chargers saved them a lot of time. Plus, they liked the option of having the car wash, the convenience store, and clean restrooms. Although an attendant is available at all times, fueling is accomplished by the customers themselves. No additional employees were added to supply this service.

Southern California Edison supplied a transformer free of charge; the 1,600 Ampere service was upgraded to a 3,000 Ampere transformer. The utility is charging about $20,000/month for the total station electricity cost, including high peak demand, which is monitored every 15 minutes. The money earned from the chargers was very insignificant compared to this electric bill. Only a small portion of the electric bill was for the electric vehicles this year. The 300 horsepower compressor for the compressed natural gas (CNG) fuel draws a lot, too.

The City of Ontario, CA provided a street sign nearby. CalTrans asked $230 for the electric vehicle charging station sign on the freeway. There are two signs on station and each charger is well labeled.

Figure 10: DC Fast Charger Delivers 200 Miles Range/Hour

Lessons Learned

Allow lead time for equipment suppliers. The manufacturer delayed project construction five weeks when the chargers and the Siemens 3000 AMPS were back ordered.

The most significant problems were encountered during construction. While the City of Ontario constructed a bridge adjacent to the station and next to the Airport, the station's conversion from overhead electrical lines to underground cabling was delayed for months.

When the project underwent Underwriter Laboratories inspection, the Level 2 charger was found to have a defective electronic chip that prevented charging. The defective component was replaced by ChargePoint. Although two chargers were in good operating condition, the city inspector would not allow any to be used until all three were operational.

Unexpectedly, post-construction electrical inspections by Southern California Edison and Underwriter Laboratories certification field inspections by the City of Ontario were delayed 4 months due to a queue of other projects. These inspections ensured there is no danger posed to the public or electricity grid. No significant problems were encountered after opening.

The proximity of other chargers in the area builds the market supply, and customers gain confidence in the availability of the relatively new technology. Supply was above demand in 2017.

Data and Analysis

The charger data collection software is an extra service from ChargePoint; the third charger has no data. The data from one direct current fast charger (DCFC) and one Level 2 charger is reported in Table 1 and analyzed here. The station collected operational data from the project for six months, August 2016 to January 2017, for this report. The average cost of electricity at the station was $0.1181/kilowatt hour (kWh) for commercial service.

The number of charging sessions increased for the Level 2 charger from 12 to 38 sessions per month. The number of charging sessions per month varied for the DC fast charger from 18 to 72. Together, just 378 charges in six months was a very small amount of sales, unable to pay for the equipment. The number is not small because there are a lot of competing commercial charging spots; almost every car charges at home. Charging away from home is not a common method of fueling.

The total charge time for 6 months was 3,189 minutes. The Level 2 charger, which is slower, was used for longer durations of course, averaging an hour to an hour and a half. The DC fast charger was used for 12 to 23 minutes on average.

The total power provided by the Level 2 system grew from 32 to 220 kWh/month. The total power provided by the DC fast charger grew from 150 to 600 kWh/month.

The total revenue earned for paid charging on the Level 2 chargers was $4.45 to $8.52 for the whole month, for 14 charging sessions in each of several early months. Total revenue earned was under $1.00 per session for paid charging on the DC fast charger.

Over the six months, approximately 269 gallons of gas were replaced while about 9,200 e-miles were added (including the efficiency of the vehicles). The emissions savings for these charges were about 2.2 metric tons CO_{2e}.

Table 1: Monthly Electric Vehicle Charger Usage August 2016 – January 2017

Month	Charge Station	Total Charging Sessions	Total Charge Time Usage (minutes)	Average Charge Duration (minutes)	Total Power (kWh)	Total Revenue Earned, if paid charging ($)	Gas Savings (gallons)	e-Miles Added	Emissions Reduced (metric tons CO2)
Aug	DCFC	21	394	19	184	16.37	18.8	644	0.15506
Aug	Level 2	12	415	35	32	3.15	3.3	112	0.02697
Sep	DCFC	41	488	12	239	20.33	24.5	836.5	0.20141
Sep	Level 2	14	703	50	49	4.45	5.0	171.5	0.04129
Oct	DCFC	18	342	19	147	16.37	15.1	514.5	0.12388
Oct	Level 2	14	847	60	66	8.52	6.8	231	0.05562
Nov	DCFC	39	685	17	263	20.33	26.9	920.5	0.22164
Nov	Level 2	27	2585	95	221	20.86	22.7	774.4	0.18647
Dec	DCFC	49	1162	23	396	47.09	40.6	1,386	0.33372
Dec	Level 2	33	2170	65	168	17.96	17.2	586.5	0.14122
Jan	DCFC	72	1519	21	643	61.61	65.8	2250.5	0.54188
Jan	Level 2	38	2374	62	221	22.89	22.7	774.6	0.18652
Total		**378**	**3189**		**2,629**	**259.93**	**269.2**	**9,202.1**	**2.21568**

Source: Ontario CNG Station, Inc.

Environmental Impact

Electricity is one of the lower-carbon transportation fuels according to the California Air Resources Board's Low Carbon Fuel Standard (LCFS) regulation[1]. The LCFS is a performance standard that requires reductions in the carbon of California's transportation fuels over time. Each fuel's carbon intensity (CI) is calculated based on greenhouse gas emissions per unit of fuel energy over the fuel's lifecycle—from raw material production through end use.[2] CI allows fuel types to be compared easily.

Lower-CI fuels produce fewer GHGs per energy unit and are assigned LCFS credits. Higher-CI fuels, such as traditional petroleum-based fossil fuels, produce more GHGs per energy unit, so are assigned LCFS deficits. In order to reduce GHG emissions, the LCFS requires a yearly declining average CI for the pool of transportation fuels.

EVs in the light and medium duty weights are over three times more efficient than the internal combustion engine vehicles they replace. The energy economy ratio is 3.4 for electric vehicles. energy economy ratio is the dimensionless value that represents the efficiency of a fuel as used in a powertrain as compared to a reference fuel. The energy efficiency ratio translates the emission savings of the smaller amount of energy an EV needs to travel the same distance as an internal combustion engine vehicle.[3]

Electricity was not a fuel category eligible for LCFS Credits in 2013-2016 when the electric vehicle market was in its infancy. In the 2020 Lookup Table the pathway "California grid electricity used as a transportation fuel in California", has the certified CI of 81.49 g CO_{2e}/MJ. That, divided by the energy economy ratio of 3.4 for electric vehicles, gives the effective CI 30.80 gCO_{2e}/MJ. From this fact both the amount of gasoline that is displaced using EVs and the e-miles added in Table 1 were calculated.

Fueling at the chargers at Ontario CNG Station, Inc. has air emissions reductions because internal combustion engines did not operate. The first six columns of Table 4 are the same as reported above in Table 1. Table 4 tells the estimated monthly positive environmental impact provided by the two EV chargers August 2016 to January 2017. Scientific conversion factors for calculating the energy measurements[4] used in this report are shown in Table 2.

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1 California Code of Regulations (CCR), title 17, section 95480 et seq.

2 A fuel's lifecycle emissions intensity is also referred to as its "pathway" or "carbon intensity score" in LCFS documentation. These values are expressed in units of grams carbon dioxide equivalent per megajoule (gCO_{2e}/MJ).

3 Cost, Effectiveness, and Deployment of Fuel Economy Technologies for Light-Duty Vehicles. 2015. P 407 Appendix R. The National Academies Press. (https://www.nap.edu/read/21744/chapter/30) Taken from California Electric Transportation Coalition. 2013. California's Low Carbon Fuel Standard: Compliance Outlook for 2020. Prepared for CETC by ICF International.

4 Air Resources Board LCFS regulations. 2016. (http://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf)

Table 2: Electric and Gasoline Energy Facts

Value	Unit	Description
105.16	gCO2e/MJ	Electricity (CA Mix) carbon intensity value (in 2016)
99.78	gCO2e/MJ	CARBOB carbon intensity value (gCO2e/MJ)
3.4	unitless	Electricity (Light/Medium Duty Vehicle) Energy Economy Ratio (EER)
119.53	MJ/gal	CARBOB energy density
3.60	MJ/kWh	Electricity energy density
3.50	mi/kWh	Electric vehicle mileage

Source: California Air Resources Board

Typical emissions for light duty vehicles in Table 3, published by the Air Resources Board,[5] were the basis of estimates in this report. In internal combustion engine exhaust, high hydrocarbon emissions indicate unburned fuel, raw gasoline. Plug-in hybrid electric vehicles typically use batteries to power an electric motor and gasoline to power an internal combustion engine, so they also have hydrocarbon emissions. The group hydrocarbon emissions include organic hazardous air pollutant compounds.

Table 3: Emission Factors for Light Duty Vehicles (2016)

Emission Type"	Gasoline Vehicles (grams per mile)	Plug-in Hybrid Electric Vehicles (g/mi)	Battery Electric Vehicles (g/mi)
Hydrocarbon	0.005	0.003	0
NOx	0.032	0.019	0
PM2.5	0.020	0.011	0.010

Source: California Air Resources Board

Ontario CNG Station, Inc. estimates in Table 4 that during the six months altogether, the hydrocarbons were reduced 0.2 pounds, the smog precursor NO_x was reduced 0.65 pounds, and the particulate matter PM2.5 was reduced 0.2 pounds by vehicles fueled.

5 Air Resources Board Proposed Fiscal Year 16-17 Funding Plan. 2016.

Table 4: Environmental Effects of Project

Month	Charge Station	Total Power (kWh)	Gas Savings (Gallons)	e-Miles Added (incl. EER)	Emissions Savings (metric tons CO2)	HC Reduced (lbs./month)	NOx Reduced (lbs./month)	PM2.5 Reduced (lbs./month)
Aug	DCFC	184	18.8	644	0.15506	0.00710	0.04543	0.01420
Aug	Level 2	32	3.3	112	0.02697	0.00123	0.00790	0.00247
Sep	DCFC	239	24.5	836.5	0.20141	0.00922	0.05901	0.01844
Sep	Level 2	49	5.0	171.5	0.04129	0.00189	0.01210	0.00378
Oct	DCFC	147	15.1	514.5	0.12388	0.00567	0.03630	0.01134
Oct	Level 2	66	6.8	231	0.05562	0.00255	0.01630	0.00509
Nov	DCFC	263	26.9	920.5	0.22164	0.01015	0.06494	0.02029
Nov	Level 2	221	22.7	774.4	0.18647	0.00854	0.05463	0.01707
Dec	DCFC	396	40.6	1,386	0.33372	0.01528	0.09778	0.03056
Dec	Level 2	168	17.2	586.5	0.14122	0.00647	0.04138	0.01293
Jan	DCFC	643	65.8	2250.5	0.54188	0.02481	0.15877	0.04962
Jan	Level 2	221	22.7	774.6	0.18652	0.00854	0.05465	0.01708
Total		**2,629**	**269.2**	**9,202.1**	**2.21568**	**0.10144**	**0.64919**	**0.20287**

Source: Ontario CNG Station

CHAPTER 4: Conclusion

The primary goal of the project was to install three state-of-the-art electric vehicle chargers for the convenience of the public and collect six months of use and operations data from the project. The total power provided by the Level 2 system grew from 32 to 220 kWh/month. The total power provided by the DC fast charger grew from 150 to 600 kWh/month in actual use. Just 378 charges in six months was a very small amount of sales, unable to pay for the equipment: the public funding of $150,050 was necessary. The 2015 grade separation project at the adjacent Ontario International Airport delayed construction. Still, the goal was accomplished.

The station is strategically located between Los Angeles and Las Vegas on I-10, at 1850 E Holt Blvd, Ontario, CA 91761, along a major path for all of the Ontario International Airport traffic to the freeway and surrounding area. The station is also next to one of the largest convention centers in the area—Ontario Convention Center. Travelers find it convenient. From the start, all customers were very happy to have the fast charger options available.

Use of the chargers means an electric car is traveling instead of an internal combustion engine car. Reducing petroleum use reduces pollutants from the air, including CO2, carbon monoxide, NOx, and organic compounds. The effective carbon intensity is 30.80 g CO2e/MJ.

Electricity is a safe, clean, efficient and abundant source of fuel. The use of renewable electricity can decrease the dependency on foreign fossil fuel. The completion of this project has provided the infrastructure necessary to help make electricity a viable source of transportation fuel for businesses, governments, and private vehicle owners in Southern California.

Plans for the Future

Ontario CNG Station, Inc. intends to install solar photovoltaic panels to be eligible for "Electricity that is generated from 100 percent zero-CI sources used as a transportation fuel in California" because it is cleaner.

The station will also install CNG, hydrogen, biodiesel and Propel ethanol dispensers to attract more customers who want to fight climate change.

California's Zero Emission Vehicle Action Plan organizes state agency actions to grow the zero emission vehicle market. They reflect input from a broad stakeholder base and strive to increase transparency and accountability. In 2013, the first ZEV Action Plan was released, a roadmap designed to support the Governor's goal of 1.5 million ZEVs on the road by 2025 (Executive Order B-16-2012). It laid out progress to-date, challenges, and four high-level goals with a series of actions for state agencies to take that could accelerate ZEV adoption.[6] Hopefully California's Zero Emission Vehicle Action Plan will grow the zero emission vehicle market here in San Bernardino County.

6 California Governor's Office of Business and Economic Development ZEV Action Plan (http://www.business.ca.gov/ZEV-Action-Plan)

GLOSSARY

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

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

CARBOB - California Reformulated Gasoline Blendstock for Oxygenate Blending

CARBON DIOXIDE EQUIVALENT (CO2e)—A metric used to compare emissions of various greenhouse gases. It is the mass of carbon dioxide that would produce the same estimated radiative forcing as a given mass of another greenhouse gas. Carbon dioxide equivalents are computed by multiplying the mass of the gas emitted by its global warming potential.

CARBON INTENSITY (CI)—The amount of carbon by weight emitted per unit of energy consumed. When there is only one fossil fuel under consideration, the carbon intensity and the emissions coefficient are identical. When there are several fuels, carbon intensity is based on their combined emissions coefficients weighted by their energy consumption levels.

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.

COMPRESSED NATURAL GAS (CNG)—Natural gas that has been compressed under high pressure, typically between 2,000 and 3,600 pounds per square inch, held in a container. The gas expands when released for use as a fuel.

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

DIRECT CURRENT FAST CHARGER (DCFC) – A device to deliver electricity to the battery of an electric vehicle. For example, the ChargePoint brand Express 200 has a maximum capacity of 50 kW which can give the car 200 miles of traveling range in one hour.

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

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE)—Infrastructure designed to supply power to EVs. EVSE can charge a wide variety of EVs, including battery electric vehicles and plugin hybrid electric vehicles.

ENERGY DENSITY—The amount of energy stored in a system or region of space per unit volume.[7]

GREENHOUSE GAS (GHG)—Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include water vapor, carbon dioxide (CO2), methane (CH4), nitrous oxide (NOx), halogenated fluorocarbons (HCFCs), ozone (O3), perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs).

KILOWATT (kW)—One thousand watts. A unit of measure of the amount of electricity needed to operate given equipment. On a hot summer afternoon, a typical home—with central air conditioning and other equipment in use—might have a demand of 4 kW each hour.

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

LOW CARBON FUEL STANDARD (LCFS)—A set of standards designed to encourage the use of cleaner low-carbon fuels in California, encourage the production of those fuels, and therefore reduce greenhouse gas emissions. The LCFS standards are expressed in terms of the carbon intensity of gasoline and diesel fuel and their respective substitutes. The LCFS is a key part of a comprehensive set of programs in California that aim cut greenhouse gas emissions and other smog-forming and toxic air pollutants by improving vehicle technology, reducing fuel consumption, and increasing transportation mobility options.

MEGAJOULE (MJ)— A megajoule totals one million joules. A joule is a unit of work or energy equal to the amount of work done when the point of application of force of one newton is displaced one meter in the direction of the force. It takes 1,055 joules to equal one British thermal unit. It takes about one million joules to make a pot of coffee.

NITROGEN OXIDES (NOx)—A general term pertaining to compounds of nitric oxide (NO), nitrogen dioxide (NO_2), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes and are major contributors to smog formation and acid deposition. NO_2 is a criteria air pollutant and may result in numerous adverse health effects.

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. One size of air pollutant, PM2.5, is very fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller.

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)—A global association of engineers and related technical experts in the automotive, aerospace, and commercial-vehicle industries who set standards for fuel composition and fueling technologies.[8]

SOCIETY OF AUTOMOTIVE ENGINEERS J1772 – A document named RECOMMENDED PRACTICE FOR ELECTRIC VEHICLE AND PLUG-IN HYBRID ELECTRIC VEHICLE CONDUCTIVE CHARGE COUPLER (SAE J1772) which covers the general physical, electrical, functional, and performance requirements to facilitate conductive charging of EV vehicles in North America.

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7 Definition of Energy Density (https://energyeducation.ca/encyclopedia/Energy_density/)

8 Society of Automotive Engineers (https://www.sae.org/about/)

Defines a common vehicle supply equipment conductive charging method including operation requirements and the functional and dimensional requirements for the vehicle inlet and mating connector.[9]

ZERO EMISSION VEHICLE (ZEV)—Vehicles that produce no emissions that pollute the environment or disrupt the climate from the on-board source of power (for example, an electric vehicle).

9 Society of Automotive Engineers Standards for Charging called SAE J1772. 2010. (https://www.sae.org/standards/content/j1772_201001/)